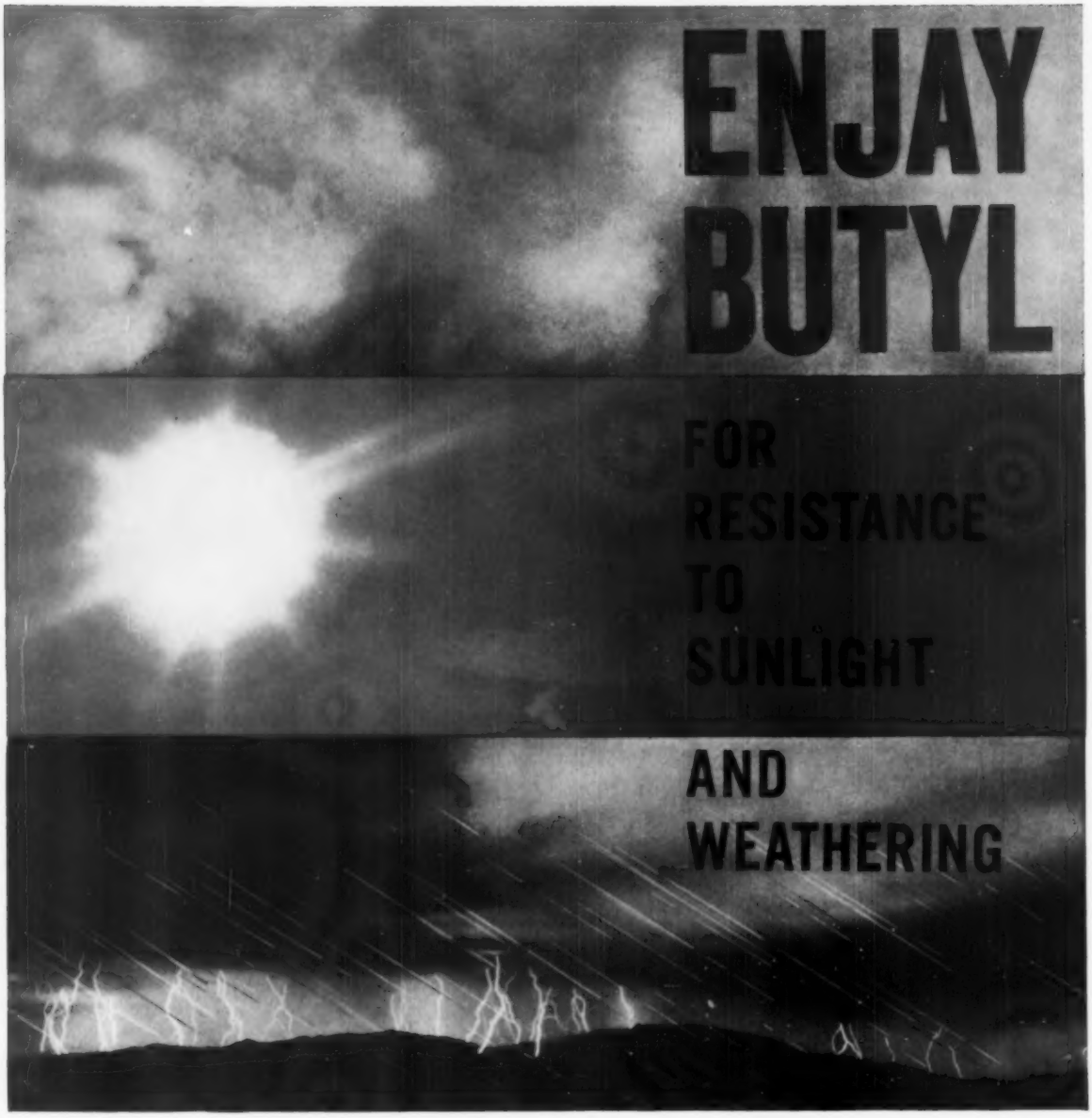
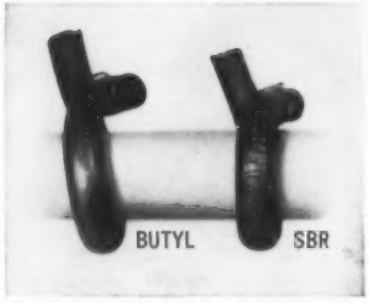
INDUSTRIAL DESIGN

4

Helicopters and other unusual flying machines

The designer manufactures—a business case history





Butyl's high resistance to ozone is graphically demonstrated when compared with SBR or natural rubber

Enjay Butyl rubber has demonstrated for many years its outstanding ability to resist deterioration caused by sunlight and weathering. This inherent resistance of Butyl to ultra-violet light, ozone, oxidation, moisture and mildew, has made possible many new and colorful products. Butyl has also increased the life of other products such as weatherstrips, protective coating, garden hose, wading pools and many automotive parts.

Butyl *also* offers...outstanding resistance to chemicals, abrasion, tear and flexing . . . superior damping qualities . . . unmatched electrical properties and impermeability to gases and moisture.

For more information call or write the Enjay Company.

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BUTYL

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

ENJAY COMPANY, INC., *15 West 51st Street, New York 19, N. Y.*

Akron • Boston • Charlotte • Chicago • Detroit • Los Angeles • New Orleans • Tulsa

APRIL, 1960 VOLUME 6 NUMBER

4

INDUSTRIAL DESIGN

A monthly review of form and technique in designing for industry. Published for active industrial designers and the executives throughout industry who are concerned with product planning, design, development and marketing.

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Coming

IN MAY—Museum exhibits pose specific problems for the industrial designer.

IN JUNE — Architect-industrial designer relationship: overlapping functions explored.

COVER: A series of complex elements, the shaft, rotor head and blades of the Omega Bö 13, are made more colorfully complex in this month's cover. A less intricate view of helicopters begins on page 30.

FRONTISPIECE: Rodney Hatanaka's photo shows workman dangling from crane in the process of erecting fiber glass reinforced plastic umbrellas for the Moscow fair. See page 47.

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LETTERS

Hallelujah for Harris

Sirs:
Design is a major part of our business. Consequently, I was impressed by what was said to the A.S.I.D. Conference on "Design Responsibilities and Directions," by Sidney J. Harris, as reported in the January issue of your paper. Having known Mr. Harris quite well for almost two decades, I won't fight Dave Chapman, but I will say hallelujah and Amen to the "generous sampling of what they caught" from Sid Harris.

When a person prostitutes his talents he not only loses his integrity, but, ironically, sometimes even loses the wages of his sin. Remember the present day automobile design, and, in particular, the 1957 Cadillac Eldorado, another faked chromium trimmed abomination. Maybe the consumer has better taste than most of us credit him with. Look at the present sound middle class furniture; in contrast, remember the "borax" that the smart guys thought it necessary to produce a couple decades ago.

I've always admired Sid Harris's ideas and the pungent way in which he expresses them, but I think he was at near peak in this particular instance.
Julius Braun
W. Braun Co.
Chicago

Student design project

Sirs:
Our senior class in industrial design recently tried an experiment in "getting the most out of a visiting fireman" which we think might be of interest to your readers.

Several weeks in advance of his visit we asked Don McFarland, current president of A.S.I.D., to prepare a problem for the class to work on so that he could criticize the solutions on his arrival — and so that his short stay would result in more than a talk on generalities of design and the profession. The problem set was a transistor radio, prepared as realistically as any in actual practice — including many of the limitations that professional designers must deal with. Since the problem was similar to projects which Mr. McFarland had given his own staff, it formed an excellent basis for the evaluation of the work of these prospective designers.

It worked so successfully, at least from our point of view, that we would like to try it again if we can find someone as cooperative as Mr. McFarland.
John Maguire
Head, Industrial Design
University of California

Pack of irritations

Sirs:
Your article on cigarette packaging in February raises a number of points. First, I think that shape exploration of the pack of 20's (and why 20's?) is called for — why not a flatter, less bulky pack? And there continues to be no provision for matches; their lack of availability is the biggest source of annoyance to smokers (and their friends).

Paper packs lose glamour when they're unsealed — must they?

Paper packs, once they're open, are a source of never-ending tobacco particles in the pocket and remain open to dirt and air.

There is still too much sameness in graphic treatment, though recently there has been considerable improvement. Few packages reflect "pleasure" in their appearance, however.

Surprisingly few packs relate to their cartons and/or advertising (notable exceptions include Tareyton and Marlboro).

No cigarette pack relates visually to the product although Tareyton takes an abstract (and invisible) look at this exploitation possibility.

The use of foil, embossing and/or other processes and materials to provide a new look has barely been touched.
William M. Goldsmith
Dave Chapman, Inc.
Chicago

"Simplify" qualified

Sirs:
I would like to thank your editors for supplying me with a constant and never-changing design direction during my past three years in the military service. It was always satisfying to read issues of INDUSTRIAL DESIGN, and inspiring to see the philosophical vein of the editorials.

In your December issue you quote a maxim of Henry Thoreau, "Simplify, simplify". I think this could be expanded for our purposes to read, "Simplify to the extent that you are positive of the balance of design elements at your disposal".
William H. Whitney
Grosse Point, Michigan

Sympathy in San Francisco

Sirs:
Congratulations on the outstanding February issue. Of course, we are all pleased here with the beautiful treatment accorded the story of our vacuum-forming technique, but the rest of the book is also a delight both from the editorial and layout points of view. Speaking of editorials, your fine one on "The misery of choice" found very sympathetic readers in these quarters.
Walter Landor
Walter Landor & Associates
San Francisco

Sirs:
I have just received the February 1959 article entitled "Shape-Variety in Plastic Extrusions."

I would like to congratulate you for an excellent job in presenting this complex and varied subject in such a concise and interesting manner. It is rare that one comes across an article which in just four pages presents a really adequate picture of custom extrusion.
Robert Marx
Anchor Plastics
Long Island City

Errata

Columbium: on page 68 of the March issue the atomic weight of columbium was given incorrectly as 41. This is the atomic *number*. The correct weight is 92.91.

Susan Senior, associate director of the international program at the Museum of Modern Art, was called "Sally" Senior on page 14 of the March issue.

Sketches on page 12 of the March issue should have been credited to *Motor Life*.

In the February issue of ID, page 22, Fred J. Brauer was described as consultant designer to the naval architects Gibbs & Cox. This should read as follows: Fred J. Brauer, Inc., were retained as interior designers by Ormet Shipping Corporation for ships designed by Gibbs & Cox.

Again Eastman leads the way in color—

with 8 TENITE POLYETHYLENE

Standard Color Concentrates

Advantages: Use of messy dry colorants is eliminated • Color uncertainty and contamination possibilities are minimized Easier and faster color changes are possible • Mixing time is reduced • Inexpensive mixer hoppers can be used

Tenite Polyethylene *Standard* Color Concentrates offer molders a quick, clean and sure means to color polyethylene for injection molding or continuous extrusion. The cost is usually less than a penny a pound when used in a 1-10 ratio with natural material. Lighter or darker shades, of course, can be obtained by varying this ratio. Also, by combining concentrates of different colors in ratios determined by experimentation, other attractive colors may be produced.

Because these concentrates consist of natural polyethylene resin in which coloring agents have been thoroughly predispersed, pigment agglomeration is virtually eliminated. The result: excellent, uniform dispersion of the color throughout the molded product.

Standard color concentrates are stocked for immediate shipment in 50-pound multiwall bags and in 10-pound polyethylene bags. Other concentrates are also available (at slightly higher cost) in an almost unlimited range of colors to satisfy any color request.

To color polyethylene . . . . . .

. . . add Tenite Color Concentrates

TENITE
POLYETHYLENE
an Eastman plastic

For prices and a set of molded 1-to-10 samples of our eight standard colors, write EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

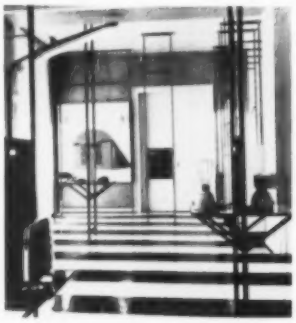
INTERNATIONAL DIGEST

Summaries of articles from leading publications that reflect the current design climate abroad

POLAND

PROJEKT, Warsaw
November, 1958, page 9
Transformations in Space: an analysis of the transformations painting and sculpture have undergone in the last hundred years lead writer Jerzy Olkiewicz to a discovery of close inter-connections with contemporary science and technology (as the similarity between the form of a utilitarian milking machine and a Brancusi sculpture, above, indicate). He suggests that the activities of the de Stijl group and the Russian abstractionists have their equivalent in the architecture of Corbusier, Mies, Gropius and Oud, and wonders if architecture, freed from the rigors of dry geometry, will lead painting toward a new Romanticism. The same issue reports on Poland's special "exhibition laboratory" at the Warsaw Academy of Fine Arts, which devotes itself solely to solving exhibit problems and to new techniques.

GERMANY



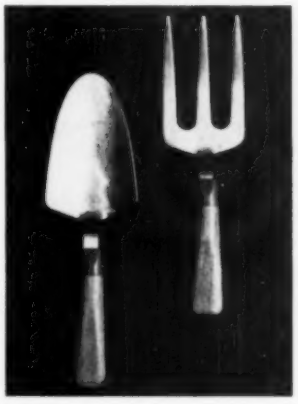
GRAPHIK (Advertising Art and Industrial Design), Munich
February, 1959, page 4
Haus Industrieform (House of Industrial Design), unlike the British Design Center, serves as a design adviser on product development to industrial firms as well as exhibiting the latest in German design. The austerely designed exhibit halls, (above) strongly Bauhaus in flavor, were visited by more than 120,000 people last year. Under the direction of Dr. Paul Mahlberg, Haus Industrieform is located in the Villa Hugel in Essen-Bredeney.

ITALY

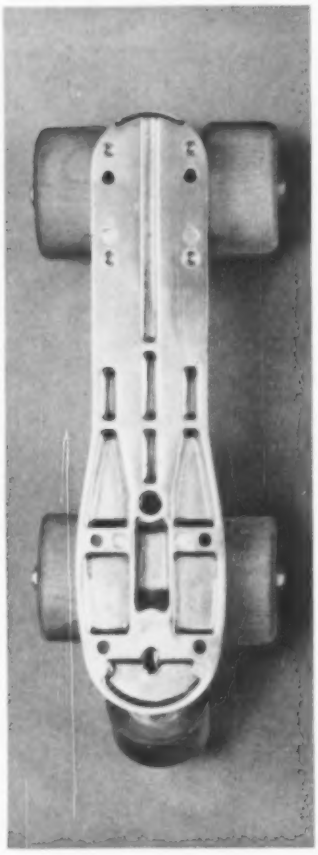
STILE INDUSTRIA, Rome
October, 1958, page 2
Pinin Farina, one of the most famous auto designers in the world, is described in four separate articles which combine to give an unusually rich picture of him and his work (below, left). In the first article, an excerpt from a book to be published in the Compasso d'Oro series, Bruno Alfieri and Ferruccio Bernabo describe Farina as the greatest coachmaker of our time because he "has successfully resisted the temptation to work out a scheme, a system of symbols, esthetic clichés which are the first symptoms of the involutionary process in the designer. From the beginning Farina's vehicles have avoided reflecting recent taste as manifested by the upper middle-class."

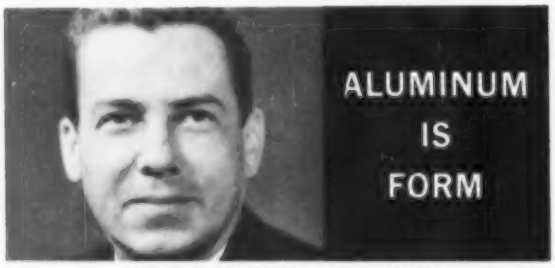
ENGLAND

ARCHITECTURAL DESIGN, London
February, 1959, page 82
"The expendable ikon" is a phrase which John McHale uses to describe a communication phenomenon peculiar to our time. An ikon, says Mr. McHale, in addition to giving a simple message also conveys more complex communication —by sign, symbol and image — about man's total environmental situation. Historically, the creation of ikons has been the role of the fine arts, and their meaning tended to stay the same for long periods of time. Today, with the fine arts more and more excluding man as a subject, ikons meaningful for our time are to be found in the technological folk arts — the mass media. Earlier ikons of man in action "depicted him in the panoply of war, as huntsman, as god, but man on the frontiers of science presents a more potent and appropriate image to our time," says Mr. McHale. He links such machine-age monsters as the outer space men (at left) with the gargoyles and devil masks of earlier times saying both relate to man's unstable awareness of his own form.



DESIGN, London
January, 1959
Focus on British design: a 38-page review of some of the best British design, is introduced by Sir Gordon Russell, director until recently of the Council of Industrial Design. "We have in Britain," he says, "a sense of scale founded on our belief in the importance of the individual. Our job is to hold on to our great traditions." He added, however, that it would be wise to "spend less time talking of things we imagine other people do badly, and find out how we could do things better ourselves."





e.g., NEW FINISHES, NEW ALLOYS EXTEND THE USES OF DIE CASTINGS

. . . S. L. Fahnestock, Chief Designer, Alcoa

You—Sam, bring me up to date on the latest in die castings.

Fahnestock—Big things are happening. For example, we've greatly improved the ball-burnishing process. It now produces a much brighter, smoother finish that approaches a **polished** finish, at much less cost. (Note roller skate.)

You—This means I can specify ball burnishing for some items that formerly needed polishing. Extends the use of die castings. That's very good.

Fahnestock—Right. And did you know that die castings can be **anodized** and finished in rich dark colors? Gun manufacturers use them for frames, butt plates, trigger guards and so forth.

You—How about anodizing die castings in **light** colors?

Fahnestock—Well, we're working on that and I should have some news for you soon. Meanwhile, one smart manufacturer is getting a similar effect by coating die castings with aluminum-pigmented **lacquers.**

You—What's the prior surface preparation?

Fahnestock—Quite simple. Just apply an Alrok® chemical conversion coating or any good chromate or phosphate treatment and you should see the finish you get.

You—I'd like to. Send me a sample. Any more news?

Fahnestock—Yes indeed. Note that "pretzel bend." (at right above) That's aluminum—die cast from our new **ductile** alloy.

You—Took that bend without even a crack. I'm impressed!

Fahnestock—We also have die-casting alloys that are **bearing** alloys as well as structural alloys. Drill a hole in the structural part and it's a bearing. No inserts needed.

You—I understand you can also bond stainless steel to aluminum die castings.

Fahnestock—Yes sir. Great for things like fry pans and iron soles.

You—This gives me something to think about. Where can I get information for a specific job when it comes up?

Fahnestock—Easy. Just call your Alcoa sales office or write me at: Aluminum Company of America, 1971-E Alcoa Building, Pittsburgh 19, Pennsylvania.

®Registered Trademark of Aluminum Company of America

ALCOA IS ALUMINUM

CAMPCO PROGRESS

latest developments in plastic sheet • film • fabrication

New Concept in Luggage

Campco Linear Polyethylene Sheet

Light-weight, rich-looking quality luggage at half the cost of conventional types is now possible with a new Campco Copolymer Linear Polyethylene sheet. The excellent physical properties of this material form into luggage that is almost indestructible in resisting the impact and abrasive wear and tear of baggage handling, extreme cold (to −180°F), moisture, mildew and chemicals.

Its high tensile and flexural strength make applications with complicated draws like forming luggage possible.

Campco Linear Polyethylene lends itself to all conventional forming techniques, machines readily and can be rapidly die-cut to size and shape. Sheets can be bonded with commercial cements or welded with heat and pressure.

Available in smooth or Haircell grain embossed finish, sheet or roll from .020 to ¼" thick. Excellent for automotive interiors, apparatus cases, housings for business machines, housewares, cabinet drawers, duct work and exhaust hoods.

Visit Campco Display

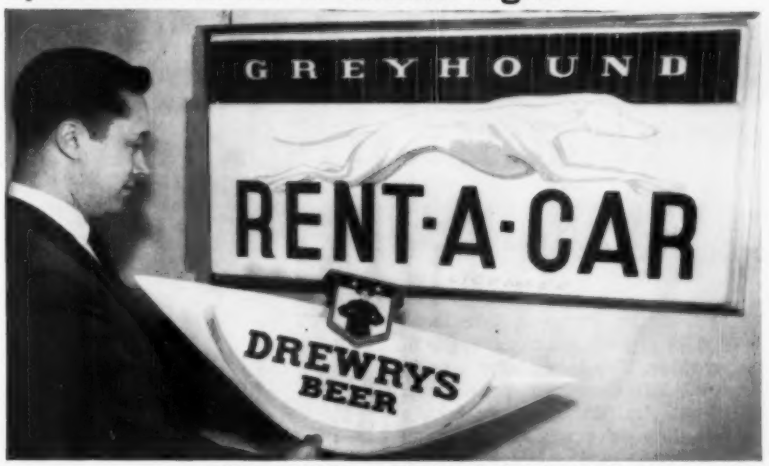
. . . Booth 521 at National Packaging Exposition

April 13 to 17, International Amphitheatre, Chicago

See the latest packaging and display applications of

Polyethylene, Acetate, Butyrate, Styrenes, Polypropylene, Nylon.

Campco Butyrate scores in weather tests, opens new vistas in outdoor signs



Outdoor signs of Campco Butyrate by Standard Manufacturing Company, Chicago

Colorful outdoor plastic signs that can withstand weather hazards without becoming brittle or losing their brilliance are now possible with a special Campco Butyrate sheet. Made from resin supplied by Eastman Chemical Products, Inc., Campco Butyrate is tough, durable, easy to form, and completely weather resistant.

Weather-test results at Arizona checking stations assure the resistance of Campco Butyrate to extremes of sunlight, rain, heat, cold, snow and wind. Moreover, its surface resists dirt build-up and washes clean in rain.

Because Campco Butyrate is strong and resilient even in thin sections, substantial savings can be effected in its application for outdoor signs. A little goes a long way. Its ease of forming opens unlimited design opportunity—imaginative shapes . . . new vistas in outdoor signs.

Campco Butyrate is available in clear crystal or a variety of colors—rolls and sheets in thicknesses .005" to .125" stock or custom size. Clarity ranges from transparent through translucent to opaque.

It's easy to decorate by either lacquer or silk-screening. Attractive combinations of bright trademarks, slogans or other wording against colored or clear background are easy to achieve.

Campco Woodgrain Sheet sells "A'lure"

Handsome counter displays of Campco Woodgrain finish plastic sheet are helping to sell Warner Brothers "A'lure" bras in apparel stores throughout the country. This new Campco sheet looks like solid wood but is light as a feather, and has all the excellent qualities of standard Campco sheet . . . high impact resistance, dimensional stability and outstanding formability. Available in cut-to-size and standard sheets from .040" to .187" thick.

Received Your Campco Personal File? This data-packed reference file on thermo-plastic sheet and film is yours on request—just send name and address on Company letterhead to Campco, 2709 Normandy Avenue, Chicago 35, Illinois.

CAMPCO Sheet and Film, **a Division of Chicago Molded Products Corp.**

DOW | **NEW PLASTICS** *inspire new product designs*

The news columns have been filled recently with rapid-fire developments in thermoplastic materials . . . materials that hold promise for the improvement of hundreds of products, both old and new. As these stories break, you'll notice a high percentage of them featuring a Dow material. Take Zerlon® 150. A few weeks ago Dow introduced this weather resistant, optically clear plastic with an exciting new range of cost-saving properties. Several other news-makers in the complete Dow line are discussed on these pages.

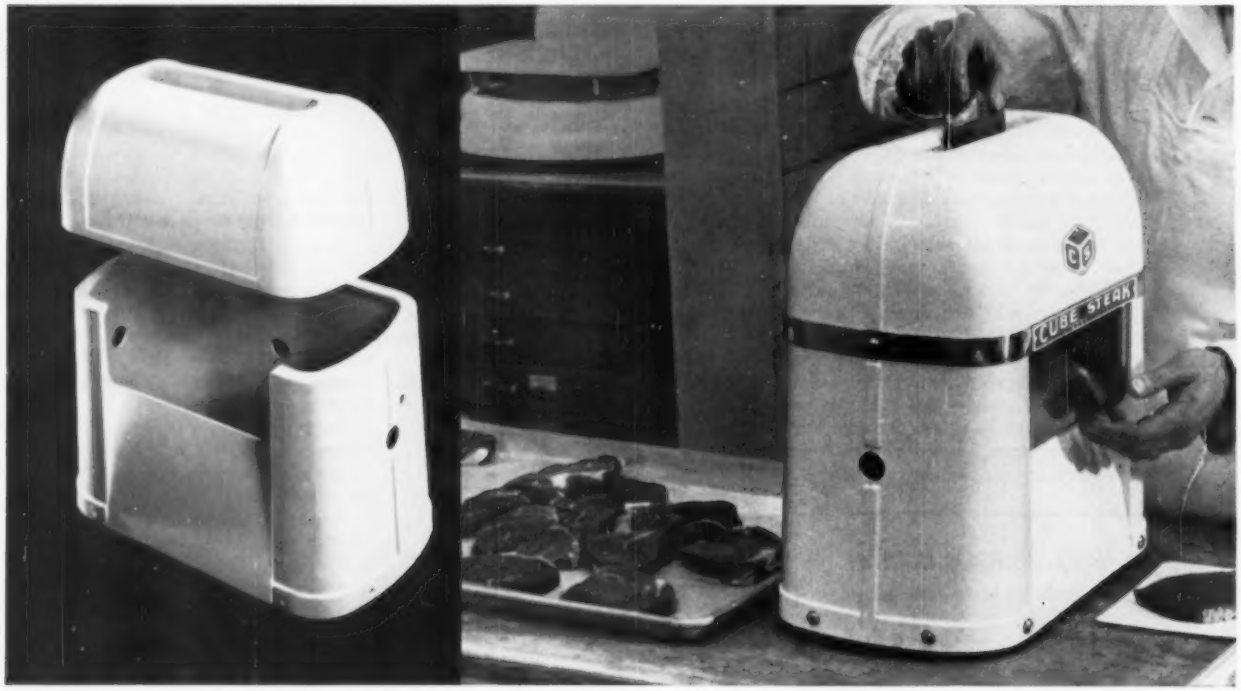
*Trademark

"AGELESS" STYRON 480 GIVEN LIFETIME GUARANTEE IN NEW SUPERMARKET TOOL

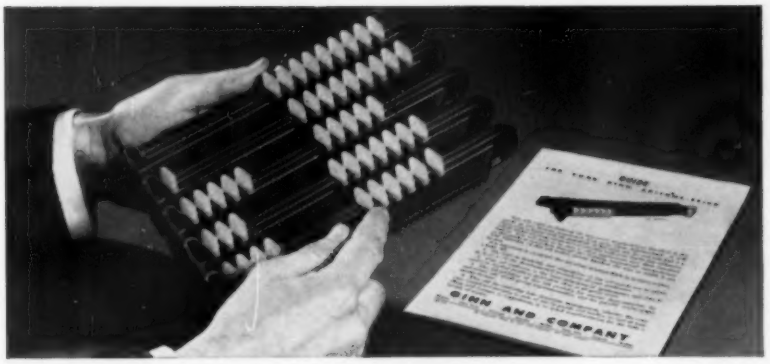
The housing of this new Cube Steak Tenderator is guaranteed for the life of the machine. This is a generous guarantee to make on equipment in rough and tumble supermarket service, but the manufacturer isn't worried . . . he knows the housing is made of Styron® 480. This versatile thermoplastic was chosen because it's durable and highly resistant to meat juices, has super high impact strength, an easy-to-clean surface.

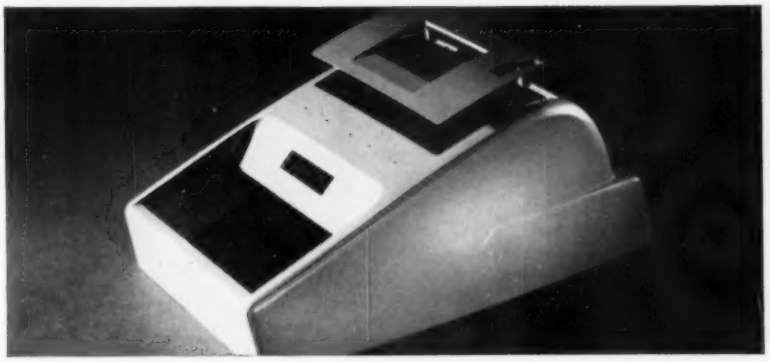
The excellent aging characteristics of Styron 480 were also an important consideration. In fact, the lifetime guarantee could not have been made without them. Fabrication was simplified and production costs substantially reduced by switching to plastic.

The housing made of Styron 480 is an excellent example of how Dow plastics help make good products better. An increasing number of manufacturers are selecting from the extensive Dow line of eight basic thermoplastics and dozens of specialized formulations. And you get extras from Dow you can't buy on a cost-per-pound basis: technical service, marketing assistance and a color styling service that's second to none.



THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN





Ready for the sales countdown . . .

with this abacus made of Styron 475

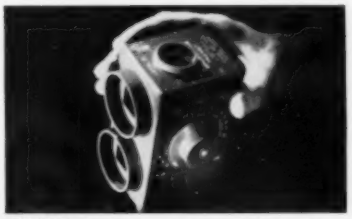
A prominent publishing house markets this attractive, highly useful educational tool. It's made of polyethylene and Styron 475, a high impact Dow plastic with excellent dimensional stability, design flexibility and moldability to spare. This abacus was developed for the publisher by a custom molder who offers integrated design, engineering and production services. It's another example of how creative engineering utilizes the many benefits of Dow plastics in new product designs.

. . . and this adding machine housing molded of Styron 440

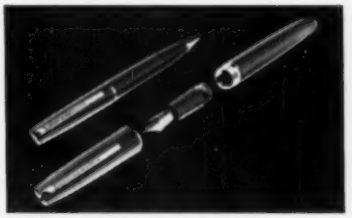
Outstanding impact strength, design versatility and a wide range of colors make Styron 440 an obvious choice for this application. The housing is easy to keep clean and its high resistance to heat prevents distortion when the machine is displayed in direct sunlight. Styron 440 also eliminated the extra fabrication and finishing operations that were necessary with the material previously used in the housing. The surface is smooth and polished when removed from the mold.

4 MORE PRODUCTS

fashioned from America's first family of thermoplastics

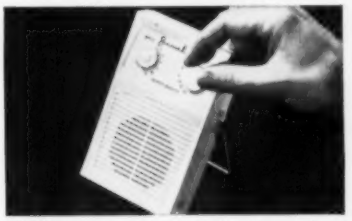


ETHOCEL. "The aristocrat of plastics," Ethocel® provides exceptionally high impact strength for this compact transit. Its superior dimensional stability helps keep the lens positioned in the one right place.



TYRIL. Characteristics such as beauty, strength and resistance to perspiration make Tyril® the ideal choice for this pen and pencil set. Tyril also provides excellent moldability for intricate details such as threaded sections.

STYRON 440. This new speaker housing for auditorium walls utilizes many of the properties of versatile Styron 440: Excellent large-area molding characteristics, a surface that requires no finishing.



TYRIL. This transistor radio housing made of Tyril has toughness, dimensional stability and a wide range of colors. Excellent electrical properties are other benefits of this outstanding Dow thermoplastic.

FOR MORE INFORMATION about the versatile Dow plastics and the product designs discussed on these two pages, write to us today. THE DOW CHEMICAL COMPANY, Midland, Michigan, Plastics Sales Department 1510BR4.

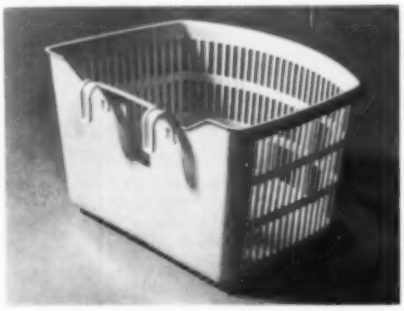
Industrial Molding Materials • Packaging Materials • Paint and Coating Materials • Building Products

DOW

NEWS

Take-apart train by the staff of Maba Toys Ltd. (above), stacking chairs by Orr Associates Ltd., and bicycle basket by staff of Smith & Stone Ltd. are among winning designs.

Canadians name award winners



Canada's National Industrial Design Council has designated 42 products for Design Awards in the 1958 judging. This past year more than 400 entries were submitted by manufacturers and designers from all over Canada. While all entries were manufactured in Canada, a number were designed outside the Dominion. The four American products to win awards were the Bissell Carpet Sweeper Company's rug and upholstery shampooer on which Harley Earl Associates colaborated with the Bissell design staff, Charles Eames' stacking chairs, and the Royal Futura 800 typewriter designed by Laird Covey. Four designs originated in Denmark and two in England.

The contest has been an annual event since 1953, and is sponsored by the NIDC to foster good design in Canadian-made products and encourage interest in design.

Aspen announces complete program

"Where communication between men has not been established, where the meeting of men's minds and hearts has not merged, men have frequently regressed into primitive behavior both within themselves and in their relationships with their neighbors." This is the thesis on which the forthcoming Ninth International Design Conference in Aspen, Colorado will be based. Date for the meeting has been moved up to the week of June 21-27. With "Communications: the image speaks" as the theme of the conference, participants will study why "the links of communication that demonstrate man's interdependence have broken down."

Recent additions to the roster of panelists (for the others see January ID, page 14) include: Abram Games, London designer; William Capitman, president of the Center for Research in Marketing; and Gilbert Cohen-Séat, French film philosopher. Moderators of the three discussion cycles will be Thomas M. Folds, director of the fine arts department at Northwestern University; Ralph Eckerstrom, design director for the Container Corporation of America; and Saul Bass, designer.

The three discussion cycles will take up different aspects of the image as a vital part of the communication process. "Cycle I—The Image Evolves: the pressure of man's growth created the symbols he needed for communication." Participants in this cycle will examine the image from a scientific and esthetic viewpoint, giving special attention to the evolution of basic visual forms.

"Cycle II—The Printed Image: the advertiser, publisher, teacher, artist and State vie for a moment of attention in the public mind." Participants will discuss why our images and symbols have failed. Various printed forms of communication and exhibits of posters, books and magazines will be used as background for the talks.

"Cycle III—The Film Image: the power of film sums up our study of the image in communication. The universality of this art encompasses all the other arts and leads men to know each other through art." Examples of foreign and domestic films will be shown during the conference.

Further information and registration may be obtained through IDCA, 22 East Illinois, Chicago, Illinois.

Craftsmen to meet in June

The importance of craft work in a society where most goods are mass-produced will be emphasized at the third annual Conference of American Craftsmen at Lake George. New York, June 19 to 21. Speakers, whose remarks should have special interest for the industrial designer, will include John A. Kouwenhoven, Finn Juhl, Arthur Pulos and Leo Lionni. Under the theme, "Exploring the Craftsman's World," the discussion will be divided into three areas: the craftsman's educational needs, the purpose of the craftsman's product, the challenge of society to the craftsman. On the third day of the conference participants will pinpoint some of the problems which the 50 conference panelists have raised.

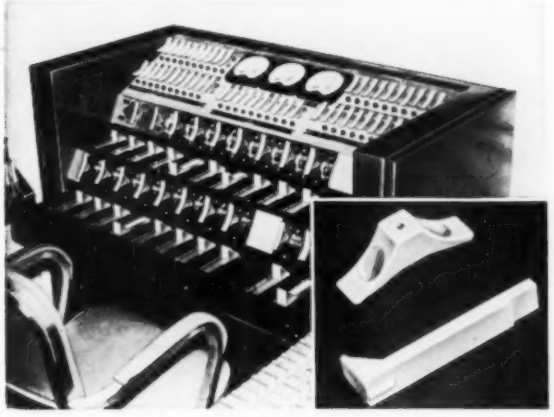
Information on registration for the conference may be obtained from the American Craftsmen's Council, 29 West 53rd Street, New York 19, New York.

CYANAMID

PLASTICS IN ELECTRICAL DESIGN

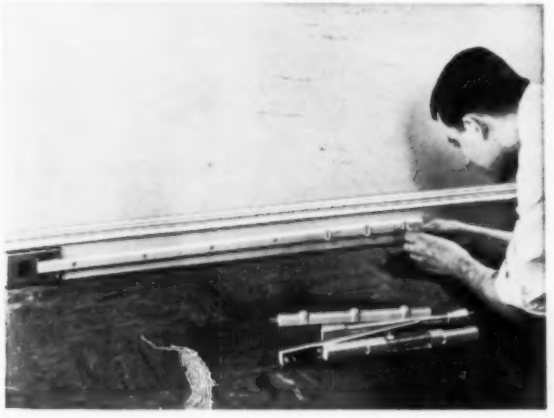
An Ounce of Protection

KLIXON precision aircraft circuit breakers have to be light; yet even the smallest, weighing about 1¼ ounces, can safely interrupt a 120-volt ac, 400-cycle circuit delivering over 4000 amperes. To provide the high arc resistance and great physical strength required, Spencer Thermostat Div., Metals and Controls Corp., uses glass-filled CYMEL® melamine plastic housings. These non-corrosive housings are excellent insulators and stand up to impact, humidity, dust, temperature extremes and fire.



Plastic Keys Conduct Orchestra of Light

The Lumitron Lighting Control System permits one operator to play infinite variations in stage-lighting effects using handles and slide bars molded of BEETLE® urea plastic. BEETLE, an excellent dielectric, requires no insulation. Molded-in colors are permanent, permit quick circuit identification for console operator. Developed by Metropolitan Electric Manufacturing Company, the Lumitron has an excellent record of dependable performance.



New Low-Cost Electrical Outlet System

Made of ivory-colored BEETLE urea molding compound, new interlocking foot-long units provide low-cost, easily installed electrical outlet extensions. BEETLE combines good mechanical and dielectric properties for safe, dependable service, meeting ASTM Specifications D705-49, Grade I. Made by Cable Electric Products, Inc., this new Snapit Inter-Link System is fully approved by Underwriters Laboratories, Inc.

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Illinois Institute of Technology announces "100 best products"

The "100 best-designed products of modern times," as chosen by a panel of 100 designers, educators, editors, and architects, has been announced by the IIT Institute of Design, sponsors of the poll. The top ten products were reported in the January issue of INDUSTRIAL DESIGN (page 14) and a discussion of the significance of the entire IIT list was printed in ID's February issue (page 54). The Institute hopes to make a permanent exhibition of the 100 products, using them as a "touchstone" for teaching. Following is the complete list of 100 products.

1. Olivetti Lettera 22 typewriter
2. Eames plywood and steel side chair
3. Barcelona chair, Mies van der Rohe
4. Studebaker 1953 hard top coupe
5. Parker "51" fountain pen
6. Lincoln "Continental" 1939-41 series
7. Edison Voicewriter "VP" model
8. Frigidaire "Sheer Look" 1957 appliances
9. Hallicrafters radio
10. Bell "500" telephone
11. Necchi sewing machine, Nizzoli
12. Fuller geodesic dome
13. Saarinen "womb" chair
14. Cord model 810-812 automobile
15. Vespa motor scooter
16. Borg "Flight" bathroom scale
17. Karmann-Ghia Volkswagen
18. Singer upright vacuum cleaner
19. GE wall refrigerator
20. Leica III-c camera
21. American Modern dinnerware, Russel Wright
22. Revere copper-bottomed pots and pans
23. Flint "Continental" kitchen tools
24. Breuer tubular dining chair, cane seat
25. Raleigh bicycle (English)
26. Bissell carpet sweeper
27. IBM "Ramac" computer
28. Cisitalia automobile (Farina body)
29. Toastmaster toaster (original pop-up)
30. McCobb "Planner Group" furniture
31. Studebaker 1947 "Starlight" coupe
32. Eames fiber glass chair
33. Aalto bent plywood framed armchair
34. Bell & Howell 16mm movie camera #240EE
35. Willys army jeep
36. Chemex coffee maker
37. Schick "20" electric razor
38. Crane "Criterion" bath fixtures
39. "Hardoy" chair
40. Ford Thunderbird 1955 model
41. Porsche
42. Douglas DC-3 aircraft (Dakota or C-47 military)
43. Thermador built-in range and oven component
44. IBM electric typewriter
45. Olivetti adding machine
46. Original canvas deck chair
47. Hans Wegner teak and cane chair
48. Arzberg china (1382 or 2000)
49. Brunswick school furniture ensemble
50. GE packaged kitchen
51. GE's first portable TV receiver
52. Zippo lighter
53. Castleton china (Museum white)
54. Nelson modular group furniture
55. Winchester lever action carbine (original)
56. Noguchi tri-legged lamp
57. Thonet chair #b-9
58. Nutone built-in mixer
59. American Tourister "Tri-Taper" luggage
60. Gense "Focus" flatware
61. Steinway grand piano
62. Finn Juhl carved wood chair, c.1950
63. Pyrex chemical flasks
64. Hasselblad camera
65. Gio Ponti toilet
66. Citroen DS-19
67. Eames articulated lounge chair with hassock
68. McCobb "Directional" group furniture
69. Nelson original "Ball" clock
70. Bell & Howell-Columbia hi-fi console, Paul McCobb
71. Beechcraft "Bonanza" airplane
72. Eastman "Brownie" camera
73. Coldspot refrigerator 1937 model
74. Luxo drafting lamp #154-2
75. Saarinen pedestal chair
76. BSA motorcycle
77. Moen single control faucet
78. Versen original ball lamp
79. Rolls Royce Phantom II
80. Frigidaire "fold-down" range units
81. Hermes portable typewriter
82. Hamilton "turnip" railroad watch
83. Ford "Model T"
84. Aalto 3-legged stacking stools
85. Luger 9mm pistol
86. IBM time clocks
87. Talon zipper
88. LaSalle automobile 1935 model
89. MG "TC" model 1948
90. Franklin stove (very early)
91. Ampex portable tape recorder
92. Budd stainless steel railway coach
93. Borletti sewing machine, Zanuso
94. Bubble lamp, Nelson
95. Hough "Payloader"
96. GM "Scenicruiser" bus
97. Victor talking machine, "morning glory" speaker
98. Tappan wall hung range
99. "Futura" type face
100. A.C. Gilbert "Erector" set

Russia promotes design says Scherr

"We feel that industrial design will soon be an important profession in Russia," a Soviet designer told Samuel Scherr, partner in the Akron design firm of Smith, Scherr and McDermott, during his recent, 11-day tour of the Soviet Union. Mr. Scherr, who returned this month from a 90-day journey through Japan, Korea, China, Thailand, India, Russia, France and England, reported his experience at a press conference at ASID headquarters in New York on April 3. During his tour Mr. Scherr visited the Moscow High Art

and Industry Institute, one of the few places where industrial design is taught in Russia. Both teachers at the school and practicing designers "were eager to learn, conscious of their lacks and sure that they would, eventually, be able to remedy them," Mr. Scherr discovered. The teachers wanted to know the size and number of students enrolled in our design schools, so that they could persuade their own superiors that the same kind of training is needed in Russia.

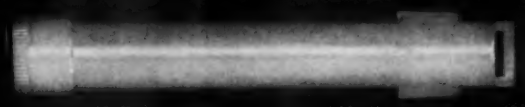
While there is frequent criticism in Russia of American materialism, Mr. Scherr remarked, the Russians themselves are fascinated with consumer goods. "In fact, Russia would offer a great new market for the U.S. if a trade agreement could be arranged," he said.

Alcoa announces education program

A new program for aluminum, aimed at industrial design students, has been announced by Samuel L. Fahnestock, chief industrial designer for Alcoa. Mr. Fahnestock, who will direct the program for Alcoa, says that it will offer three services to schools and colleges: complete aluminum technical libraries, aluminum materials needed for approved student projects, and seminars discussing new forms and finishes available in aluminum.

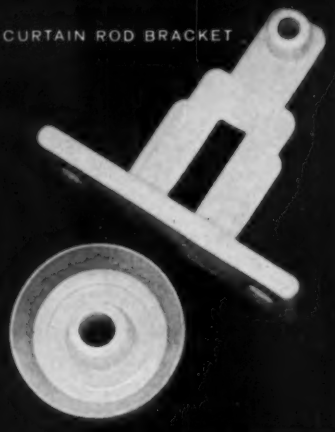
At present the new program is operating in the industrial design departments at Philadelphia Museum School, University of Syracuse, Rhode Island School of Design, IIT's Institute of Design, Pratt Institute, University of Illinois.

DESIGNED IN CELANESE FORTIFLEX...



PILL DISPENSER

CURTAIN ROD BRACKET



CURTAIN ROD ROLLER

LABORATORY FITTINGS

from Laboratory Fittings to Pill Dispensers . . .
Product improvement inspired by FORTIFLEX

These applications of the remarkable new Celanese polyolefin plastic Fortiflex are typical of dozens—hundreds—of industrial products and components that are already being made of this material . . . and the list of new products and design improvements inspired by Fortiflex is growing daily. For Fortiflex possesses many of the desirable features of polyethylene . . . *plus* new rigidity, new strength, new surface lustre. It's resistant to acids and alkalis, heat and cold; it's structurally strong; and it's economically molded. Fortiflex is presently available in four melt indexes developed to accommodate a wide range of conditions and applications of interest to designers and manufacturers. For more information and/or test quantities, please use the coupon.

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Fortiflex...a Celanese plastic

Canadian Affiliate: Canadian Chemical Company Limited, Montreal, Toronto, Vancouver.
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TYPICAL PHYSICAL AND CHEMICAL PROPERTIES OF FORTIFLEX

Properties of Fortiflex "A" Related to Melt Index

PHYSICAL PROPERTIES	ASTM METHOD	UNITS	FORTIFLEX RESINS A-20	A-70	A-250	A-500
Melt Index	D-1238-52T	—	0.2	0.7	2.5	5.0
Heat Distortion Temp. (66 psi)	D-648-45T	°F.	185	185	180	180
Brittleness Temp.	D-764-52T	°F.	—200	—180	—160	—100
Impact Strength, izod (⅛" x ½" injection-molded bars)	D-256-54T	ft. lb./in. notch	23	18	13	3
Tensile Strength, Max., 0.2 in./min.	D-638-52T	psi	3700	3600	3500	3300
Elongation, First Tensile Yield Point	D-638-52T	%	25	25	25	25

Properties of Fortiflex "A" Not Affected by Melt Index

PHYSICAL PROPERTIES	ASTM METHOD	UNITS	VALUE
Density		g/cc.	0.96
Refractive Index	D-542-50	n_D^{25}	1.54
Hardness, Shore D	D-676-49T		65
Stiffness	D-747-50	psi	150,000
Water Absorption (⅛" specimen, 24 hr. immersion @ room temp.)	D-570-54T	%, wgt. gain	<0.01
Flammability	D-635-44	in./min.	1.0
*Mold Shrinkage, length		in./in.	0.03 to 0.05
width		in./in.	0.02 to 0.04

*Measured on injection molded tensile bar. Mold shrinkage depends on part design and molding conditions.

Celanese Corporation of America, Plastics Division,
Dept. 116-D, 744 Broad Street, Newark 2, N. J.

Please send: ☐ more information on, ☐ test quantities of Fortiflex.

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Company _____

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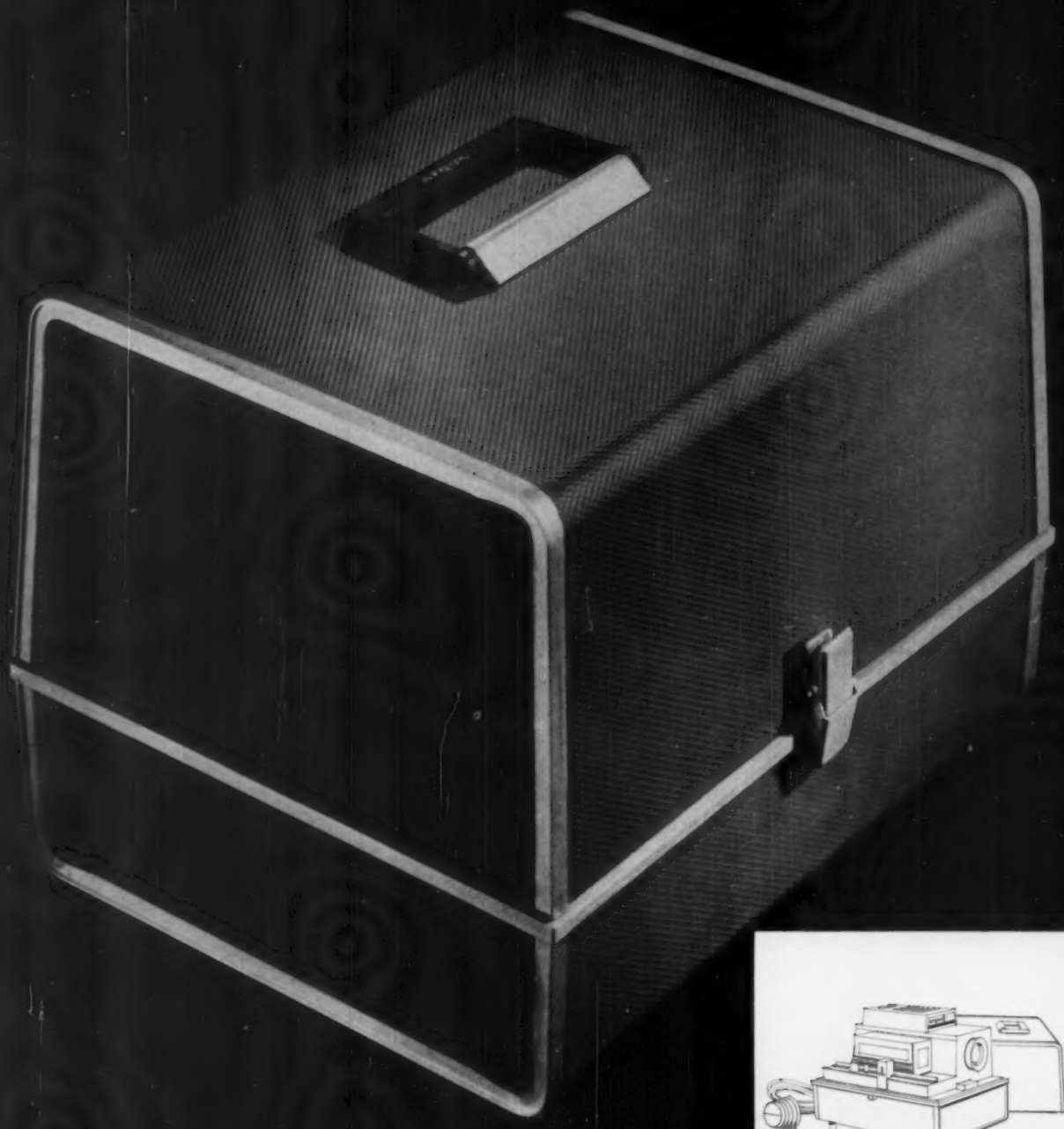
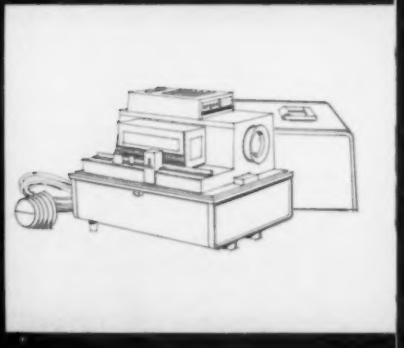
Shaping the





Design by Harley Earl Associates
Arvinyl and fabrication by Arvin Industries, Inc.

new world of product design

ARVINYL

ARVINYL is a highly versatile new metal laminate which affords designers vast opportunity to improve product life and looks. And Arvin's "one-stop" fabrication facilities assure superior quality, virtual elimination of trim scrap, and notable economies in tooling and labor costs.

We can laminate both sides of metal, deep draw Arvinyl into almost any form, and spot weld it by magnetic force to metal of lighter or heavier gauge without marring the vinyl surface. An especially interesting Arvin development is the Aluma-Lok* technique used in making the Argus projector case.

For working with designers, Arvin maintains a prototype department and a plastic tool and die shop for building mockups. We invite you to bring to our consulting staff, without obligation, any projects which contemplate new design. For descriptive Arvinyl brochure, write to Dept. AD49.

argus

Argus Cameras, Ann Arbor, Michigan, NOrmandy 2-8811
Division of Sylvania Electric Products Inc

January 9th, 1959

Mr. R. G. Nau
Arvin Industries, Inc.
13th Street, General Office
Columbus, Indiana

Dear Bob:

During the past nine months, we have been utilizing your manufacturing facilities in the fabrication of our Argus 300 and 500 vinyl-clad projector cases.

The consumers' acceptance as well as the dealers' enthusiasm for this vinyl-clad projector case has been most gratifying. The styling, durability and "quality look" have all helped to make the Argus projector even a better value.

It has been a real pleasure to have developed this projector case with Arvin Industries.

Very truly yours,

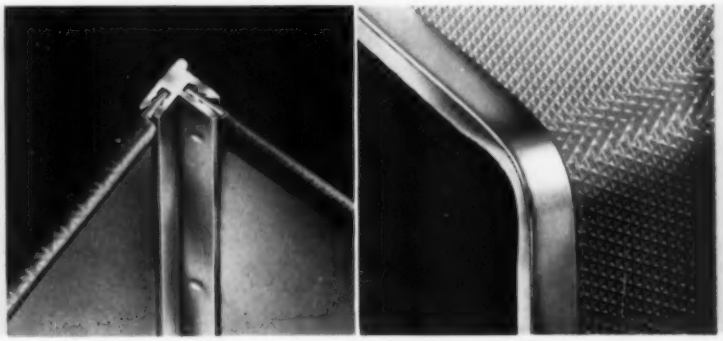
N. L. Symons
Director of Purchases

Arvinyl Division, Arvin Industries, Inc., Columbus, Indiana

**Patent applied for*

NEW ARGUS PROJECTOR CASE

Two-channel aluminum frames, extruded by Arvin, are applied in the flat to two edges of the wrap-around section, which is then formed by Arvin's Aluma-Lok* technique. End pieces are slipped into channels and mechanically locked into place. Interior is painted, latches and plastic handle (also made by Arvin) are applied and the case is complete. Tooling is simple and there is virtually no trim scrap. Result: A better-looking, better selling case, with greatly improved resistance to damage—and produced at lower cost than the previous pyroxylin-covered wood case.



Aluma-Lok is ideally suited to almost any type of cabinet or enclosure for products such as:*

TELEVISION

TYPEWRITERS

DICTATING MACHINES

RECORD PLAYERS

EXHIBITS . . .

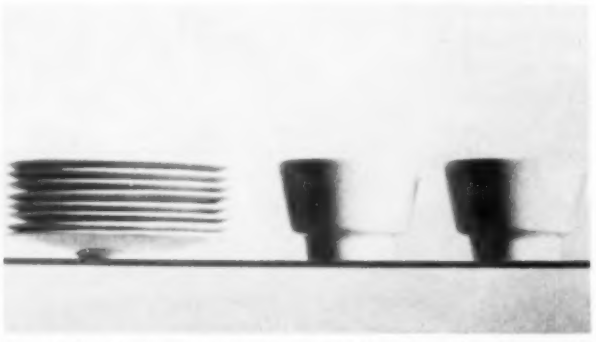
Design in Chicago, the thirty-second annual printing exhibition of the Society of Typographic Arts will run until June 5 at the Art Institute of Chicago. Jurists Lee King of Edward H. Weiss Advertising, Carl Regehr, of Bert Ray Studios, and Edward Katz of Crafton Graphic Company, selected 99 entries out of 879 submissions. Included in the show are announcements, annual reports, books, bookjackets, booklets, catalogs, Christmas cards, advertising, posters, record sleeves, packaging, labels, and miscellaneous printed pieces. While most of the entries are printed in offset, there is considerable use of letterpress. Few entries use silk screen or the more experimental techniques.

Brochure by John Massey. Ad by Alvin Pierce. Sponge wrapper by Hal Heater.

The Art Directors Club of New York held its thirty-eighth exhibition of advertising and editorial design during the first week of April in New York. The jury selected 487 items in 30 major categories from a record-breaking 14,000 submissions. The Art Directors Special Medal went to Stephen Frankfurt, television art and production director at Young and Rubicam, for the overall excellence of Johnson & Johnson advertising on television. The jury also awarded Art Directors Club medals to 14 entries (two of them at right) and Certificates of Distinctive Merit to 47 entries. The exhibit was held at the Astor Gallery and awards were presented at the Waldorf-Astoria.

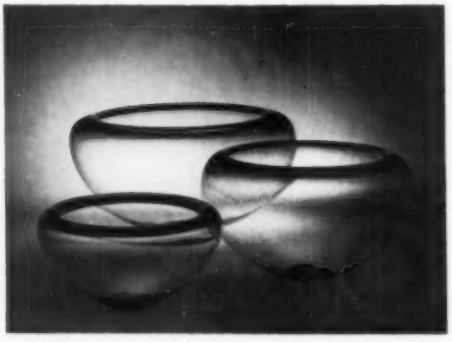
Poster by William Taubin. Record cover by Acy R. Lehman.

Keramikka-Lasi (ceramics and glass) were on view at Georg Jensen's in New York this month in a collection planned to show the close collaboration of designer and manufacturer in Finland. The collection contains work by nearly 20 ceramic and glass craftsmen who have designed for Arabia and for Notsjoe glassworks. The recent work of Kaj Franck, head of the design department at both Arabia and Notsjoe, is throughly covered. Other designers whose work was represented include Ulla Procope, Kyllikki Salmenhaara, and Aune Siimes. Birger Kaipianinen's fantastic bird—a composite of ceramic clocks and wrought iron—was among the show's top conversation pieces.



Porcelain demi-tasse and saucer by Kaarina Aho. Decorative icicles by Kaj Franck.

Glass 1959, an exhibition of more than 280 pieces of glass from 22 countries, will open at the Corning Museum of Glass in Corning, New York on June 1. The show, says Thomas S. Buechner, director of the museum, will serve more as a platform for the presentation of new ideas than as a retrospective study of former trends. Russell Lynes, Edgar Kaufmann, Leslie Cheek, George Nakashima, and Gio Ponti, who composed the jury, made their selections from nearly 1800 pieces. The show will be sent to the Metropolitan Museum of Art in the Fall, and then to Toledo Museum of Art, Chicago Art Institute, Virginia Museum, and Carnegie Institute.

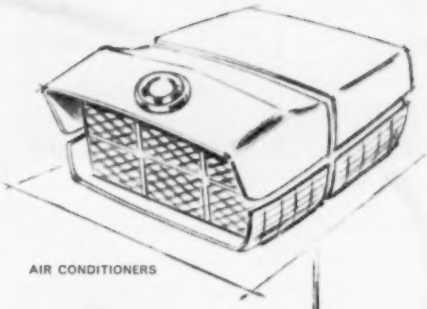


Blue bottle by Paolo Venini, Italy. Bowls by Per Lutken, Denmark.

Idea! ...a world of inspiration

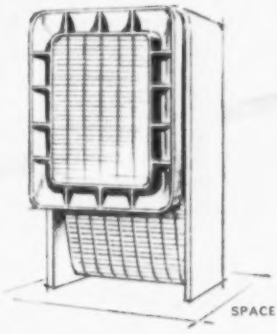
with H&K perforated metals

TAPE RECORDERS



AIR CONDITIONERS

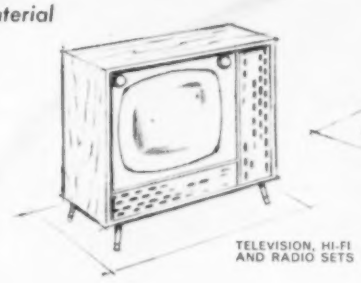
LIGHTING FIXTURES



SPACE HEATERS

FURNITURE

Harrington & King can perforate the proper design, pattern and open area in practically any material available in coils, sheets or plates . . . from foil-thin to 1" thick.

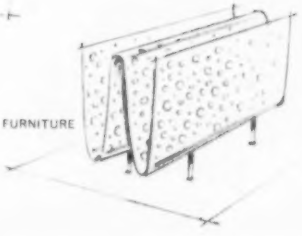


TELEVISION, HI-FI AND RADIO SETS

Metallic materials include steel, aluminum, stainless steel, brass, copper, monel, zinc, bronze, etc.

OFFICE FURNITURE AND EQUIPMENT

Non-Metallic materials include plastic, wood, composition, paper, cloth, etc.



NOVELTY FURNITURE

For more than 75 years, Harrington & King has helped to broaden the horizons of industrial design through the imaginative creation of exciting perforated patterns in both metallic and non-metallic materials.

Whether for functional or decorative use—or both! — the appropriate motif for almost every application is available from our vast selection of existing dies . . . at no charge for tooling. Or, if necessary, tools for special designs will be made to order.

H & K sales engineers will be pleased to work with you on your perforating requirements.

Mail coupon to nearest H & K office—today!

Just a few of the many H&K patterns are illustrated—in reduced size.

THE **Harrington & King** PERFORATING CO. INC.

Chicago Office and Warehouse
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Please send me—

☐ GENERAL CATALOG No. 75
☐ STOCK LIST of Perforated Steel Sheets

NAME _____

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COMPANY _____

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IDI show will travel across country.

Ohio Valley designers put on exhibit

Fifteen members of the Ohio Valley Chapter of IDI have prepared a traveling exhibit (above) called "Scope" to explain the significance of industrial design to the public. Each of nearly two dozen three-by-five-foot exhibit panels is devoted to the work of one of the contributing members.

"Scope" has already been seen at the Cleveland Institute of Art, Bowling Green University, Canton Art Institute, and Ohio Union. It will be on loan to the Chesapeake and Ohio Railway in Huntington, West Virginia until May 2 and then will travel to the Dayton Art Institute, Akron Art Institute, The Massillon Museum, Ohio Wesleyan University, and Miami University (Ohio).

U. S. exhibits at Casablanca

The theme of the U. S. Exhibit at the International Trade Fair opening at Casablanca this month is "new techniques for better products." Designed and completed in seven weeks under the direction of Stowe Myers, with Michael Grivas and Murray Kasman, it will present current U. S. industrial achievement as the result of a brief sixty years' development.

The exhibit (below) covers 29,000 square feet, and consists of a unistrut building, an external patio area, and an 84-foot diameter geodesic dome containing the 360° travelogue shown last summer at Brussels. Exhibits include demonstrations of vacuum forming, copper enameling and silk screening, a stereophonic juke box, a working model of a Pet Milk installation, and the U. S. Rubber "fiberthin airhouse."

Cornell design utilizes monorail transit.

Cornell students design a city

A group of 34 graduate architectural students at Cornell University has planned a long, narrow city of 350,000 inhabitants along the upper basin of the Colorado River, to be the center of a new shale oil industry in Western Colorado. As distance will make it impractical for workers to drive themselves to work, a fast monorail system (above), fully powered by natural gas from the shale oil, will provide the city with a transit system and will carry an estimated 100,000 workers to and from the oil installations.

A model of the heart of the 30-mile-long city is now on view at Cornell. Design of the shale oil city has been the most recent in a series of Cornell planning projects under the supervision of Dr. Frederick Edmondson.

Stanford offers engineering design

A special course in "Creativity and Comprehensive Design" at Stanford University, Palo Alto, California, from June 22 through July 3, will offer experienced engineers the opportunity to examine and analyze the psychological factors favoring creative design in engineering. Among topics covered will be "Perceptual, Cultural and Emotional Blocks to Creativity," "Human Engineering for Comprehensive Design," and "Organizing a Company Program in Creative Engineering." Application forms may be obtained from Professor John E. Arnold, director of the course, at the Department of Engineering, Stanford University.

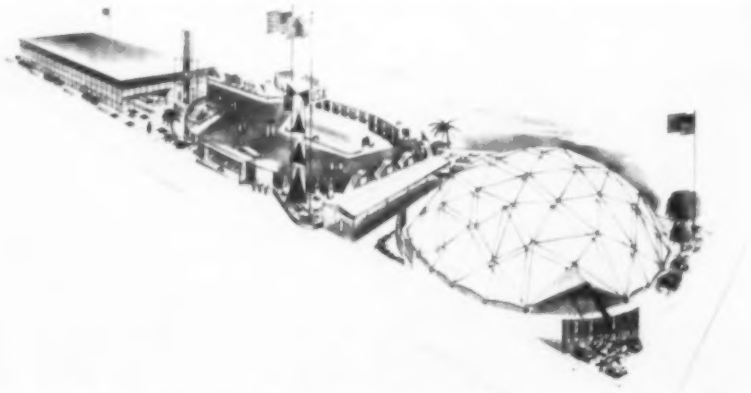
Miniature generator wins award

The 1958 Miniaturization Award, sponsored by Miniature Precision Bearings, Inc., went to SNAP-111, a five-pound atomic generator (below), designed by a team headed by Melvin Barmat. Developed under the auspices of the Atomic Energy Commission by the Martin Company and the Minnesota Mining and Manufacturing Company, it can produce, during its lifetime, power equivalent to that of dry cell batteries 300 times its weight, and is the first device to combine a radioisotopic heat source with an efficient thermoelectric conversion system on anything more than a laboratory scale.

In addition to the main award, certificates of excellence were presented to Robert W. Yancey for a sub-miniature telemeter; Peter J. Pijoan and John Buckley for a miniature high-speed gyro motor; Sonotone Corporation for a hearing aid

Designer Barmat with atomic generator.

worn entirely in the ear; Patek Philippe and Company of Switzerland for one of the smallest complete crystal clocks in the world; Keith Johnson (Stanford University student) for a home-constructed magnetic tape recorder about the size of a kitchen matchbox; the Heald Machine Company for development of a radically new grinding machine for improved production of ball bearing races; Servomechanisms, Inc., for an evaporated magnetic film stepping strip which permits reduction in the overall size of a memory element in high speed digital computers; and Diamond Ordnance Fuze Laboratories for pinhead-size indicator lamps.



Stowe Myers adds unistrut building to familiar geodesic dome for Casablanca fair.

Coming in the May 1959 issue of

INDUSTRIAL DESIGN

Museum Display Design

A number of museums are using the services of industrial designers, either on retainer or as permanent staff members, to handle museum display design, formerly a function of the curator. The May issue of INDUSTRIAL DESIGN *will discuss some of the specific problems: the exhibition techniques, the wide diversity of a museum's audience, the relation between designer and curator.*

Designer's Case Study

Designer Henry Keck reports in his own words on how his West Coast office engineered and designed a counter dispenser for Alka Seltzer, for drug store soda fountains.

United States Steel Vinyl Coated Steel

Peter Muller-Munk Associates has worked with U. S. Steel from early research stage on development of a new vinyl-coated steel. INDUSTRIAL DESIGN'S *story will cover Muller-Munk's work: studies on possible market, final appearance of material, design of promotional kit, and will also cover development of material, technical information on fabrication process.*

AMF Bowling Equipment

Henry Dreyfuss' work with AMF Pinspotters, Inc. on development of a new line of bowling alley equipment which incorporates several new functional devices, several new applications of plastics, and re-styling to meet changing nature of bowling alley clientele.

Report on AMA Packaging Exposition

Walter Stern, technical director of packaging and graphics at Raymond Loewy Associates will report in full on new materials, new techniques, new packaging machinery appearing in annual show of American Management Association, April 13-17, in Chicago.

Each issue of **INDUSTRIAL DESIGN** *delivers to the desks of designers and executives a definitive review of contemporary design ideas and techniques.*

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$24.00 *for three years*

Whitney Publications, Inc.
18 East 50th Street, New York 22, N. Y.

Reynolds offers embossed aluminum tubing

Company News

ON THE MARKET: The **Reynolds Metals Company** has added embossed aluminum tubing, in a choice of three patterns (above), to its "Do-It-Yourself" aluminum line; it can be cut and shaped with ordinary wood-working tools.

RETAINED: **Monte L. Levin** by Sylvania Electric Products and Kearfott Company, Inc., as consultant designer . . . **Charles Butler Associates** by Vickers Armstrongs, Ltd., (Great Britain) to advise on the interior styling of the Vickers VC 10 (right).

NEW OFFICE: **Walter Dorwin Teague Associates** will open a new office in San Juan, Puerto Rico, sponsored by the Economic Development Administration of Puerto Rico.

NEW FIRM: **De Varco-Turoff Associates** at 329 Lexington Avenue, New York . . . **Cawley-Neff Associates** (below) at 3 Penn Center Plaza, Philadelphia 2, Pa.

GOING PLACES: **John J. Mahoney** and **Frank L. Cioffi** to St. Regis Building, 34 Park Place, Newark 2, N. J.

Eastman Kodak has expanded its professional service center in Rochester, N. Y., for industrial and school photographers . . . **GE** is to build a high-speed prototype of the WRU document selector for Western Reserve University, Cleveland, Ohio . . . **Eric H. A. Teran** (below) and **Gerald Frisch**, vice presidents, will direct work in a new five-year plan of decentralization at Jim Nash Associates.

Competitions and Awards

Jury for the **Boston Arts Festival Architecture Competition** will be Douglas Orr, Morris Ketchum, Jr., and James Fitch; closing date for the competition was March 23; winning entries will be displayed at the Festival, June 5-21 . . . The 1959 **Copper and Brass achievement award** will honor the year's most significant advance in the use, application or metallurgy of copper, brass, bronze, or other copper-base alloys; nominations should be mailed no later than April 30 to the Copper & Brass Research Association at 420 Lexington Avenue, New York.

Organizations

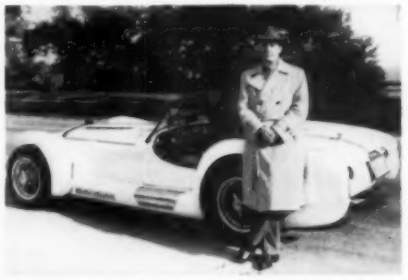
The **IDI Ohio Valley chapter** has announced that membership is open to industrial designers living in the following states: Ohio (except Toledo area), Indiana (except Chicago area), Pennsylvania (western part), West Virginia, Kentucky, and Tennessee. Application for membership may be made to Rolland Lietzke, Saxe Road, Mogadore, Ohio.

NEW SERVICES: The **National Bureau of Standards** and the **National Science Foundation** will operate jointly a research information center and advisory service, "to bring together research and development data on methods and equipment for the automatic processing of scientific information" . . . The **National Lumber Manufacturers Association** has established a Wood Information Center at 1318 18th Street, Washington, D. C., to provide detailed information about all aspects of wood.

Butler to design interior of Vickers VC 10

People

APPOINTED: **Martin Jaffe** and **Robert Fisher** (below) as vice presidents, and, with **Donald Pahl** (below), as design directors, at Robert Zeidman Associates . . . **Raymond H. Wadsworth** as head of the Mechanical Engineering Department of the Tele-Prompter Corporation . . . **Wayne Kunkel** as manager of a newly-formed quality control department at Ansul Chemical Company . . . **George M. Gilder** as design director at Alan Berni & Associates, Inc. . . . **Daniel Smith** as director of the Interchemical Color Center . . . **Frederick J. Whiteman** as Associate Dean of the Art School at Pratt Institute . . . **Kent J. Worthen** as manager of product planning for point-to-point communication at GE's communication products department's headquarters, Lynchburg, Va. . . . **Robert Rogaff, Peter Munselle, Gianpiero Bongi,** and **Barney Jensen,** to the design and planning departments at Charles Luckman Associates . . . **Asa Snyder** (below) as director of research and development at Clearing Division, metal working press equipment, U. S. Industries, Inc.



Stevens with his own design, "Excalibur"

Brooks Stevens (above) spoke about human nature and improved product design, at the annual meeting of the Société des Ingénieurs de l'Automobile, in Paris on March 2.

Coming Events

The Society of Plastics Engineers announces two regional technical conferences: April 28 at Dallas, Texas—Reinforced plastics from the pleasure boat, aircraft and missile industries viewpoint; and May 7 at Pittsburgh, Pa.—Plastics in the metal industry. Speakers at the first meeting will include Clint Haig of Libby-Owens-Ford, "Why design quality into reinforced plastic boats?"; Fred M. Gore, "Industrial designer looks at reinforced plastics"; and Dow Moore of the Ferro Corporation, "Design influences on engineering reinforced fiber glass boats" . . . Among speakers at the **Design Engineering Conference** in Philadelphia (May 25-29) will be Hellmuth Walter, director of research, Worthington Corporation, on the education and role of German engineers and engineering executives. . . . **Europak 1959**, the fifth European Packaging Exhibition, to be held in Amsterdam on April 21-28, will have many visitors from all over the world, including the Iron Curtain countries and the U.S.A. Its total surface will exceed by some fifty per cent the area of its predecessor, held in Amsterdam in 1957.

Teran *Jaffe* *Pahl* *Fisher* *Snyder* *Cawley* *Neff*

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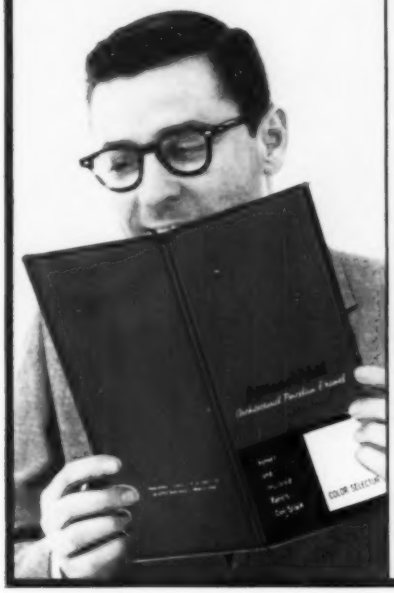

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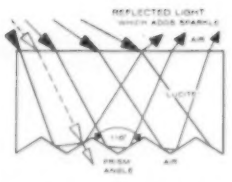

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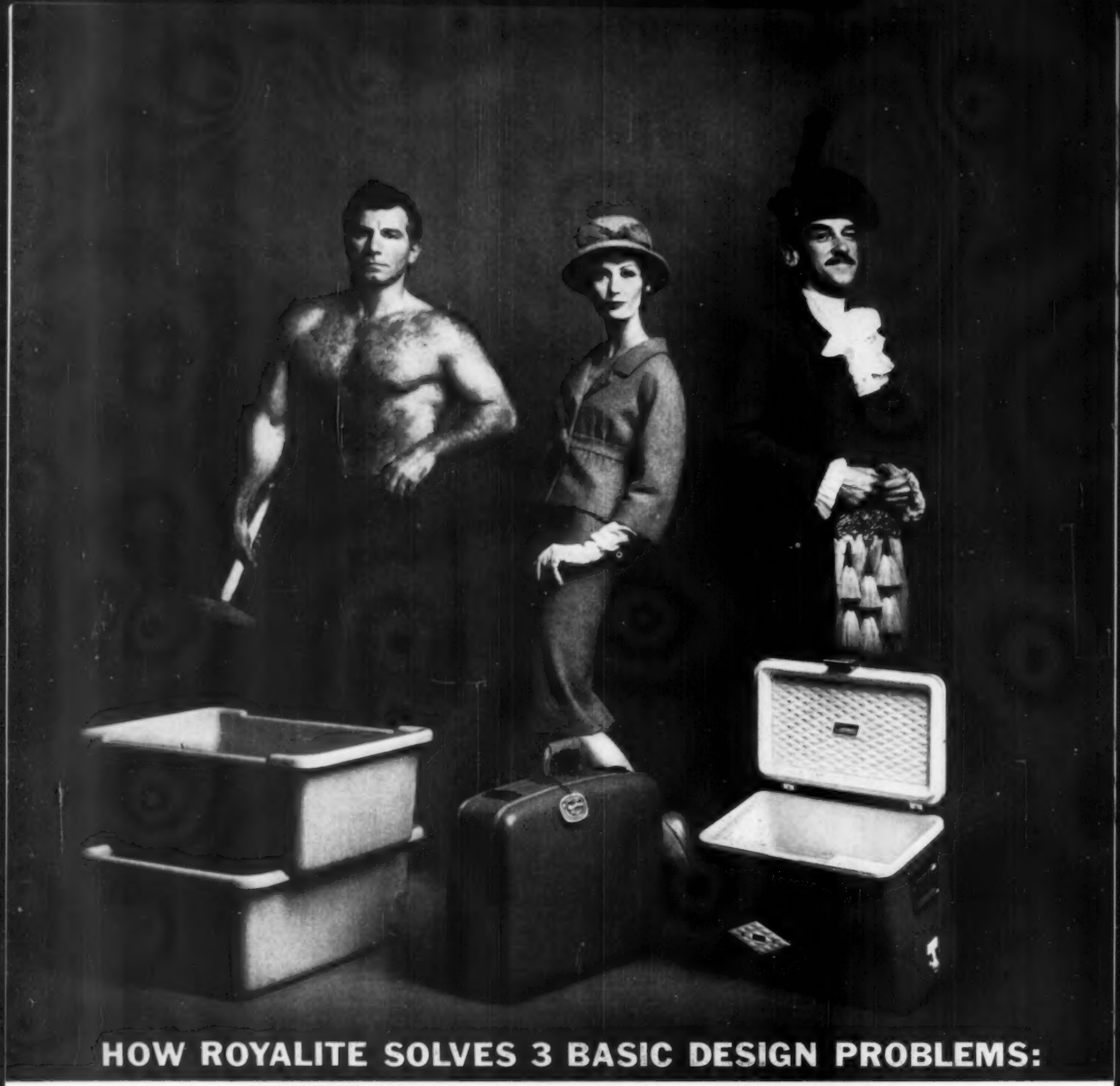
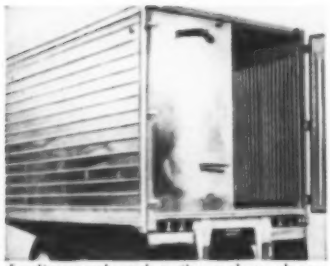


HOW ROYALITE SOLVES 3 BASIC DESIGN PROBLEMS:

TOUGHNESS * BEAUTY * ECONOMY



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Frank Lloyd Wright

Last month on this page we called attention to the fact that Frank Lloyd Wright was more alive than ever; and now he is dead. The death of an 89-year-old man ought not to come as a surprise, but Wright's did. Like George Bernard Shaw before him, he had achieved an age at which people no longer wondered when he would die, but assumed instead that he probably wouldn't. Except for the physician's laconic statement that he was "getting along satisfactorily and then suddenly died," the circumstances of his going are unrecorded. It is unthinkable that he feared death, more likely he resented the intrusion. He hated coffins, whether designed to house dead individuals or living families.

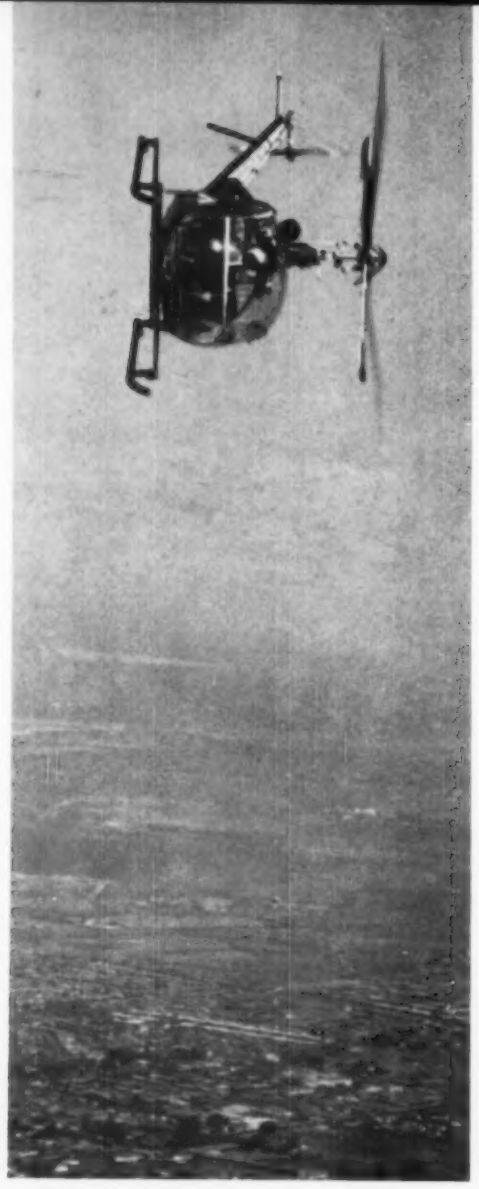
It is a harmless journalistic convention, when men of stature die, to ask whether their work will live. Wright may have been almost as good an architect as he said he was, but an architect's immortality cannot safely be invested in his buildings, for these can vanish at the drop of a bomb or the whim of a divinity school board of directors. An architect has to take his chances with the rest of mankind: such immortality as he may have will come through his ideas, through his having lived a life that continues to make a difference even after it has stopped. In the end, the earthquakes withstood by the Imperial Hotel count for less than the earthquakes created by Wright himself. There were a lot of these, and their tremors are discernible in industrial design as well as in architecture and city planning.

To speak only well of the dead is hypocritical and patronizing. Frank Lloyd Wright was not a saint. Although six years ago he spoke of coming down with "a strange disease — humility," he managed nobly to fight it off. Despite his fervent teaching at Taliesins east and west, it would be an outrageous joke if history were to set him down as a mellow elder statesman of design. He was a disturbingly egotistical, unjust, recalcitrant, often silly man. And he was great because he had great ideas and believed in them and *acted* as though he believed in them. Like saints, he had "the audacity of faith" (his last book was, significantly, called *A Testament*) and like saints he used his life and his art to make a point about man's hope.

Years ago the doctor-poet William Carlos Williams gave his prescription for a funeral:

> *See! the hearse leads.*
> *I begin with a design for a hearse.*
> *For Christ's sake not black —*
> *nor white either — and not polished!*
> *Let it be weathered like a farm wagon. . . .*

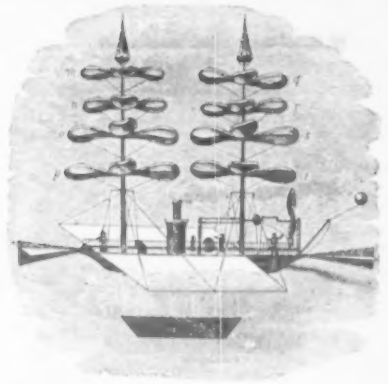
Wright's hearse was a weathered farm wagon that roughed the half mile from chapel to home burial plot, as about fifty of his students followed on foot. It was a man's burial, and not a production. At a time when creativity has become material for conferences and seminars and groupthink, at a time when a designer's ideas are suspect until the purification of the committee room — at such a time we have lost a man who worked and taught in the rare conviction that he was right, that the light inside him could be trusted. All his life he was his own man. For Frank Lloyd Wright, the whole world was up for grabs, and he never stopped grabbing it and trying to shape it to his humane and angry vision.—*R.S.C.*



WHAT'S UP IN HELICOPTERS

Machines that can fly straight up form an industry that has problems in getting itself off the ground

By URSULA McHUGH



Frail, illogical, unpredictable, faintly comical, slow, the helicopter is a much more domestic machine than the airplane. In all its weaknesses, perhaps because of them, the helicopter is still a reflection of the men who make it, while the airplane has evolved from the fragile, tentative machine the Wrights built to a smooth-skinned, remote creature that seems to have forgotten its origin on a cellar workbench. The idea of vertical flight is a particularly human one, involving, it almost seems, a suspension rather than a reflection of nature — even birds cannot rise straight up. The machine that fulfilled this dream has a freedom and agility not possessed by anything that flies: it can hover in one spot at almost any height, it can move very slowly under complete control, it can move instantly in any direction, it demands only a very little bit of ground to land on and take off from, and it can perform many of its maneuvres and land without the help of its engine. If it can do all that, and the Hiller shown opposite indicates that it can, the helicopter would seem to be an ideal machine for transporting people and materials in an increasingly crowded environment, for rescuing man from the impossible situations he is constantly getting himself entangled in, for doing all the things that demand control and agility and independence of conditions on the ground.

Nevertheless, the sky isn't full of these marvelous machines. Breguet's helicopter lifted its pilot off the ground in 1907, only four years after the first airplane flight, but while the airplane almost immediately acquired complete control and freedom, and its basic form was almost immediately fixed, the helicopter remained tethered to the ground for years, lacking control and stability, while its inventors tinkered with one configuration after the other: coaxial rotors, tandem rotors, intermeshing rotors, three rotors, four rotors. In desperation, one inventor fastened a balloon to his machine to make it stay up. (As one result of all this experimentation, there are no new helicopter configurations; whenever a helicopter appears with its rotors in a new place, a researcher triumphantly points out that in 1928 someone in South Africa built a similar one.)

What keeps them up

Lighter-than-air machines, like balloons, are lifted by buoyancy; heavier-than-air machines, like the helicopter and the airplane, rely on their motion in relation to the air. In the airplane, it is the motion of the whole machine that provides the lift; the helicopter can hover in one spot because only its wings move. Aerodynamic lift is the upward force produced by the passage of an airfoil (the wing) through the air. The plane of the airfoil is raised at a slight angle to the direction of movement, and since the air which passes above the airfoil must travel a longer distance than the air which passes beneath it, the upper air is thinned out, and the denser air beneath presses upward with enough force to counteract the pull of gravity. In the case of the airplane, the wing is pulled forward by the propeller. But with the helicopter, both motion and lift are provided by the rotating wings. The power needed to provide the lift is much greater for a helicopter than for an airplane: a helicopter needs two to three times as much power to hold a weight motionless in the air as an airplane needs to cruise with it. This problem of power has always been the basic impediment to vertical flight; although a model helicopter had flown in 1784, there simply was not an engine strong enough to lift a full-sized machine until the development of the gasoline-powered reciprocating engine.

The greatest contribution to successful helicopter flight was made not by the early experimenters but by the autogiro, which the Spanish engineer Juan de la Cierva first flew in 1923. The basic principle of the autogiro is autorotation. Cierva discovered that a set of blades, shaped like those of a helicopter, but set at a slightly lower pitch, would, in falling vertically, be forced around by the updraft of air. Once they had attained enough speed, the lift they provided would slow the descent of the aircraft. In level flight, the autogiro is pulled forward by the action of the propeller, and the rotor, slightly inclined against the horizontal, autorotates by the force of this forward motion. Since their rotor is not powered, autogiros can neither climb vertically nor hover, but they have the advantage of controlled flight at very low speeds (as low as 25 miles an hour) and of unpowered vertical descent, the ability upon which the helicopter depends for its safety. The simplicity and safety of the autogiro permitted Cierva to experiment with the aerodynamics of rotating wings to an extent not possible before. He discovered for example that the rotor blades must be hinged at the hub so that they can flap up and down. (The reason for this is that the rotor blade advancing in the direction of flight possesses more speed—its own plus that of the whole aircraft—than the retreating blade. It therefore possesses more lift, and would flip the machine over on its side, if it were not permitted to rise up slightly, thus decreasing its lift, as it advances.)

The first completely successful helicopter was a machine called the Focke-Achgelis FA 61, built in Germany in 1937, and the first completely successful helicopter pilot, a lady named Hanna Reitsch, flew it inside a Berlin auditorium. (She later personally tested a flying bomb, and is said to be still flying.) This helicopter owed its success to its controllability, which was largely a result of Cierva's experi-

Early autogiro, designed by Cierva and manufactured in U. S. by Pitcairn. Some later models eliminated wings.

Igor Sikorsky in VS 300, first successful helicopter in U. S. Machine was tethered for first year while inventor learned principles of control. Rope was cut in 1940.

Courtesy Museum of Modern Art

A mass-produced, low-cost helicopter has been an elusive goal for years. This prototype, with cab of molded plywood, was designed in 1945 by Alvin Lustig for Roteron.

ments. It had two rotors mounted side by side, but the principles by which it was made to climb, descend, and change direction are the same as those by which almost all subsequent helicopters were controlled. The turning rotors of a helicopter describe a disk in the air. When the whole rotor is tilted forward, the disk tilts forward too, and the lift propels the helicopter forward in addition to sustaining it in the air. Increasing or decreasing the pitch of the rotor blades will make the helicopter rise or descend.

The multiplicity of rotors, resulting in the wide variety of configurations in helicopters, represent a number of solutions to the problem of torque: the tendency of the fuselage to spin in a direction opposite to that of the rotors. In 1939 Igor Sikorsky flew the model which, because of the simple way in which it solved the torque problem, became the "classic" helicopter. A small rotor mounted vertically at the end of a long tail boom produced a side thrust sufficient to stabilize the fuselage. Unlike other multiple-rotor configurations, which demanded complicated and heavy transmission systems, the tail rotor was geared directly to the lifting rotor. This was the prototype for the first production helicopter, the XR-4, which first saw service in the second World War. This was by no means a revolutionary design (the only claim left to patent was a comparatively minor element of the control system; a helicopter with a vertical tail rotor had been flown in Holland in 1925). Success in helicopters seems to come with the recombination of already-tested components (together, perhaps, with the economic support of a generous military budget).

Sunday supplements have for some time found good copy in exuberant predictions of a helicopter on every roof, giving the impression, which the industry profoundly regrets, that the era of commuting, shopping, and Sunday-driving by helicopter is only a few years away. The prediction seemed plausible during the Korean War, when the helicopter had its first chance to show what it could do. Military enthusiasm for its performance then (largely in rescue operations) produced a happy abundance of contracts in the period between 1954 and 1957, chiefly for research on larger transport helicopters. But with the 1957 recession, and the cut-backs in the defense budget, the source of research money was abruptly cut to a trickle, and in the past couple of years the helicopter industry has been in the forlorn position of the precocious young man who is embarrassed to hear the class prophecy read at reunion five years later.

What their problems are

The first of the helicopter's disadvantages is its high cost. Bell, which has produced the great majority of helicopters in civilian use, lists its two commercial models, the 3-place 47G-2 and the 4-place 47J (see pages 34 and 35) at $39,500 and $68,500 respectively. (This is without such extras as radios and flotation landing gear, which alone would add between two and three thousand dollars more.) Costs of operating the 47G-2 are estimated at $5.55 an hour for fuel and oil, $7.60 an hour reserve for overhaul and spare parts, and $5.50 an hour for maintenance. With liability insurance, depreciation, and the pilot's salary, the company figures the total cost of this helicopter flown 600

Helicopter strips to bare essentials to carry one man

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1 Gyrodyne XRON-1. Coaxial counter-rotating blades are most logical and least complicated solution to the problem of torque, but present problem of directional control, here solved by controllable drag plates on rotor tips. Porsche engine may be replaced by smaller, lighter turbine this summer; including extra gas for turbine, this increases payload by 100 lbs.

2 Hiller XROE-1. Collapsible Rotorcycle shows conventional configuration of main and tail rotors, overhead control stick. Range with present fuel capacity (2½ gals.) is 27 miles.

3 De Lackner platform helicopter. Two counter-rotating blades mounted beneath the platform are powered by a 40 hp outboard engine.

1 Kolibrie, made by NHI, Rotterdam. Ramjet engines can lift helicopter's 520-lb. weight plus load of 910 lbs. Rotation is begun by small piston engine behind tail boom. If one jet fails, the other maintains rotation for safe descent. Speed for maximum endurance: 30-35 mph.

2 Bell 47G-2. Bar weighted at ends rotates with blades, producing gyroscopic stabilizing effect. Military version of Model 47 performed most evacuations in Korea. Machine can carry 886 lbs.

3 Hughes 269A. Designed for two-man missions, five have been produced for the Army. Normal range is 150 miles, useful load 635 lbs.

4 Bell 47J. With metal rotor blades (wood available; weighs and lifts less) machine, intended for "executive" market, weighs 1640 lbs., can carry 1210 lbs.

5 Alouette, developed by French Sud Aviation, built in U. S. by Republic. First turbine-powered helicopter certificated by FAA, 5-place machine can carry 1485 lbs. Turbine consumes 330 lbs. of fuel an hour in sea level cruising conditions.

6 Alouette "Gouverneur." Commercial version of French military machine was designed by Paris office of Raymond Loewy. Shell made helicopter more stable, 15 mph faster. New cockpit seats one more.

Small, many-purpose helicopter aims at simplicity and adaptability

hours a year at $22,415 annually, or $37.36 an hour. The larger 47J costs $47.80 an hour under the same conditions.

The pilot's salary must almost invariably be figured as part of the operating expenses, since a helicopter is rarely a fly-it-yourself affair. A license to fly a fixed-wing aircraft is not enough to pilot a helicopter; the FAA (the new name of the old CAA) requires 40 hours of flying instruction, of which 15 must be in a helicopter. (And the FAA requirements are lenient compared to the amount of experience the insurance companies demand: 1,000 hours is an average figure.) Helicopter instruction is at least $70 an hour and can cost considerably more. Furthermore, there are only twenty helicopter flight schools in the country, distributed very unevenly geographically. A few of the manufacturers (Sikorsky, Bell, Hiller) get around this difficulty by operating their own training programs and including instruction as part of the total price of the helicopter. Almost all helicopter pilots, however, received their training in the service. And flying a helicopter is not easy—it requires considerably more concentration and readjustment of the controls than an airplane does. Helicopter pilots regard themselves as the hardest-working members of their profession and are regarded by airplane pilots as prone to dither.

Maintenance is a very large part of a helicopter's expense. Since it has many more moving parts than an airplane does, its components are bound to wear out more quickly, especially the gears, which must have very close tolerances. The FAA certificate specifies the intervals, varying with conditions of use, at which the individual machine must have a complete overhaul. To take the Bell helicopters again as an example, the company estimates that this overhaul will take place at the end of 600 hours of flying time. It involves a complete disassembly of rotor and engine and 240 man-hours. Less elaborate checks must take place at 25-hour intervals. Figures vary according to components; the transmission of the Gyrodyne shown on page 33 requires a complete overhaul every 200 hours.

The basic problem of a helicopter is getting enough force for vertical lift. The piston engines in standard use now are usually airplane engines turned up on end and attached to the rotor shaft. Since they were not originally designed for helicopters, they present a number of special problems—for example, the lubricating oil drains down and collects at the bottom of the engine, which was designed to be installed horizontally. But, more important, a reciprocating engine is simply not strong enough to carry a sufficient payload, and the problem is intensified on long hauls, when the helicopter must carry a larger fuel supply. And

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larger engines are not the solution, since they mean more weight and, proportionately, decreased efficiency.

Atmospheric conditions are more important to a helicopter than they are to an airplane, and on hot or wet days, or at altitudes where the air density, and consequently the lift, is appreciably less, their load must be reduced, and their ceiling is lowered. Bad weather and poor visibility ground them more often than airplanes.

A fundamentally minor disadvantage of helicopters, but the one that causes them to be regarded often as nuisances by their neighbors, is their noise. This is even more apparent to the passengers inside the helicopter, for whom the noise, accompanied by the vibration, makes the strain unendurable for more than a short trip.

Finally, helicopters are too often forced down by mechanical difficulties, a consequence of their complicated, and delicate, construction. This is not so great a hazard as it sounds, since although helicopters make more forced landings than airplanes do, their ability to autorotate makes these landings safer, and helicopter accidents produce comparatively fewer fatalities. Even in crash landings the tremendous centrifugal force of the blades, and the energy of the whole machine, means that the pieces of the helicopter tend to fly outward, away from the occupants.

With all these disadvantages, who is buying helicopters? The military, very largely. Of the estimated 3900 helicopters now in operation in the United States, about 3400 belong to the armed forces. There are approximately 30 helicopters operated by government units, 70 privately-owned "executive" helicopters, and 370 in commercial operation. Their civilian uses include the rescue operations that are the usual source of helicopter human-interest stories, transportation of men and cargo to and from spots where surface transportation and airplanes cannot conveniently go (for example, workers are taken to and from some off-shore oil rigs by helicopter), and agricultural use, such as crop-dusting. Especially in this last use, however, the helicopter is prohibitively expensive, and, as one example of the generally revived interest in the autogiro, Kellett Aircraft has reactivated, for agricultural use, its KD-1, a machine which dates from the thirties. In fact, Kellett is working on a new version it hopes to have on the commercial market shortly.

But the way in which the helicopter affects the widest audience, and the most obvious commercial future for helicopters, is in the transportation of fare-paying passengers. There are three helicopter carriers in the United States certified by the Civil Aeronautics Board: Los Angeles Airways, Chicago Helicopter Airways, and New York Airways.

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Large transports improve their capacity for earning their own living

Their difficulties—and their successes—illustrate many of the factors which affect the commercial use of helicopters. New York Airways operates between LaGuardia, Idlewild, and Newark Airports, midtown Manhattan, and the New York suburbs. Its function is almost wholly as an extension of the regular airlines: 90 per cent of its passengers are going to or from airline terminals, and 65 per cent of the tickets are sold by airlines and travel agents as part of package flights. Because so many of its passengers are trying to make connections, it is vital that the helicopters fly on schedule, and yet last year the company actually flew only 80 per cent of its scheduled flights, in comparison with the regular airlines' 95 per cent. Airways must offer the same baggage allowances as the airlines, which means that its Vertol 44B's, which have in theory 15 places, must often carry fewer passengers to allow for the weight of the baggage. Airways charges 40 cents a passenger mile, but this fare, high though it is in comparison with the cost of surface transportation, is no indication of the real cost of operation. Like the other two certificated helicopter services, and like the airlines in their beginnings, New York Airways is government-subsidized—about two-thirds of the operating costs are met by government payments for carrying the mail. An additional subsidy comes in the form of the heliports Airways rents from the Port of New York Authority at rates which represent only a part of their true cost.

Federal Aviation Administration requirements force the helicopters to fly a circuitous route, since a single-engined helicopter, like any other aircraft, must always be within gliding distance of an unpopulated landing place in case of engine failure. Suburban heliports are not always in the heart of the suburbs they serve—municipal politics or public feeling may force the helicopter service to use the regular airport miles out in the country. Even in Manhattan heliports are located in inconvenient sections of the city, since they must be built on the waterfront to allow for a slanting (and more powerful) takeoff. This brings up another fact about the mechanics of helicopters. Although they can descend straight down safely by autorotation if their engine fails, this is possible only below and above a certain height. Below about thirty feet, the denser air of the ground cushion will slow their descent. A height of three or four hundred feet allows enough time for the rotors to gather sufficient speed from the updraft to develop lift. Velocity will have the same effect as height in allowing the rotors to gather speed. But some combinations of insufficient forward speed and height are known to helicopter pilots (because of their appearance on a graph) as "dead man's curve"—engine failure under these conditions means the helicopter, unable to develop enough lift, will plummet straight down.

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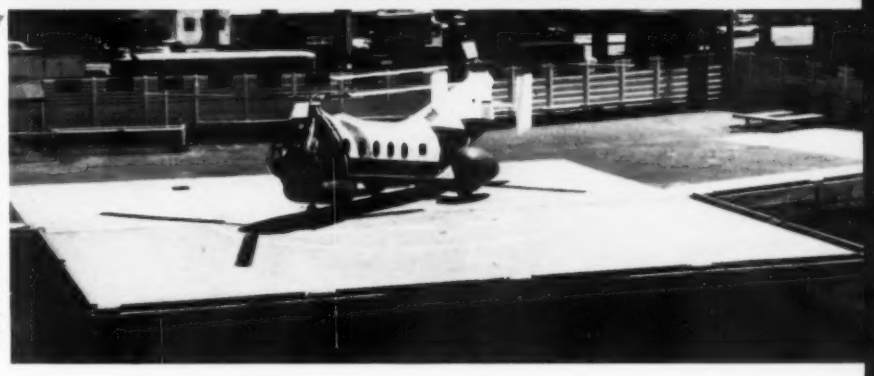

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Courtesy Port of New York Authority

1 Sikorsky HSS-2. Developed as sub-chaser for the Navy, machine has two turbines mounted above fuselage. With light load it can function on one engine. Boat hull replaces floats for water landings.

2 Sikorsky S-61. Projected transport, similar to HSS-2, will have three turbines, room for 25 passengers. Interior and exterior treatment by Raymond Loewy Associates.

3 Kaman H-43B. Designed for crash-rescue service with the Air Force, 8-place machine is powered by Lycoming T-53 gas turbine, has two counter-rotating main rotors.

4 Bell HU-1. Turbine-powered machine designed to meet Army specifications for quick take-off, minimum of pilot effort. It can climb vertically at 1800 fpm, carry a load of 1900 lbs.

5 Rotodyne, designed by Fairey Aviation, London. To be built in U. S. by Kaman, aircraft achieves vertical lift by jets mounted on rotor tips, forward flight by two turbine-powered propellers. It will cruise at 185 mph.

6 Vertol 107. Two turbines power prototype transport, which accommodates 25. Military version designed as missile-carrier.

7 Vertol 44B. Rotors at either end spread center of gravity, permit flexible cargo arrangements. (Single-rotor helicopters must often carry ballast in tail.)

In spite of these difficulties, however, New York Airways has steadily increased the scope of its operation. In 1953, the first year of passenger service (it had started off carrying only mail the year before), the company carried 1500 passengers. In 1958 it carried 91,000. The company's biggest problem is in getting a helicopter that will carry enough passengers to reduce operating costs to the break-even point. Airways has filed letters of intent with Kaman to buy a fleet of Rotodynes, an English-designed helicopter that will supposedly carry 55 or 65 passengers. It will take another five years, however, to get the ship certificated and into production, and before then Airways expects to replace its present fleet with helicopters in the 25-passenger range. Possible choices are the Vertol 107 or the Sikorsky S-61, designed in its commercial version by the Raymond Loewy office, both shown on this spread. The CAB has before it 75 applications for helicopter services in other cities—a sign of confidence in in a profitable future.

A cautious optimism

In spite of all the predictions that have gone wrong — so far wrong that industry spokesmen, with wrathful references to the harm that yellow journalism has done the cause of helicopters, will commit themselves to only vague prophecies of the industry's future—a current of optimism is gathering strength in rotor circles. It emanates even from such sober circles as the American Helicopter Society, which has its headquarters in the New York town house of one of the nineteenth-century coal barons, and dispenses technical information from rooms with gilded and frescoed ceilings, the baron's porcelain collection lining the walls, and Bach issuing from the library.

The reason for the optimism is a number of technical developments that promise to make helicopters stronger, more durable, and less subject to the uncertainties of the weather. Even though almost all of the research responsible for these developments has been paid for by military money, and is therefore directed toward military requirements, the results are capable of immediate commercial application. (Commercial helicopters are, in any case, almost invariably a modification of a military version.)

The most important of the new developments is the turbine engine. Turbines will deliver twice as much horsepower as piston engines of the same weight. Their simpler design means easier maintenance, they consume cheaper fuel, and they produce less vibration and noise. They have their disadvantages: they use a great deal more fuel (which reduces the benefits of their lighter weight); just now, in their experimental stages, they cost a good deal more than piston engines; and they suffer more adverse effects from

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Aerial cranes carry their cargo in a hollowed-out fuselage or dangle it below

hot weather than piston engines do. But the fact that they can carry a larger payload outweighs all their defects, and all the helicopter manufacturers are now experimenting with turbine-powered machines.

Another new power source for helicopters is ram-jet or pulse-jet engines attached to the tips of the rotors. (An auxiliary engine is needed, however, to build up enough speed for the jets to take over.) This eliminates the need for a complicated transmission system and also means that there is no torque to be counteracted. Jets have a tremendously high fuel consumption, however, and their high scream make them unusable in populated areas. (This is one of the problems the Fairey Rotodyne must solve before it can be put into commercial use.)

Another very recent development is the automatic stabilizing equipment (known in the industry as ASE) that was first used successfully only a year and a half ago. If it fulfills its present promise, it will permit all-weather operation of the larger transport helicopters—it is too heavy and expensive for general use in the small machines. This, together with the longer component life that is developing gradually as a result of redesign and new metallurgy, and of an extremely strenuous testing process, seems to promise for the helicopter, if not the spectacular future once envisioned, at least a new and more realistic start in life.

1 Sikorsky S-60. Prototype uses piston engines; turbines will be installed in later models. Crane can carry five tons on 20-mile mission (payload carried outbound only). Most components have been tested for several years in another model.

2 Omega BS-12. Two piston engines, mounted externally for easier maintenance, will carry five-ton payload and enough fuel for 1hr. 15 min. Cargo is slung from point directly below rotor shaft.

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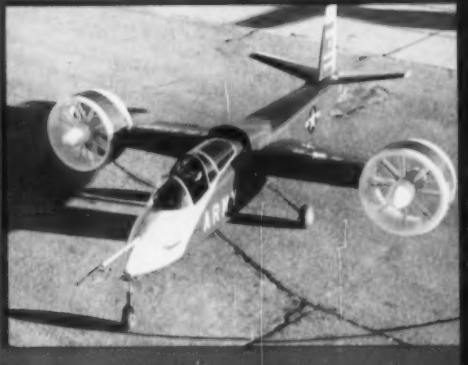
3 Hiller X-18. Experimental aircraft combines features of conventional airplane and VTOL (vertical take-off and landing) and STOL (short take-off and landing) aircraft. Wings can be tilted and locked in any position. Gas turbines drive rotors used as propellers in forward flight or for conventional take-offs. (This take-off procedure requires less fuel, permits a larger payload.) Top speed: 250 mph. Machine weighs 26,500 lbs. empty; with cargo: 33,000 lbs.

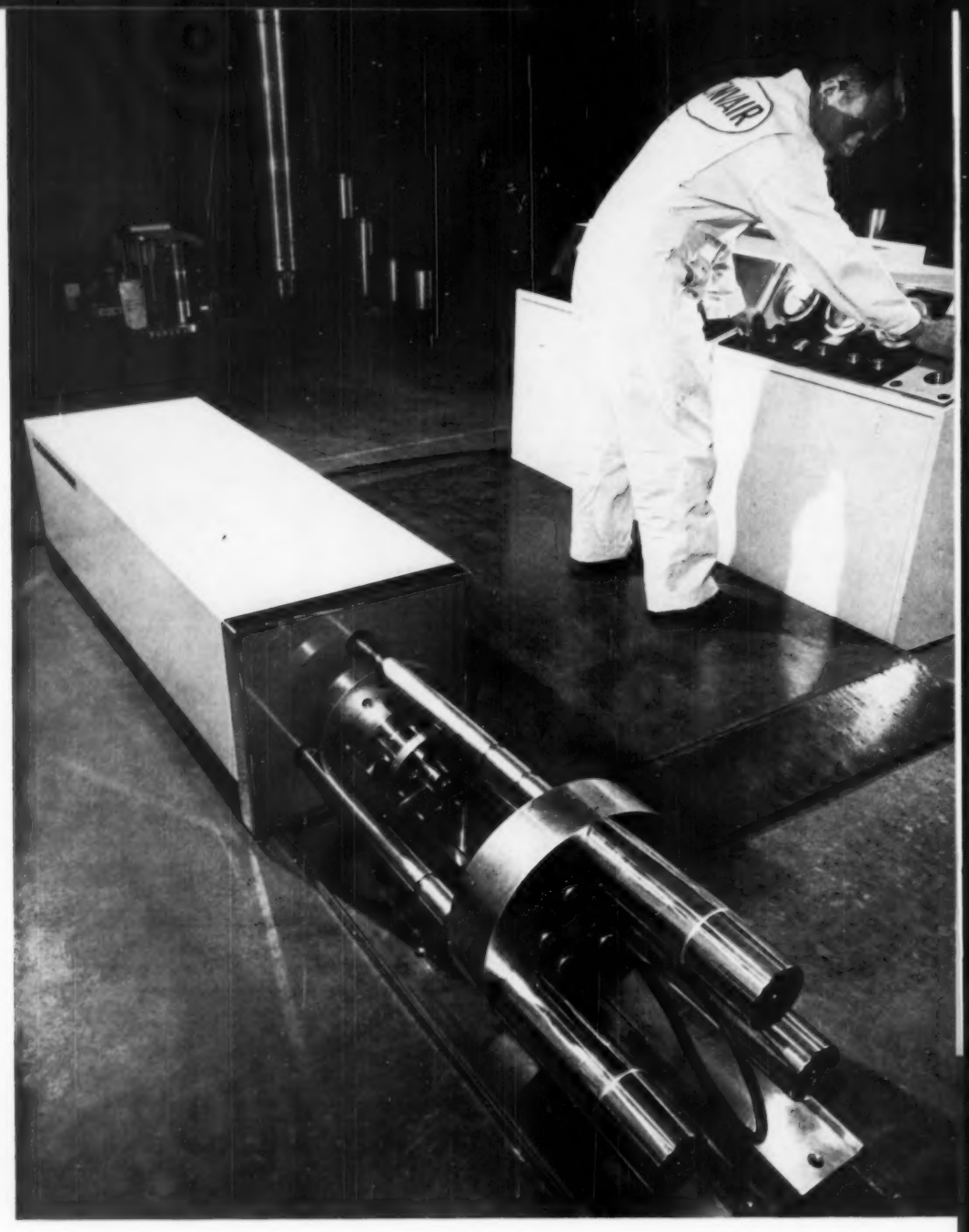
4 McDonnell XV-1. When used as helicopter, power is obtained from jet engines at rotor tips. As forward speed reaches 100 mph., "convertiplane" shifts power to piston-driven propellers; lift is then provided by short airplane wings. Maximum speed in this position is 200 mph. (Windmilling top rotor creates some drag, means craft is slower than conventional airplanes.)

5 Vertol 76. First tilt-wing to achieve successful conversion in flight, the VTOL research aircraft has a maximum speed of 110 mph, weighs 2680 lbs. empty, carries 600 lbs.

6 Doak 16. After vertical take-off, ducted propellers at wing tips rotate in midair for horizontal flight. Research aircraft is turbine-powered, carries 609 lbs.

Shapes of the future: wings or propellers tilt to turn helicopter into airplane





DYNAPAK

A new machine, working on a new principle, gets a new form.
High energy-rate tool extrudes, forges, forms, and compacts
hard-to-work materials with great forces at high velocities

Dynapak, the efficient-looking machine at the left, is an example of that much overused phrase, "a new concept." According to Convair, its manufacturer, it is not an adaptation of or an improvement on an existing tool, but the embodiment of a new technique of working materials. A piston, actuated by gas at 2,000 psi, is driven at high speed and knocks a metal billet into or through a die. The operating principle of the machine differs from that of existing presses —in the Dynapak operation metals melt for an instant when subjected to high pressures rapidly applied. Application of this principle to metal working means that hard-to-work, high-strength metals can be formed into complex shapes without breaking or having to undergo many expensive and time-consuming forging and annealing operations.

Although metallurgists have known the principle for some time, until fairly recently there was no practicable way of producing the necessary pressures at high velocities, and it was not until the need arose in the aircraft industry to make large, curved parts out of high-strength materials that there has been any reason to produce them. Early work in the field showed that explosives could be used, and such simple operations as dimpling and piercing, riveting, and bulging and flaring of tubes, were performed with them.

Explosive forming, as it was called — high energy-rate forming is a better term — is very simple. In essence, a sheet of the metal to be shaped is placed over a die, and an explosive charge is set off above it. If the explosion takes place in air, the shock wave does the forming, or its force can be transmitted by a fluid medium such as water. Dies can be made of materials ranging in hardness from wood to tool steels, depending on the method being used.

The trouble with explosive forming was that lack of control and repeatability in the equipment produced very erratic results. The answer to the problem seemed to be a controllable machine that could produce the necessary pressures and velocities. Conventional presses could produce the pressures, but the cost of making one that could operate at high enough velocities would have been prohibitive. Fortunately, at the same time that high energy-rate forming was being investigated, work was progressing on a shock-testing machine, at Hyge Machines, a division of Convair, which released high-level energy (thrust loads as high as 180,000 pounds) under strict control. The marriage of the two ideas was inevitable, and produced the Dynapak, according to its inventor, Jack B. Ottestad, chief project engineer at Hyge.

The problem of the machine's mechanical design fell into two parts: the power source, and the recoil mechanism. The power source is an adapted gas actuator from the shock-tester. Nitrogen at 2,000 psi is released through a large orifice to drive a piston at speeds as high as 600 miles an hour, always under the control of the Hyge shock-tester mechanism. (See overleaf for specific description of operation.) The recoil system was designed on the principle of dynamic reaction, rather than that of static load-carrying capacity, so that the complete machine, relying on the inertia of its own parts instead of the possible resisting strength of its mount, could float with respect to some fixed reference point, such as the floor. The machine can be mounted on anything that will support its weight, (under 1,000 pounds) which is negligible in comparison to the forces it commands.

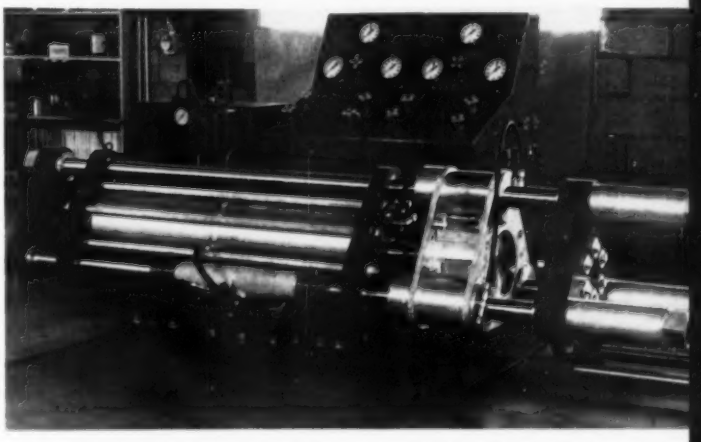
Rube Goldberg prototype

Although a prototype existed that worked, Ottestad felt that a radically new machine wanted a new form, so he engaged Zierhut/Vedder/Shimano, Van Nuys, California, industrial design office, to provide it.

The prototype machine stood on a baseplate heavy enough for a battleship, which belied its dynamic reaction frame. Its parts were fastened together with a multiplicity of nuts and bolts. Its internal connections looked unnecessarily complicated. They were made with flexible tubes, running every which way, issuing from the body of the machine apparently wherever it happened to strike someone's fancy.

It was a 12-inch machine; that is, its pressure cylinder was 12 inches in diameter. Z/V/S started in from scratch on a six-inch machine, first attacking the problem of the visible working parts. Studying the triangular bolster-plate connecting the three tie-rods, they determined that its replacement by a circular form would express its function better. They proposed that as many external parts as possible be chrome-plated, and that simple round nuts be substituted for the bulky hex nuts fastening the machine together. These changes were designed to better express the fact that Dynapak is a finely made, precision instrument. Their enclosure, which was entirely new (the prototype had its innards exposed to view), was a simple rectangular cover of gray-enameled sheet-steel with chorme trim. It is easily removable for getting at the machine to repair it, and is fitted with vents for cooling. The straggling gas- and air-lines were collected and led to the surface in a neat panel at the bottom, and the whole was mounted on a light base of chrome-plated steel that gives credence to Dynapak's capacity for containing all its energy within itself.

The next step was the design of the power pack and con-



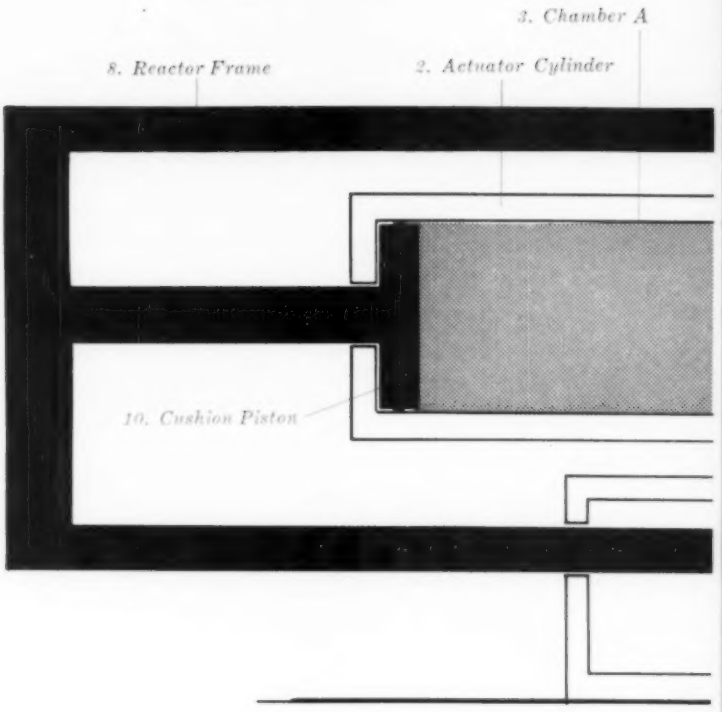
Dynapak prototype before Z/V/S were called in. Heavy baseplate and massive structural members seemed to belie manufacturer's claim that all its energies were contained within it; wandering tubes and awkward console made for visual confusion.

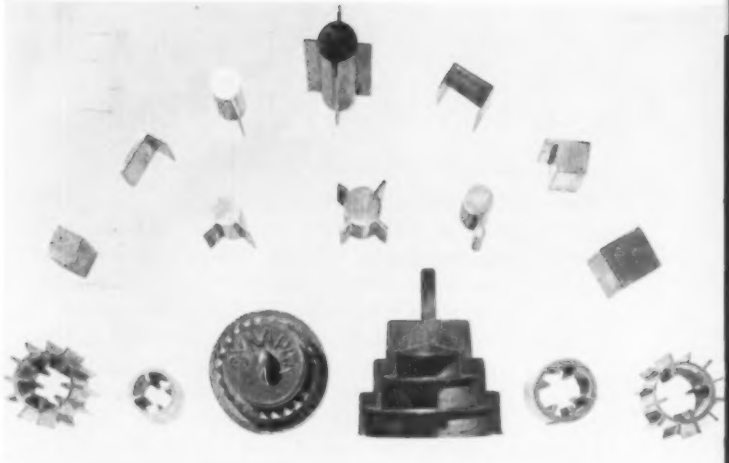
HOW DYNAPAK WORKS

The schematic diagram at right illustrates the firing and recoil processes—the basic operations of Dynapak. The chief trouble with explosive forming (see page **41**) was the difficulty of controlling it, and repeating its effects accurately. This gas-operated high energy-rate machine promises to steal explosive forming's thunder and tame it.

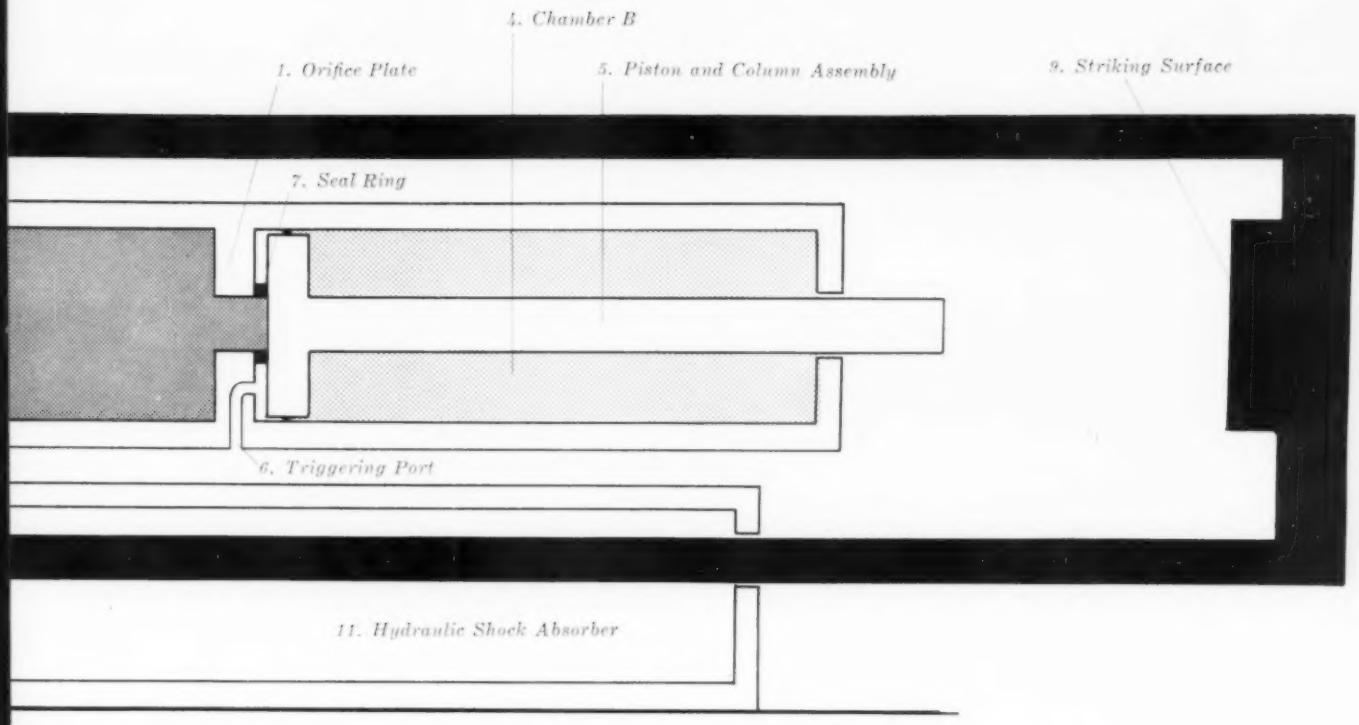
The power source, or driving section consists of the actuator cylinder (**2**), which is divided into two parts by a partition with a large hole in it, called the orifice plate (**1**). A piston-and-column assembly (**5**) rides in the actuator-cylinder on a sliding ring seal; seal ring (**7**) is attached to the piston and is the same diameter as the orifice.

Firing: Actuator cylinder (**2**) is separated into chamber A (**3**) and chamber B (**4**) by the orifice plate (**1**). For the purpose of this explanation, assume that the actuator cylinder (**2**) has a cross-sectional area of 10 square inches, and the orifice a cross-sectional area of 1 square inch. If chamber A (**3**) is pressurized to 2,000 psi, and chamber B (**4**) to 200 psi, the total pressure acting on one side of piston (**5**) is the same as that acting on the other side (200 psi times 10 square inches equals 2,000 psi times 1 square inch). If the pressure in chamber A is increased by even a few pounds (by admitting gas into the cylinder through triggering port (**6**)), a slight movement of the piston to the right is caused. A movement of 0.002 inch is enough to disengage seal ring (**7**) from the face of the piston, allowing 2,000 psi to act over the whole face, with a total pressure of 20,000 pounds (2,000 psi times 10 square inches). The net thrust of 18,000 psi occurs in about 0.001 second and causes the piston to move to the right at velocities as great as several hundred miles per hour. Recoil Mechanism: When fired the piston (**5**) acts as a free body (that is, it is not supported in any way) moving to the right. The reactor frame (**8**), striking surface (**9**), actuator cylinder (**2**) and cushion piston (**10**) act as a free body moving toward the left, at a much lower velocity than that of the piston. When the piston and column assembly hit the striking surface (**9**), the left-moving free body is stopped, and begins to move toward the right, so that the piston (**5**), reactor frame (**8**), striking surface (**9**), and cushion piston (**10**) form a new free body with respect to actuator cylinder (**2**). Under the new disposition of forces, the cushion piston (**10**) is slowed down by gas pressure in the actuator cylinder (**2**). All horizontal motion in Dynapak is counteracted internally, and there is no lateral connection between the machine and whatever surface supports it. The only connection between the machine and the ground is through the hydraulic shock absorber (**11**), whose primary function is to damp the oscillations of the machine about its neutral position.





None of these sample steel parts made on Dynapak has been finish-machined. In outer semicircle extrusions show web thicknesses impossible before. Forgings, lower center, have zero draft angles.



trol console. Although the machine is easy to run, its operator must have instant control of the tremendous forces it can release at such high velocities. The valves on the old console were inconveniently ranged over its entire surface, and the gages widely spaced over their panel. Z/V/S collected the valves into a single line and replaced their handles with simple round controls, making it easier for the operator to keep his eye on the machine's functioning. The power pack was a box with switches, gages and pipes stuck on the outside, having no visual connection with either the console or the machine itself. Z/V/S placed it in a cabinet matching that of the console. Both cabinets carry through the gray enamel and chrome motif of the press.

Potential forming operations

Even though Dynapak's most startling characteristic is the high impact energies available in it which make it useful for extruding, forging, sheet-forming (of high-strength metals), and compaction (of ceramics and powdered metals), it is not limited to these operations. Its piston can move at slow enough speeds for it to be used as a standard extrusion press, and to deliver the first low-pressure, long stroke for soft compaction. Because of the nature of high energy-rate forming, Dynapak produces parts that cannot be made in any other way, according to Convair. It can extrude parts with web thicknesses of 0.01 inch from billets of high-strength steel alloys and titanium, for instance, and other materials in which surface finish and close tolerance are critical; it can forge hot or cold materials, producing parts with zero draft angles and finished surfaces; it can compact ceramics and powdered metals to densities that cannot be obtained with slow loading; it can perform precision shearing and punching operations on brittle metals with one-piece dies; and finally (which is where research into high energy-rate forming began), it can form sheets of hard metals into parts impossible to make any other way.

Dies do not have to be heated, nor must lubricant be used in most operations, because Dynapak's short time cycle (0.001 second) subjects the die material — ordinary steels may be used — to destructively high temperatures for so short a time that very little heat is transferred to it.

The small size of the machine, compared with the sizes of conventional forging presses of similar force, makes it easy to install induction heating and to isolate the entire working section in an inert atmosphere. This is of vital importance in the working of metals such as titanium, tungsten, molybdenum and columbium, which oxidize rapidly at high temperatures.

Dynapak promises to be a revolutionary advance in metalworking machinery, but it is still too early to say that there are no bugs in it; or if there are, where or what they may be. Only further testing in the field will tell.—*W.H.*

REdesign

VELCRO: THOUSANDS OF HOOKS GRAB TINY LOOPS TO MAKE A UNIQUE FASTENER

The annoying burdock burrs that stick to clothing and animal fur gave Swiss inventor George De Mestral the idea for a unique fastener, Velcro, a tight-grabbing nylon closure with hundreds of applications. Velcro ("vel" for velvet, "cro" for the French *crochet*, "small hook") is simply two strips of nylon tape, one covered with tiny, close-packed filament hooks, the other with thousands of small, soft loops. When the two strips are pressed together, the hooks engage the loops, cling to each other, and distribute stress over the complete area of the strips. When peeled apart, the strips separate easily with a pleasant sound and feel.
De Mestral's inquiry into the burdock burr began in 1948 at the conclusion of a hunting trip. Curious about the burrs' tenacity as he pulled them from his clothes, he studied them under a microscope and discovered that each burr had hundreds of minute hooks. In the next eight years, subsidized by Swiss banker Alfred Gonet, De Mestral transformed his observations under the microscope into a practical closure that could be easily mass-produced. Working at first with French and Swiss textile experts, and later by himself, he devised a loom capable of weaving 300 symmetrically aligned loops per square inch. He wove his own nylon thread under intense, infrared heat to make the loops sufficiently rigid to withstand hand wear. But by 1955 he still had not been able to develop a means of producing the hooked half of the tape.
Finally, the principle on which barbers' clippers operate gave De Mestral the idea for a loom that snips nylon loops in half to form hooks. In 1957 Jean Ravaud, a French-born, naturalized American launched the International Velcro Company in Switzerland. Today there are eight mills in Europe and Canada, and one in the U. S. at Manchester, New Hampshire. Velcro is distributed in the United States through Velcro Sales Corporation, 681 Fifth Avenue, New York.

Velcro is already appearing on blood pressure bands (above) and in clothing (especially helpful for the handicapped). It is being tested for dozens of such diverse applications as quickly installed exhibits, holding continuous conveyor belts for large printing presses, and holding diapers together. Velcro may be washed, dry cleaned, and ironed. After 30,000 openings it will retain its grip, and, the makers say, probably outlast the life of the product it is used on.

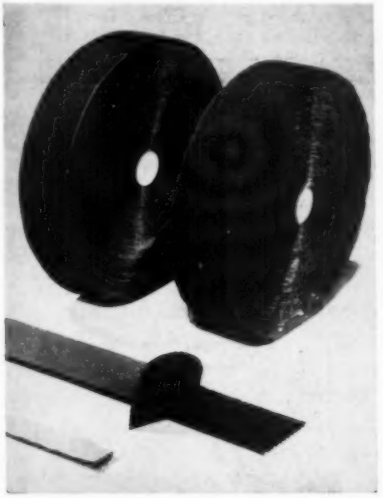
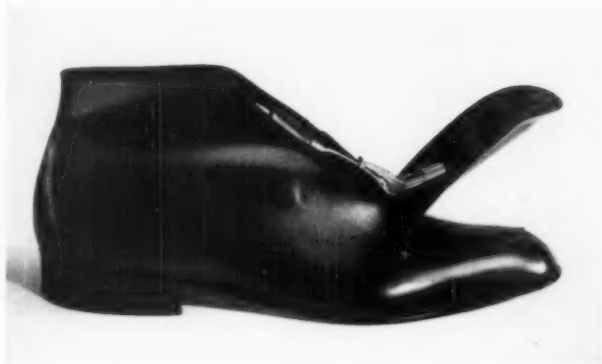
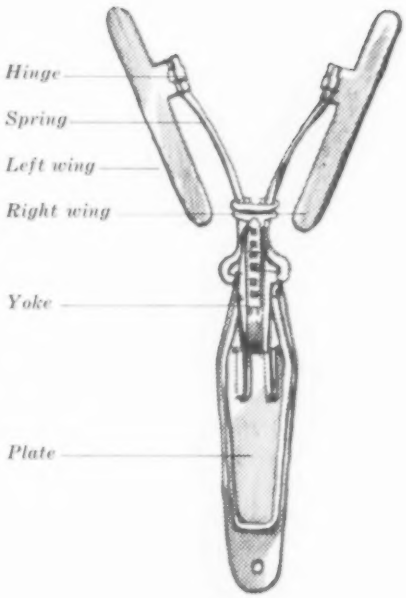


Photo: Norman Gaines Studio

A PIONEER IN CLOSURES, MANUFACTURES A NEW ONE

One of the first innovations in shoe closure since the lace replaced high button boots has been perfected by Talon, Inc., the country's first and largest zipper manufacturer. The closure, called Shu-Lok, replaces conventional laces with a complex but inconspicuous stainless steel unit of three major parts: 1) a flat plate which slips into the tongue of the shoe, 2) a wishbone spring (developed by Raymond Manufacturing Division of Associated Spring Corporation in association with Talon engineers) which pulls the shoe opening together, and 3) a yoke which adjusts to high or low instep. Shu-Lok's plate is attached to the inner surface of the tongue of the shoe, while the wings are attached to the two quarters of the upper which cover the instep. When Shu-Lok snaps closed it draws the two quarters firmly together; a flip of the tongue opens it. To adjust Shu-Lok to the instep, the yoke is disengaged from the spring and the small adjustable prong is pulled up to lengthen the yoke, pushed down to shorten it. A free-lance inventor-mechanic named C. B. Forrester originated the idea for Shu-Lok fastener and brought it to Talon back in 1948. But it was not until 1955 that Forrester, retained by Talon for seven years, had improved his closure sufficiently for Talon to market it. Under an agreement with Talon, Flagg Brothers division of the Genesco Corporation put the first Shu-Lok footwear on the market in 1956. Talon continued to work with its new closure, and studied market reaction. As a result of these studies it has eliminated a rounded loop at the top of the spring, a modification which allows the tongue to lie much flatter, thus making a smoother instep for more attractive shoe styling. The present Shu-Lok, going on the market this month through half a dozen large shoe companies, will be carried in styles ranging from a man's wing-tip shoe (with non-functioning laces across the instep) to children's shoes and women's informal and sport shoes.





АМЕРИКАНСКАЯ ВЫСТАВКА В МОСКВЕ 1959 г.

(American National Exhibition in Moscow)

The alien legend above, and the symbol above it, express a uniquely promising phenomenon, a warm spot in the cold war. Beginning July 25, Russian citizens will have a six-week look at American life and culture through an exhibition sponsored by the Government, with industry participation. Simultaneously the Russians will hold an exhibit in New York. The immediate importance of this exchange is obvious; its potential importance is staggering. No less staggering was the assignment taken on by designers George Nelson and Company. From vague October discussions to a July opening, a show of 300,000 square feet had to be conceived, designed, written, assembled, approved and reapproved, contracted for, built, and shipped to Moscow. A show much larger than our show at Brussels had to be done in a fraction of the time, on about 1/5 the budget. But the problem was not that of Brussels, for the Moscow exhibit has a more special burden than that of putting a nation's best foot forward: it has to communicate the most elementary facts of American life to a people whose experience is such that they may be expected not to believe them. Hence, an almost wearying emphasis on credibility, on avoiding the air of propaganda. Although the experiment is more one of communication than of design technique, the program was worked out largely in a design office by a designer-Government team. From time to time Nelson made an effort to keep some record of the process. The resulting "log" is irritatingly fragmentary, but through extracts from it, and the designer's explanatory remarks, both overleaf, we begin to see a show emerging.—*R.S.C.*

George Nelson *scribbles away at design concept while Harold C. McClellan, general manager of the American National Exhibition in Moscow, maintains telecommunication with Washington. McClellan is a Los Angeles industrialist and former Assistant Secretary of Commerce for International Affairs. Appointed to his present post last October by President Eisenhower, McClellan went to Moscow to negotiate with the Russians on details relating to both exhibits. The business was to have taken one week; he came back—mission accomplished—in three. "Anybody else would have been a broken man," says Nelson. McClellan's job was the supervision of all aspects of the gigantic project, planned to express three-dimensionally how America lives, works, learns, produces, consumes and plays. He first talked with designers in October.*

From Washington, and almost everywhere else, a crowd gathers to create a fair

Jack Masey, *Director of Design for the Office of the American National Exhibit, is shown above in Helsinki. He was previously with the USIA in India for five years.*

Phil George *is responsible for coordinating the entire Moscow design. He was formerly in charge of corporate design program and exhibits for Reynolds Metals.*

Richard Barringer *(seated) commuted from his Chicago office to help develop the "jungle gym" steel structure.* **Jack Hall** *(standing) will coordinate all the displays.*

Charles Eames *worked with Nelson in developing the basic organization of the exhibition, and with his wife Ray is responsible for the film presentation. Eames and Nelson worked out operating principle: "First we reduce information to primer, then we simplify," as antidote to anticipated Russian disbelief.*

Designer's comments and extracts from "log"

On September 10, 1958, an agreement was signed in Washington committing the U. S. and the U.S.S.R to an exchange of exhibitions on "Science, Culture and Technology". The agreement was made by old pros in the area of international relations, but complete laymen as far as exhibitions were concerned: the schedule called for the simultaneous opening of two large national shows at the beginning of July, 1959.

SEPTEMBER 30, 1958 *Phone call from Washington to inform us of the reciprocal exhibition agreement. Had read about this in the New York Times a week earlier. Washington apparently does not realize that people in New York read newspapers. Reason for call: possibility that our designs for a nuclear energy exhibit in Moscow (drawings completed but project discontinued) might be incorporated in the new exhibition. Site for the new project to be Gorki Park. Same site as the one selected for the trade fair of the year before, also abandoned.*

OCTOBER 7, 1958 *Dinner in Washington with small group tentatively assigned to the new project. Not much information. It is made clear that the project will be far too big for one office to handle. Violent arguments until 2 a.m. on the basis of no facts whatsoever.*

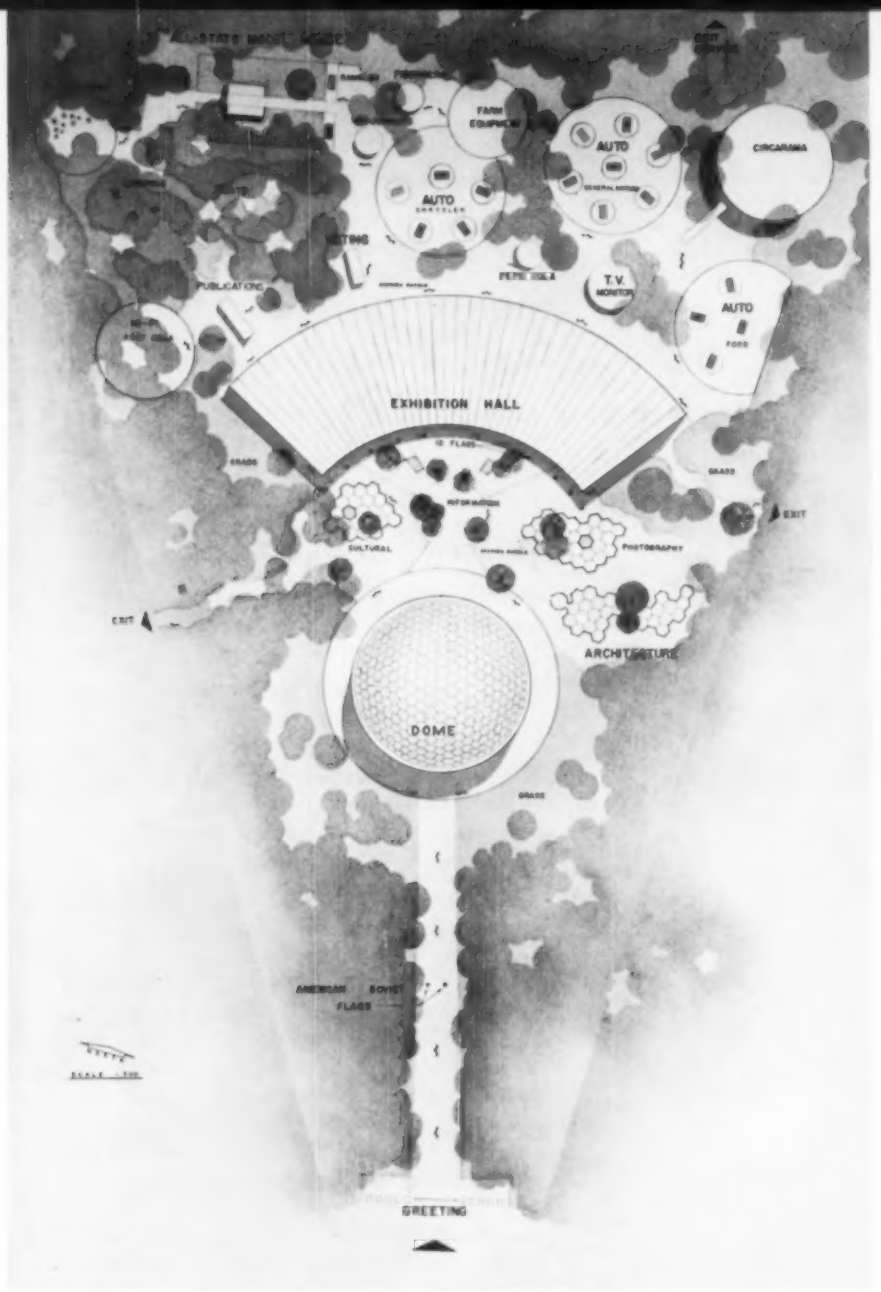
OCTOBER 13, 1958 *Nelson staff lunch, New York: Harper, Pile and Chadwick. Expression of strongly mixed feelings regarding possibility of association with Moscow exhibition. On the one hand, glamor plus realization that the exhibition could have an important effect on U.S.-U.S.S.R. relations. On the other, the possibility of wrecking the office by taking on too large a project: the Government as a client, plus an impossible time schedule, offers fascinating possibilities of exposure to a scandal-loving press, with congressional investigation as possible jackpot. No decisions.*

OCTOBER 17, 1958 *Summoned to Washington for first meeting with Harold C. McClellan plus assorted brass. Cooled heels in anteroom. When finally admitted to meeting, took part in lively discussion of possible pre-fabricated buildings suitable for exhibition purposes. General discussion of budget. Alarmed discussion of time schedule. Ushered out 11:45 a.m. At 1 p.m. message delivered to anteroom by agreeable young official: "You are offered appointment as designer Moscow project, Welton Becket & Associates offered appointment as architects Moscow project. Your answer required by 4 p.m."*
Complete confusion. Had been told earlier that project was too large to be turned over to any single design organization. McClellan had reversed this. Had decided apparently that only way to cope with project under the near-impossible conditions was to centralize responsibility.

People ask "How did it happen that your office was given this project?" I've often wondered. Possibly we were connected with Moscow in various minds, since the last Government project we worked on had been intended to go into Moscow, and initially there was some thought that portions of this exhibition could be reused.
Again, people ask "Why did you take it on?" and again it is very hard to be precise. Part of the answer is that I tried to reach my more cautious associates by phone between one and four and was unable to get hold of any of them. The real reason, I think, is: who could turn a project like this down, whatever the risks? A chance like this comes once in a lifetime and even if you break your pick on it — well, think of the stories you can tell your grandchildren.

4 p.m. — Fifty people in a huge room complete with eagles and flags. Looked like MGM set for Grade B political film. Experts in a dozen categories talked briefly. First real idea of complexity of project. Two basic buildings for exhibit to be designed by Welton Becket & Associates.
[Editor's note: these turned out to be the aluminum dome and the glassed, fan-shaped pavilion referred to later.]

OCTOBER 18, 1958 *Returned to office, announced decision. Mixed feelings, but excitement predominates. Looked at photographs and drawings of Gorki Park buildings in which the bulk of the U. S. exhibition was to be housed. Horrified! Not sure buildings would be suitable for raising of hamsters. Obvious that acceptance of these shoddy containers will put us behind largest eight ball in exhibition history. Communicated opinion to Washington.*



The site plan transforms 300,000 square feet of park into an American show

The site plan above will, like fifty others before it, be altered slightly because of new products added to the exhibition by American industry. Once a hunting ground for the Czars, the 300,000 square foot exhibition site has been landscaped by the New York firm of Robert Zion and Harold Breen. Two main exhibition buildings—the geodesic dome and the fan-shaped exhibition hall—have been designed by Welton Becket & Associates of Los Angeles. The dome will have 30,000 square feet of floor space, the exhibit hall 50,000 square feet. These two buildings will cost about $750,000 and will be purchased by the U.S.S.R. at fair's conclusion for $375,000. Three large turntables above and to the right of the fan-shape will display American automobiles. In the upper left hand corner is a 3000-square-foot playground equipped by Play Sculptures, Inc., and to its right is a model home. Designed and constructed by All-State Properties (architect Stanley H. Klein), the home is calculated to show Soviet visitors how a "typical" American family lives. Between the dome and the exhibition hall are three irregular nests of fiber glass reinforced plastic "umbrellas" which will house displays of fashion, architecture, and photography. These shelters are financed by U.S. plastics firms.

Shortly afterwards a sizeable U.S. negotiating team went to Moscow to work out details. Negotiations were to have lasted a week. The team returned almost a month later exhausted but not unhappy. Major achievement from exhibition point of view: Gorki Park site abandoned, beautiful site in Sokolniki Park provided by Russians. The rub: U.S. was committed to design and erect eighty thousand square feet of exhibition buildings and still open a full-scale, completed show by July 4th.

While the negotiating team was away a good part of November, panics and problems. There were no funds. No budget. No program. No way of establishing a budget. No time for the design group to do its job (and no job for the design group to get started on). No contract. No basis for a contract.

However: an office was formed, built with people on loan from State, Commerce and USIA. Exhibit policy was outlined by a 3-agency committee. A paper (necessary preliminary to a program) was prepared. It was precise and intelligent, and gave the design group both direction and freedom.

Major preoccupation was *credibility*. Objective was to tell the truth as best we could about America and its institutions. The problem, only partly a designer's problem, was how to make the Russians believe it.

The other problem: how to go to all the meetings and still get any work done.

We established the following lines of basic procedure:

1. George Nelson & Company, Inc., makes the overall design (plan, allocation of space, standard typography, color schemes, etc.) for the entire exhibition.
2. GN & Co. appoints other designers (these are not employees but are separate contractors) to do specific work.
3. GN & Co. would take on, as designers, certain specific projects in addition to its overall planning and coordinating.
4. GN & Co. would not be responsible for procurement (it would specify; the actual procurement would be left to personnel in the coordinator's office).
5. GN & Co. would have no responsibility in connection with getting financial or other help from private industry.

NOVEMBER 4, 1958

Washington survey team reports that Russians are willing to buy U.S. exhibition pavilions if permanent structure.

Someone seems to have found some money. The budget is going to be somewhere between two and a half million and four million dollars.

Scale for the allocations for major exhibits has been established.

Reports from experts indicate that the Russians have "an almost psychopathic curiosity about the United States".

NOVEMBER 17, 1958

Meeting, Washington, McClellan and team back from Moscow.

Surprising news: The Russians asked no questions about the content of our exhibition, appear to have no interest in censoring the U.S. communication.

Dozens of details on the protracted negotiations. What they have now for the first time is the very real possibility that both exhibitions will come off. [Editor's note: It was not, however, until the second full-scale meetings with the Russians, around the end of December, that negotiations had reached the point of justifying the full conviction that the exchange was actually going to happen.]

Attendance estimates are two and a half to three million.

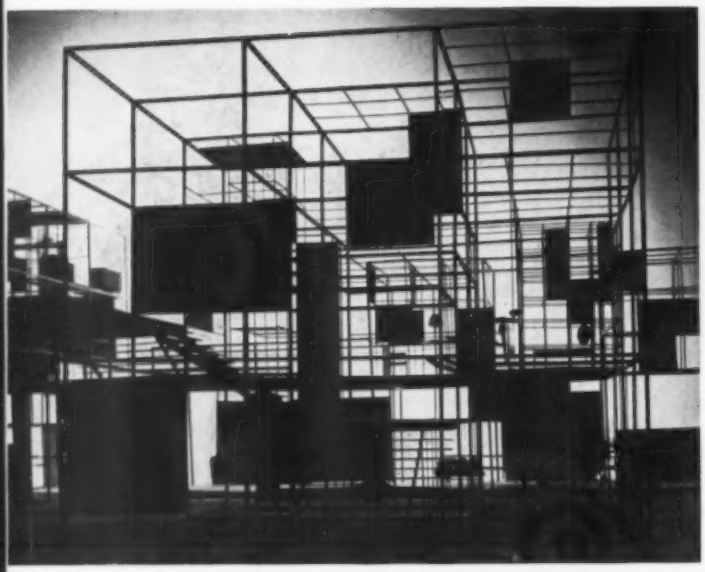
The opening date is no longer rigid, due to problem of erecting new exhibition buildings. Opening date is now somewhere between July 4th and early August.

Renewed emphasis on problem of credibility. How do we make them believe what we know to be true?

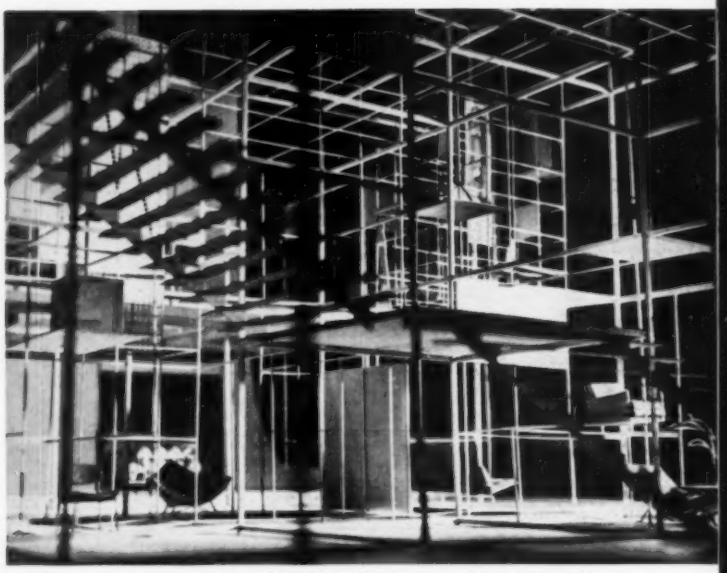
NOVEMBER 22, 1958

Los Angeles meeting with Charles and Ray Eames. Arrived loaded with miscellaneous information gleaned from a dozen meetings in Washington and New York, 40 or 50 phone calls.

I went to the Coast at a time when there was hard work to be done in New York and Washington. I went primarily to put a stop to commuting to Washington. We had reached the point where it was time to figure out what we were going to do. Earlier



The abundance produced by American economy will be represented by more than 5000 consumer products displayed in the exhibition hall on a "jungle gym" framework model shown above.

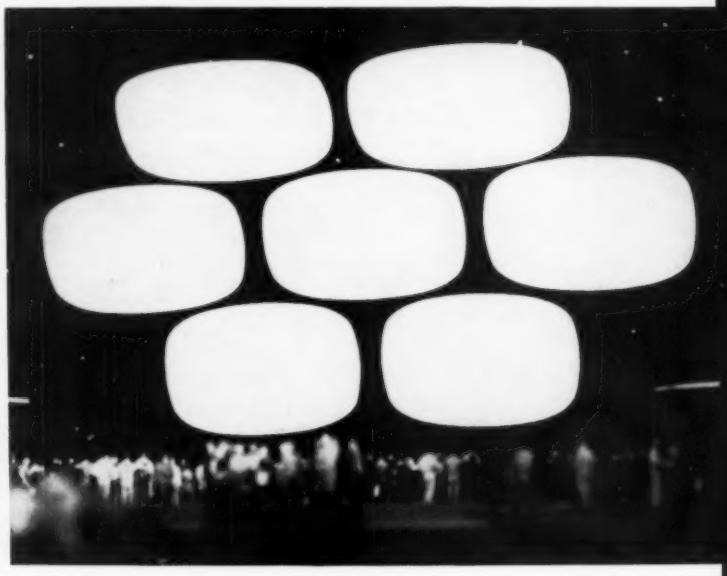


Modular steel framework minimizes interference from strucutre, creates mezzanine areas from which visitors may observe the exhibits above, below and on the same levels at which they stand.

Contrasting exhibit techniques: a busy jungle gym and dramatic screens

Seven-screen arrangements on both models shown here are experimental, neither is final configuration. Synchronized 35-millimeter multi-projection technique will be used in the exhibit.

One showing will represent five-day working week of "typical Americans." Second showing will present the American weekend. Scenario for first by Eames, for second by Billy Wilder.



collaborations with Eames made the prospect of a few days of quiet talk sound agreeable and possibly productive.

There were three days of talk, most of it seemingly aimless. By the fourth day however, we somehow found ourselves with a complete scheme and a very clear concept of the basic organization of the exhibition.

This boiled down to:

1. Use of the dome as a kind of "information machine." No glamor. No things.
2. Use of the glass pavilion as a kind of bazaar stuffed full of things, idea being that consumer products represented one of the areas in which we are most effective, as well as one in which the Russians had already indicated they were most interested.
3. An awareness that 80,000 square feet of exhibition space was not enough to communicate more than a small fraction of what we wanted to say resulted in a decision to use films as a way of compressing into a small volume the tremendous quantity of information we wanted to present.
4. The overall message could be amplified and intensified by the use of 8 or 9 acres of outdoor space suitable for anything (e.g. automobiles, house, farm equipment, etc.) that was weatherproof.

The discussions now revolved around the use of films.

A principle: First we reduce information to a primer — then we simplify.

Discussions of film techniques. Circarama had already been contracted for, so there was no need to repeat that idea. In the dome show what gradually evolved was the idea of a multiple-screen presentation, not to be treated as a series of simultaneous films but as bits of visual data. Billy Wilder, the Hollywood director and writer, moved in Sunday night, November 23, 1958, as critic, sounding board, kibitzer, ultimate participant.

NOVEMBER 24, 1958

Jack Masey, Co-ordinator of Design and Construction; dawn arrival from Washington. Masey briefed on decision to treat dome as information machine, glass pavilion as bazaar. Worked on details of exhibits with Charles and Ray Eames, Billy Wilder. Everybody convinced Government could use a few dozen more Maseys.

New awareness of need to handle this project on basis of collaboration as against "farming out".

Arrangements for immediate New York meeting with Richard Barringer, architect from Chicago, Carl Koch, architect from Cambridge, Peter Harnden, designer from Paris, Jane McCullough, editor from Vermont.

Propect now at point where we can do some work. Only problem: still no contract with Government, and still no basis for contract.

DECEMBER 2, 1958

Meeting, Washington. A report from negotiating team on problems of coming to agreement with Russians on details. Discussion of scheme developed in Los Angeles and New York. General alarm at proposal that dome be set up as an "information machine", fear it would not be sufficiently dramatic. Considerably greater alarm and disapproval of the idea of a multiple-screen presentation in the dome as its major exhibit.

Considerable pressure to follow conventional exhibition procedures which would mean glass pavilion would be stuffed with one set of objects, dome equally stuffed with another. Our contention: If acts one and two are identical, people leave the theatre.

Less disagreement regarding the treatment of the glass pavilion, which involves the creation of a kind of "jungle gym", permitting the building to be filled from floor to ceiling with consumer products and other objects.

Major point at issue is the handling of the dome, which is quite clearly going to go up to top level.

During this period between mid-November and mid-December the design office was functioning under a preliminary contract. The reason for the preliminary contract was that data was still lacking to provide a basis for a final contract, and some instrument was needed to permit work to go ahead.

Preparation of the preliminary designs was completed in nineteen working days. The dream of an intricate collaboration had not worked out. Eames on the West Coast was now concerned solely with the films for the project, assuming that the proposal would

be accepted. The major contributors were Peter Harnden, who brought in a wealth of experience from dozens of foreign exhibitions, and Richard Barringer of Chicago, who joined the office for a long enough time to establish the basic structural pattern for the jungle gym. At the same time, the office staff was growing. People who hadn't seen each other in years met in the elevator, and found they were working for the same project. Within a month the permanent staff had been expanded by thirty people and a pleasant working place began to take on the appearance of a slum — but a very happy slum.

The main problem was that our proposals for the development of the dome as an information machine had not received top level support and we were unable to see a strong consistent statement for the exhibition as a whole without this.

The crucial meeting occurred in Washington on December 22, 1958. George V. Allen, head of USIA, was present. For the dome two schemes were presented: one a plan based on the use of things mostly of a scientific nature, the other based on the use of multiple screens. The former was presented as badly as we knew how to do it, and this was convincing, but what finally turned the tide was Allen's conviction that the multiple-screen presentation was the one really effective way to establish credibility for a statement that the products on view were widely purchased by the American public. An automobile, for instance, might be looked upon, if the Russians chose to do so, as a prototype made for display purposes. Twenty to thirty shots of the parking lots surrounding factories and shopping centers, traffic congestion in cities, and car movement on express highways could leave no possible doubt in the visitor's mind.

DECEMBER 24, 1958

It looks like a better Christmas than we expected. The two crucial situations in the exhibition as a whole have been worked out and accepted. The glass pavilion now goes through as the most complete collection of major consumer products we have ever put together. The dome stays uncluttered. Its three major components—RAMAC, the eight hanging exhibits, and the films—all add up to the same thing: the presentation of believable information about America and its institutions and the way its people live and work.

From here on there is nothing to do but work. We have January, February, March and a part of April to put together the most important part of all United States exhibitions.

At this point the day-to-day record breaks off. Too many things were happening too fast. These had to do with endless meetings with the hundreds of participating industries, and with the development of the outside exhibits which began as a rather sparse group of major products such as automobiles, and is now ending up as a collection of separate shows which are taking over almost all of the available land.

There was also an anticipated crisis in midstream. There were certain cultural requirements, such as space for Steichen's "Family of Man" show, for a large-scale exhibit of U.S. architecture, and for a shelter to house the choices available to U.S. consumers in the way of clothing. None of these could be fitted into the dome, and the glass pavilion was already overloaded with required exhibits. The last-minute architectural problem was to develop some kind of shelter which could meet these requirements and at the same time add intrinsic interest to the exhibit.

Editor's note: An answer was found in a super-high-speed collaboration between the plastics industry and the design office, a collaboration quickly extended to include, as an engineer-consultant, Dr. Albert Dietz of the Massachusetts Institute of Technology. The result, shown on the opposite page, and now in production, will be three clusters of translucent fiber glass-reinforced plastic units described by the designers as "umbrellas," but actually more like flowers in configuration. These structural units, about 15 feet in height and 16 feet across in their largest dimension, are hexangular in shape, and fastened together to form continuous shelters with irregular outlines. Each section is supported by a hollow (to allow rain drainage) column, anchored in concrete slabs. On March 27, at the Mitchell Field Air Force Base, where the sections were tested and the photographs shown here taken, it was established that the free-form, vaguely floral shelters will stand. It is possible that they will stand as a design statement of considerable significance in a national exhibition of great significance.

A nest of inverted parasols will shelter displays of culture and fashion

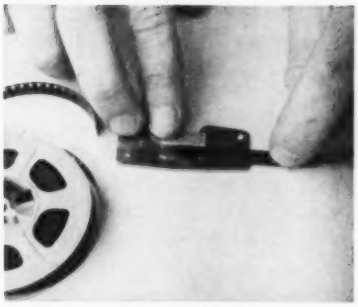
The designer manufactures

by Gregory Dunne

Hudson Photographic Industries, founded by two designers and an engineer, has spliced design to management and run the result into a million dollar business

Designer Eugene Martinez, president Marvin Kapilow, and sales director Robert Reibel examine mock-up of HPI's new Previewer.

"Anything you can do, I can do better,
*I can do anything better than you."**
Song by Irving Berlin.



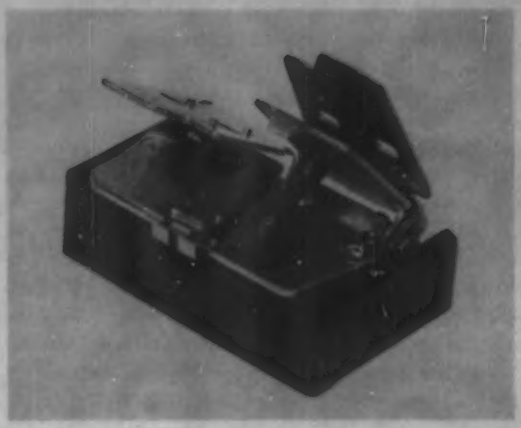
A Mylar splice is applied to 8mm film aligned on a Quik Splice jig. The sprocketed tape is fitted over the nibs of the jig to correspond to the sprocket holes of the movie film.

Hudson's main offices are in this 120-year-old house in Croton, N. Y. Other storage facilities and fabricating shops are scattered all over New York's Westchester County.

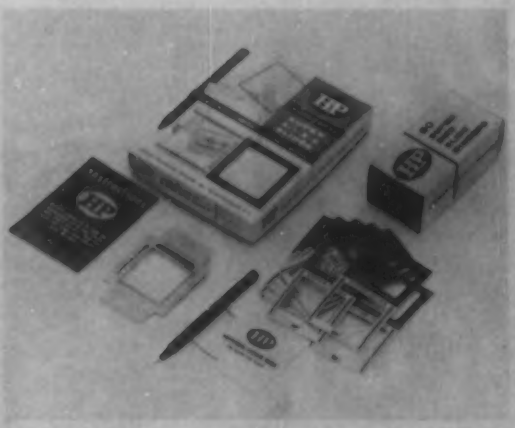
Late one night in 1956, three young men toiled in a cheerless Atlantic City hotel room to edit a demonstration film for presentation the next morning at a trade convention meeting. The rush of shooting and processing the picture had left them little time for splicing the various film elements into a cohesive, pictorial message. Their troubles were further compounded by the primitive, messy, and time-consuming splicing equipment on hand. Time and again, the three men, Robert Reibel, Marvin Kapilow, and Eugene Martinez—the first two employed respectively as merchandising director and director of engineering and research for Ednalite Optical Company, the last a consultant designer to the company—cut the film, scraped off its emulsion, painted the film ends with glue, and stuck them together—only to have them pull apart, unable to hold the splice. They finally resorted to a roll of Scotch tape to join the film strips together and, with a jeweler's screw driver (the only pointed instrument available), punched sprocket holes in the tape so that it could pass through a movie projector. The makeshift splices were a success; the film was shown the next day to a gallery of salesmen unaware of the midnight-oiled ingenuity of the picture editors.

But Reibel, Martinez, and Kapilow were not satisfied to have proved once again that necessity was the mother of invention. For some time they had watched—and been unimpressed with—the parade of new photographic products at the annual trade shows. Their splicing misadventures merely lent substance to the nebulous idea of "doing something about it" that they had flirted with for months. In August, 1956 they acted, incorporating themselves as Hudson Photographic Industries to supply the photographic field with simpler, cheaper secondary equipment. Today they are grasping for the two million dollars sales mark, are the object of solicitous overtures from Wall Street, and, in the faintly incredulous words of sales director Reibel, seem "blessed with the Midas touch."

Despite the narrative similarities, Reibel, Martinez, and Kapilow bear only superficial resemblance to Horatio Alger heroes. Though young (at 34, Martinez is senior member of the triumvirate) and presumptuous enough to have incorporated on no more than $5,000 and an idea, they had shrewdly calculated the angles and roughed out the shortcuts to success. Their backgrounds showed a wide degree of overlap in the design, engineering, and photographic fields. Reibel, 33, trained as an engineer and designer, had drifted into sales because he had no affinity for board work. After "starving graciously" for a year in Europe as an apprentice ceramist and architect, he worked both in a design office and as a free lance before switching to merchandising where, he felt, his training would enable him to practice "creative selling." Martinez, a bulky, thick-spectacled designer with half a head of red hair, worked as a package and product designer after graduation from Cooper Union. While doing consultant merchandising for Ednalite, he met



Older film splicers had two plates to clamp film, and two additional plates for cutting the film. A spring-mounted scraper was used to scrape off film emulsion. The film strips were then joined together with glue.



HPI's slide conversion kit uses viewer mask to frame desired picture. Composing template is placed over processed film and centered over section of transparency to be mounted. Film is scribed, cut along the scribe lines, and then mounted in HPI slide binders.

Kapilow, an ingenuous 27-year-old mechanical engineer who was later selected as Hudson's president, because as Martinez jokingly asserts, "We wanted someone young enough to qualify for the Young President's Club."

The decision to incorporate Hudson was not hastily arrived at. As merchandising director of Ednalite, Reibel had accumulated a fund of unofficial information on the photographic industry from distributors, salesmen, and customers. He and his partners added dimension to this knowledge with market data gleaned from governmental agencies, mail order houses, and photographic journals. The boom conditions, they found, had forced the nearly 500 manufacturers in the photo field to concentrate on the production of primary equipment almost to the exclusion of smaller accessory items. The larger companies were hard-pressed to develop new cameras and projectors, while the smaller firms were occupied in satisfying consumer demand with cut-rate imitations. There seemed to be ample room for a company committed to new ideas which specialized in the development of cheaper, simpler accessories. This, of course, was acting on the fragile assumption that the inherent value of these products would create demand. After considering these hypotheses, Reibel, Martinez, and Kapilow decided that their chances for success would be enhanced if they limited their activities to the home movie field, because it offered the greatest growth potential in terms of dollar volume and user activity. And, more important to a new company with ambitious plans for expansion, it was the segment of the photographic market that was serviced by the fewest manufacturers.

Friendly persuasion

Reibel quit his job with Ednalite in August 1956 to run the full-time operations of Hudson Photographic Industries from an abandoned grocery store on the Hudson riverfront in Croton, New York. The selection of Croton was a calculated choice. The town had been a main switching center for the New York Central, but railroad cutbacks had made available a floating labor supply. The town was on the main transportation arteries, its rents were cheap, and it was proximate to suppliers with whom the three partners had had friendly working relations in the past. For the first year, none of the three drew a salary from their corporation. Because his duties as sales director could only be handled during normal business hours, Reibel worked full time, while Martinez and Kapilow supported the company with free lance work and supervised Hudson's design and production in their spare time. Periodically the three dipped into their combined savings to meet unforeseen obligations, and "by going into debt up to our ears kept this monster alive."

Six weeks after incorporation, Hudson had its first major product on the market. Because 35mm slide projectors would not accept the 2¼" x 2¼" pictures made by many cameras, Burleigh Brooks had introduced an attachment on its Rolleiflex cameras to give users the option of cutting pictures down to 35mm size, and had set aside a large advertising and publicity budget to promote it. To accommodate other 2¼"x2¼" camera owners, Hudson developed a simple conversion kit (left) which enabled amateur photographers to compose and mount their slides for use in a 35mm projector. The Super Size Slide Kit snagged the in-

terest of several distributors who were willing to gamble on the shrewd hunch that the Rolleiflex promotional campaign would cause owners of competitive reflex cameras to seek out similar equipment to reduce their slides.

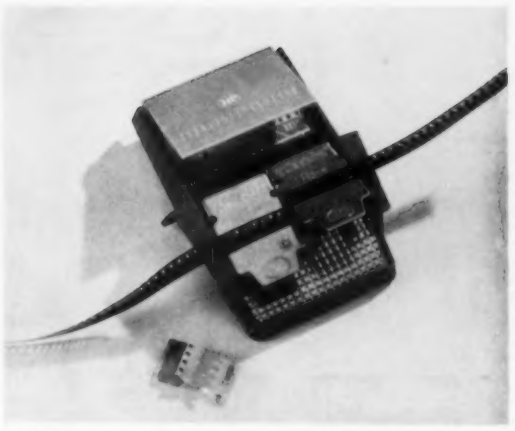
In the last three months of 1956, Hudson sold over $50,000 worth of slide kits and also established a basic working policy that is still in effect. The company's three owners maintain personal control over assembly, quality standards, and sales. No funds are tied up in non-producing capital equipment—which leaves them free to devote their attention to their merchandising and creative programs. "We've tried to keep our overhead as small as possible," Reibel states. "We want to trace our growth to new products and new thinking and not be strangled by production prerequisites."

But despite the apparent success of the slide kit, Hudson was still shakily juggling its finances. Friendship, persuasion, and an indifference to the calendar dictated the terms of bill payment. The company selected suppliers who had agreed to remain flexible on the matter of credit. On the other hand, Reibel frankly told his three distributors that he was in a tight spot for cash and asked them for immediate payment so that he in turn could pay off the suppliers. The distributors willingly complied with his request, and went one step further by not deducting the two per cent discount normally available with ten-day bill payment. On these terms, HPI kept its head above water.

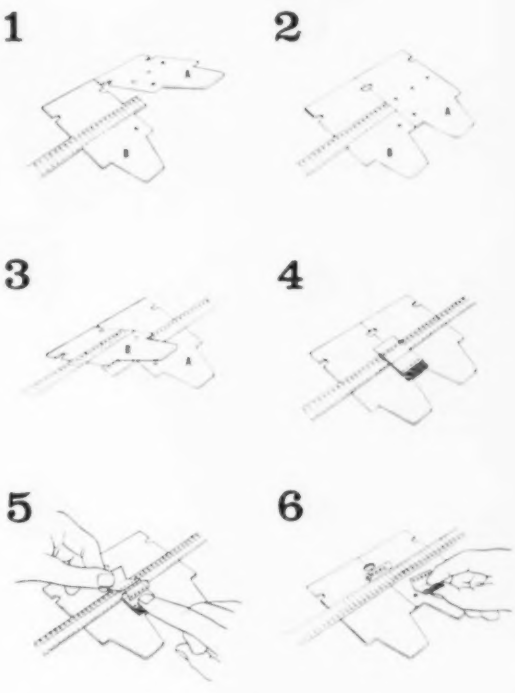
A lesson learned, a start made

As soon as the slide kit went into production, Kapilow plunged into the development of an anamorphic lens that would be within the budget and mechanical aptitude of the average photography hobbyist. Hollywood's Cinemascope® craze had prompted many camera manufacturers to produce lenses that would bring the wide-screen effect to home movies, but the lenses were costly and mechanically flawed. By Christmas, Kapilow had come up with an inexpensive, bug-free lens, and ordered a prototype made. But after taking a closer look at the market, Hudson changed its mind. Distributors were flattening out the curve of consumer demand with a variety of anamorphic lenses from different manufacturers. Reibel, Martinez, and Kapilow thought that with their precarious financial position, it would be disastrous to allot a large production inventory to a disappearing market. It was only a little more risky to build a market rather than to follow the crowd, and the returns, if successful, would be far more enticing.

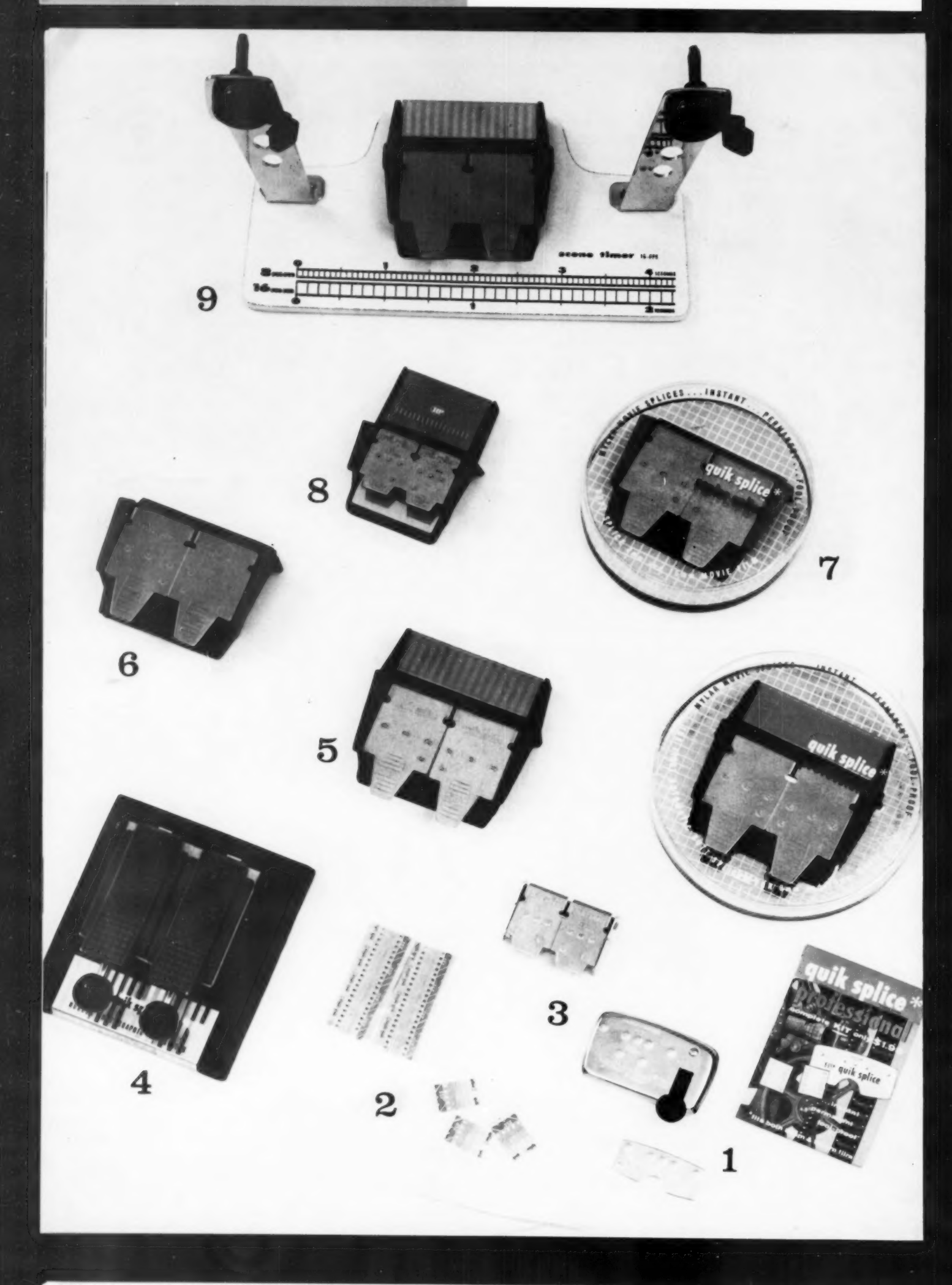
On the heels of this mishap came a breakthrough on the splicer project that had pushed Reibel, Martinez and Kapilow into the business world. The photo equipment companies had ignored new approaches to splicing for over twenty years despite the fact that it was an essential function to the showing of movies. Processed film is returned in 50-foot reels which must be edited and respooled in three-to-four hundred foot lengths to allow uninterrupted projection for a reasonable length of time. New consumers tended to shy away from the splicing chore because it required elaborate equipment and technical agility. For a number of months, Reibel, Martinez, and Kapilow had tinkered with a variety of synthetic materials as the basis for a simplified splicing method. Their system depended on a strong, age-resistant patch material, backed



HPI's butt splicers have two cutting plates which serve both to clamp and shear the film. Film is held firmly in place by close tolerance (.0005") prongs and the shear action of the stainless steel cutting plates.



The splicing operation is illustrated in the above drawings. Shear action of cutting plates cuts the film. Close production tolerances must be maintained so that film can be accurately aligned, held, and joined by splice.


9
8
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quik splice*
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quik splice*
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quik splice*
Professional
quik splice

HPI's Quik Splice family is planned to anticipate the market and competition

1. Quik Splice kit ($1.98) contains package of Quik Splice tape and chrome steel film alignment jig. It is used to splice and repair both 8mm and 16mm film. It is small and compact and can be used as a portable, carry-around splicer.

2. Quik Splice Mylar splicing tape (79 cents per package of 36 splices) is used to patch both 8mm and 16mm film. It is used with all Quik Splice equipment, and with contract splicers mounted in Argus, Keystone, Bell & Howell, DeJur, and other movie projectors.

3. Quik Splice contract splicers. These are splicers made by HPI for various manufacturers of movie projectors and editors. It is sold with these projectors and editors as part of the equipment.

4. HPI Studio splicer ($79.50). This professional splicer is designed to handle both 16mm and 35mm film strips. It is of heavy-duty construction, and made of cast bronze and cutlery steel, both of which are non-magnetic, in order to handle magnetic and optical sound film. Unlike the other splicers, it has arms to hold the wide 35mm film in place on the cutting plate. The weight of the splicer keeps it from being knocked about in the dark and damaging the film.

5. HPI Pro splicer ($7.95). This 8mm and 16mm butt splicer is made of die cast aluminum with a stamped stainless steel cutting plate. It contains a storage compartment with a pre-finished chrome steel cover for holding Quik Splice tape. It was the first butt splicer that HPI released. Like all Hudson equipment, it is sold as part of several different merchandising groups to attract the widest number of consumers.

6. HPI Senior splicer. ($6.49). This a less costly model of the Pro-Splicer (No. 5). It was developed as an export model to meet price competition in Canada, South America, Europe, and Asia. Released in this country as an inexpensive promotional attraction for the 1958 Christmas season, it was available to dealers only in dozen lots and was taken off the American market after Christmas. Except for lack of a storage compartment, it is fabricated like the Pro Splicer.

7. Two see-thru packages for the Pro and Senior Splicers. They were developed to serve as displays as well as packages, give immediate product identification even when stacked in a retail store. Martinez does all HPI's packaging and point-of-sale display work, as well as all their advertising layouts.

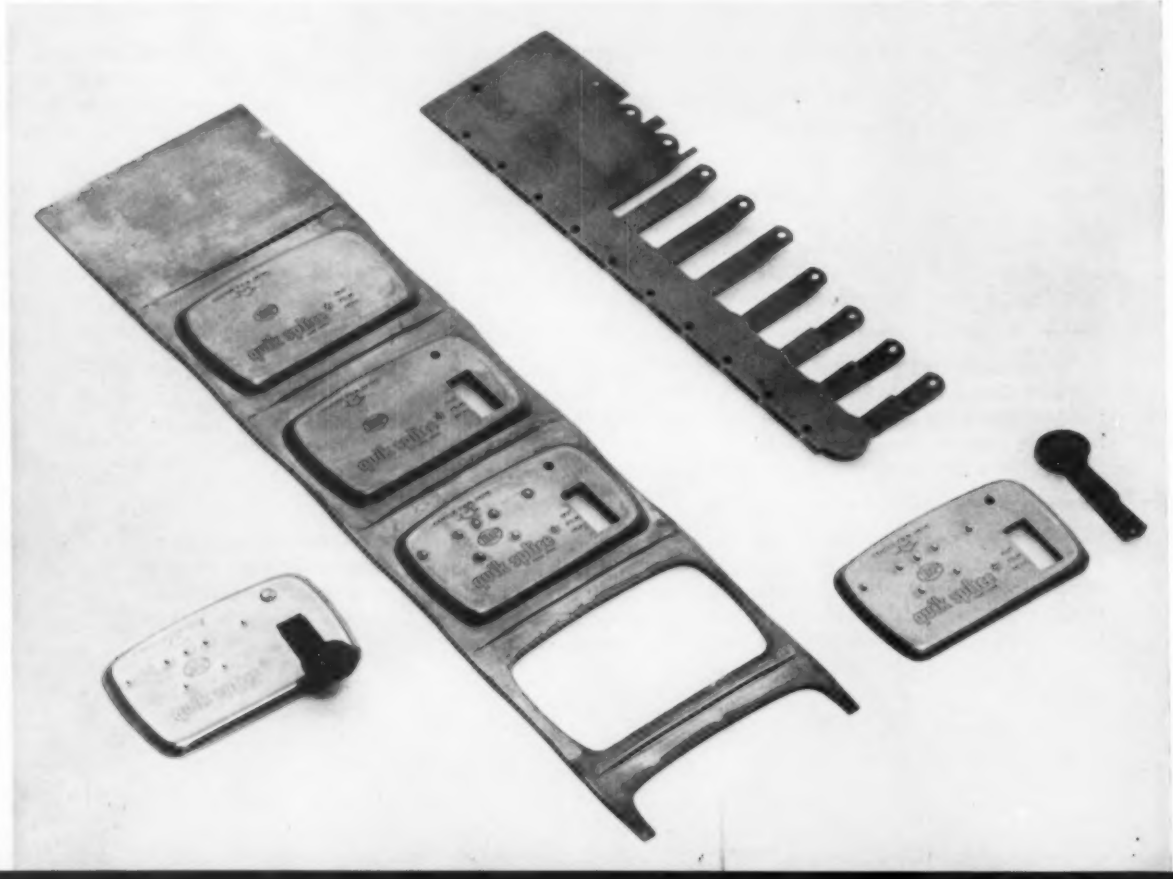
8. 8mm Butt splicer ($4.98) is used to splice only 8mm film. It is of the same basic construction as the other splicers, but is designed to sell for under $5.00. This is the splicer that appeals to the bulk of the amateur market (most home movie makers use 8mm film), and is consequently the largest seller in the splicer line other than the Quik Splice kit. It has tape storage compartment with an extruded styrene cover; its base is die-cast zinc and its cutting blades stainless steel. This will be the last mechanical innovation in the splicer family.

9. Movie Makers Workshop ($11.95). This is a complete film splicing and editing workshop. It contains an 8mm and a 16mm butt splicer and a pair of nylon-geared film rewind arms which are mounted on a hardwood base containing a scene-timing scale used to measure length of film for sub-titles. The rewinds are also sold as a separate package. Unassembled Movie Maker Workshops are sold through HPI's mail order outlets under house names.

HPI does the packaging for this disassembled kit sold under proprietary name of Montgomery Ward. The rewinds are also sold as a separate package. HPI put them on the market in September 1958 for $4.95. All working parts are made from self-lubricating nylon. The arms are fabricated from chrome steel. Older rewinds were more than twice as expensive; made from zinc die castings; they had cast metal gears which were liable to wear and tear.

215,000 contract splicers to be stamped and pressed in 1959

The contract splicer below is for Keystone Camera Company. Base plate is stamped from cold-rolled steel; cutter is stamped from high carbon spring steel. Both pieces are run through a press and are formed on a progressive die.



with a pressure-sensitive adhesive to join torn or edited film strips, which could be pre-sprocketed and pre-cut to an efficient splice length. Around the splicing medium, they would have to design a series of mechanical devices to align and cut the film as well as to facilitate the application of the splice patch. Several synthetics had been tried and discarded because of shrinkage, discoloration, or inadequate tensile strength. In January 1957, however, Riebel secured a roll of du Pont's new Mylar® film from a supplier and showed it to his partners. They were enthusiastic about its strength, optical clarity, and inertness, which prevented deterioration from age, heat, or light. Convinced that Mylar would make the best splice patch possible, they took out the first bank loan of their joint career in order to finance the fabrication of the material.

Technical processing, strategic planning

But few fabricators had had experience with processing Mylar. Over a period of months, Hudson worked with converters in the East and Middle West to find the best and quickest means of removing the plastic film from the raw stock, and then to back it with the proper pressure-sensitive adhesive and a protective, peelable paper coating. It was a long arduous period of trial and, mainly, error. Yet as each false start eliminated a possibility, the mounting negatives began to teach Kapilow, who was supervising the fabrication process, a great deal about the material. But as knowledge increased, capital decreased. Finally in March, Hudson fired the converters and hired space in a Yonkers, N. Y. tool and die shop to let Kapilow conduct his own processing experiments. In less than a month, he had developed a primitive but workable production sequence.

Reibel and Martinez, meanwhile, had drawn up a two year marketing timetable for a whole family of products that they trademarked as Quik Splice. They intended to capitalize on the basic idea of splicing tape by augmenting it with inexpensive splicing machines that would allow the consumer to butt splice his film with professional ease. A tentative, though thorough, release schedule was set up for each of the product packages even though most were not yet even on the drawing board. But by determining in detail how and when each product refinement would be presented to the public, they gave a direction to their program which put them one step ahead of their anticipated competition. Furthermore, Hudson deliberately planned to design a clean, efficient "housewares" look into its equipment to give it a mass appeal for the amateur movie maker.

Hudson shipped its first Quik Splice package to distributors late in the spring of 1957. The initial kit contained splice patches designed to accommodate both 8mm and 16mm film interchangeably and a stamped metal jig to align the film for splicing. Damaged film could be cut by either scissors or a razor. By releasing the kit at a price–$1.98–that made it an expendable product, HPI hoped to encourage impulse buyers who, if satisfied, were offered an additional come-on of splice refill packages retailing at 79 cents. The more elaborate butt splicers were still far short of production sketches, but Kapilow and Martinez were sure that they would present no major engineering or design obstacles that would upset the release schedule. They felt that if the splicer family were to succeed, Hudson first had to exploit the low-cost merchandising factors of the simple splice kit and refill packages which would in turn develop a market susceptible to more expensive splicers and attachments.

The designer learns the angles

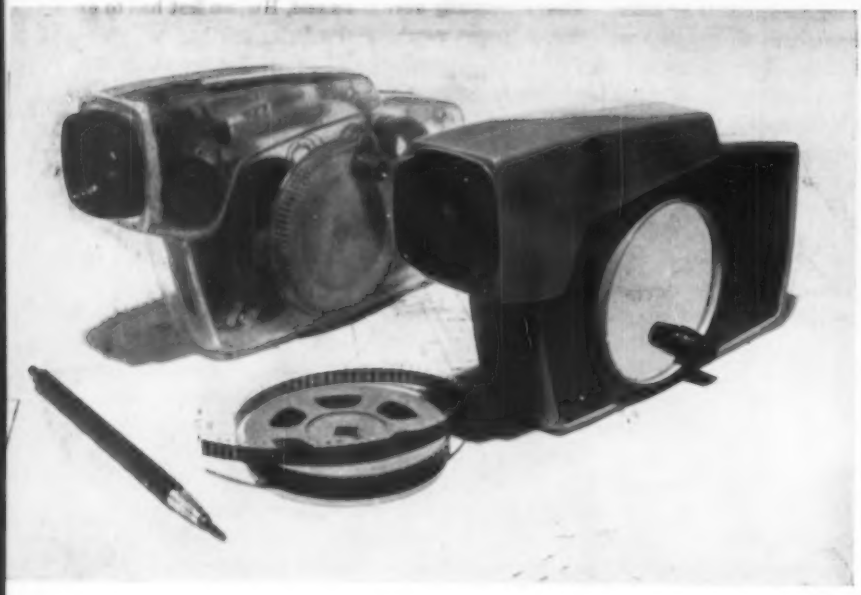
The distributor's first reaction to the splicing kit was apathy. "Nobody jumped up and down when they saw Quik Splice," Reibel recalls. "We really thought we had laid an egg." He and Martinez crossed the country wheedling and cajoling dealers to take on at least minimum inventories of their kits. They had hired a fifty-ish grandmother, Kay Alderman, to canvass retail stores in the metropolitan New York area (the biggest market for photo equipment), teaching clerks and store owners how to use and sell the equipment. She took no orders, but Reibel, with whom she had worked in a similar capacity at Ednalite, shrewdly calculated that she could pre-sell Quick Splice by "spreading our gospel and stirring up feelings of good will."

Determined to force the market, Reibel sent feelers to both Sears Roebuck and Montgomery Ward to see if they would be willing to include HPI's first butt splicer in their catalogs. Both mail order houses agreed, and contracted for complete splicing systems to be sold under a house name. Montgomery Ward was so impressed, moreover, that they wiped out their inventories of old splicers to carry Hudson's. HPI also realized that if the projector manufacturers could be roused to the benefits of the splicing system, tie-in merchandising deals might be arranged that would open up a whole captive market. Keystone signed an agreement in January, 1958 to include the 8mm butt splicer as an attachment to their new projectors. During the course of the year, similar contracts were concluded with six other manufacturers. Furthermore, Technicolor Corporation, next to Eastman Kodak the largest film processor, arranged as a promotional attraction to offer an HPI splicer to its customers with each order of developed film.

In each of these deals, Hudson reserved the right to be the sole source of tape refills. This right was all but guaranteed by the patents surrounding its system. It reckoned that 215,000 splicers would be sold through tie-ins alone in 1959. Added to the 314,000 splicers already on the market, these would account for half a million dollars worth of refill packages if each splicer owner bought just one 79 cent packet of Mylar patches. Hence Martinez can afford to crack, when he projects these finding to include the 5½ million 8mm and 16mm camera owners in this country, that the tape puts Hudson "in the razor blade business."

Competition and promotion

In mid-1958, Hudson, never really satisfied with its cramped quarters in the grocery, began looking around for larger digs, and, in August, moved into a once-condemned Hudson River Gothic house right off Croton's main stem. Also, in order to maintain closer production controls, they bought the small tool and die operation to which they had been jobbing the bulk of their fabrication. The shop still does custom tool and die work, but as 75 per cent of its facilities were already absorbed by Hudson, the purchase was effected with little difficulty or upset to timetables.



HPI's Previewer was developed to show 8mm motion pictures. Its case is molded in high impact styrene in two snap-together parts. User puts reel on spindle; threading is eliminated by dropping film into a built-in slot and attaching it to take-up reel. Framing is automatic, and it is unnecessary to focus lens because it was designed with large depth of focus. Eyepiece was designed to accommodate people with glasses. The picture is lit from behind by internal light source. User turns handle to watch film, reverses it to rewind. Price: $12.95.

HPI expands through product diversification

Quik Stik is sold through Hudson's subsidiary corporation, Maker Products, Inc. The spray-on adhesive utilizes the aerosol process, and is distributed through art supply outlets. It dries quickly, does not stain or leave a residue on second surfaces.

Audio Tape Splicing Kit uses Mylar splices pre-cut to length with strippable paper backing. The splicer is an aluminum extrusion; it has a storage compartment underneath for splices and razor to cut tape. Tape is put on slotted longitudinal groove which is undercut to hold tape in place, then cut through slot. Price: $1.98.

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Hudson's success finally attracted the ultimate accolade. Late last summer, Eastman Kodak, the photography industry's Big Brother, marketed a new splicer of its own. With the irreverence of youthful spirits, HPI claims that Eastman's solution was one that they had tried and discarded as impractical, but points out nevertheless that "Kodak's getting into the field put the seal of approval on our system." Thirty days after Kodak announced its splicer, Hudson's orders doubled. HPI is confident that its two-year program has been successful in saturating the market with an established, stable product. "From now on," Martinez declares with his customary assurance, "cost cutting is the only basis for competing against us."

Expansion and development

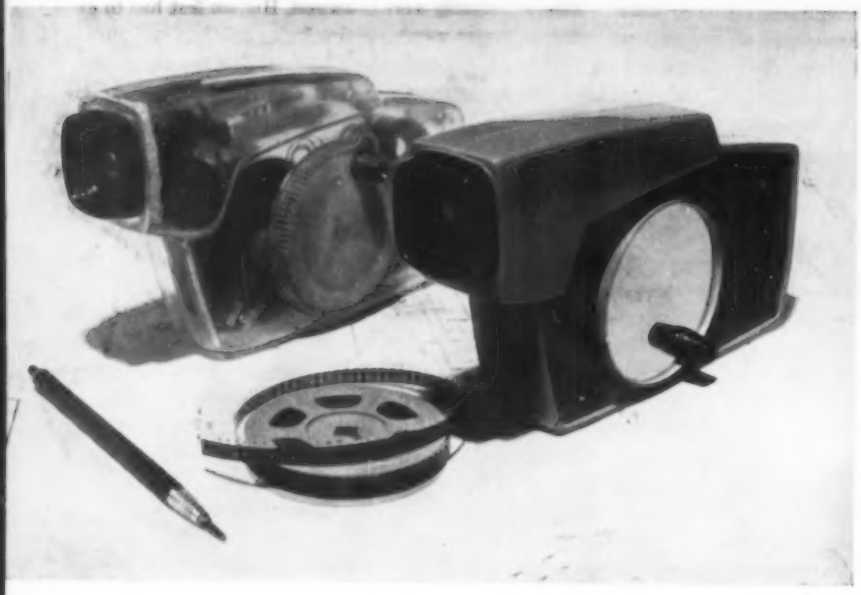
Reibel, Martinez, and Kapilow believe that there's no success like more success. "This is a bootstrap operation," they argue. "If we stop developing, we're dead." They still feel that they haven't milked the splicing idea dry. There is a vast market for their system in audio tape. Hudson is also working with a computer manufacturer on a system for splicing Mylar computer tape. Other business machine companies are likewise experimenting with Mylar tape because it is impervious to age and the elements. Hudson is following these experiments closely; it is prepared to pounce on any feasible idea with a complementary splicing system.

In addition, Hudson is looking for other ways to diversify its product line in areas tangent to the splicer family. The three partners reasoned that home movies are restricted to parlor showing only because of the size and expense of projectors. They were convinced that they could open new frontiers for 8mm movie viewing with a cheap, portable viewer that had a built-in light source. This small viewer could be carted to the office or bridge club, and would show a movie command performance when lifted to the eye. Kapilow and Martinez went to work on this idea to try to discover a practical optical system and casing, while Reibel, though not even sure that they could find an engineering or design solution, hammered out a marketing schedule. HPI made allowances for a more leisurely development period for the viewer than it had for the splicing system both because it was more complicated, and because the three owners wanted to back it with a more impressive reputation than Hudson had at that time. The time, they judge, is now propitious; they will release the still-secret previewer in June.

Hudson is not disposed to discard the residue of any past experience. By combining Kapilow's education in finding an adhesive for the Mylar tape with their interest in the aerosol process, the three partners arrived at an idea for a spray-on glue. With the aid of freon manufacturers and aerosol packagers, they solved the problem of chemically formulating and packaging the liquid adhesive, Quick Stik. It is sold through a separate subsidiary corporation, Maker Products, Inc., which was set up on the advice of Hudson's lawyers and accountants so that the assets of the parent company would not be tied into any litigation.

The problem of growth

The immediate problem facing HPI is to gather together all the bits and pieces of the company into a single location. Reibel intimates that it is time for Hudson to abandon its attitudes of informality and to acquire the sober externals of stability that HPI's ambitions for expansion and respectability require. These ambitions, however, pose a threat to the very structure of Hudson's business philosophy. Prior to their incorporation, Reibel, Martinez, and Kapilow felt that their cumulative talents gave them both flexibility and a saleable commodity. They purposely shied away from client service because it offered no equity and too much compromise. But by acting as both client and designer, they made possible a creative continuum which eliminated the expensively time-consuming process of convincing management of the feasibility or necessity of a design program. This situation, moreover, allowed them the luxury and psychological mobility of being wrong without recourse to alibi. (In retrospect, Martinez admits that he and his partners have not always been right—a statement that few designers are prepared to volunteer.) Size, however, brings with it the inclination, and perhaps the necessity, of being more client than designer. Reibel can no longer say "We've got big ideas" without adding, on reflection, "We'd prefer to keep Hudson a closed corporation, but big ideas take big money." Big money also takes big management, which, in turn, confines flexibility. The question, then, is whether Hudson can continue to grow and prosper without sacrificing the personal control that has been so largely responsible for its progress to date. But Reibel, Martinez, and Kapilow are the only ones who can decide the optimum conditions under which they will carry on.



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SURVEY SHOW REFLECTS CURRENT TRENDS IN PACKAGING GRAPHICS

AIGA

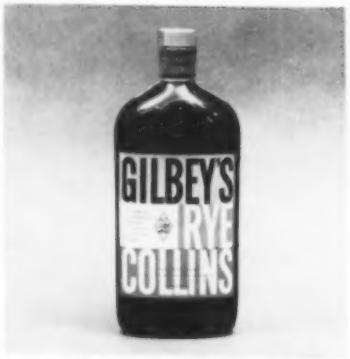
That "good art often pops up where you least expect it—on the grocery shelf, in the department store, on the home medicine shelf," is the thesis which the American Institute of Graphic Arts presents to the public in its current show. This year's exhibit of some 120 packages and record sleeves (covering the period from September 1956 to September 1958) is meant to record graphic achievement in packaging and will travel across the U. S. and Europe.

Few new design ideas cropped up among the entries, but many familiar devices were utilized in an attractive way. Though the selection was a relatively small one, there were many similarities among the entries. For instance, four of the fourteen record covers used type as the main design element, while another three of them worked various kinds of musical instruments into a design motif.

Judging this year's show were Dr. M. F. Agha, consultant art director; Lester Beall, designer; Charles T. Coiner, art director; Donald Deskey, designer; Karl Fink, president of the Package Designers Council; and Charles T. Gerhart, member of the art department at Procter and Gamble. *A.F.*

EDWARD C. KAZLOWSKI. Offset printing promotion box for Warner Brothers Co.

RUDOLPH DE HARAK. Laclede Profie tablets box for MacLean Advertising Incorporated.



CLAIR STEWART, art director; Kenneth Macpherson, artist. Rye Collins for Gilbey.

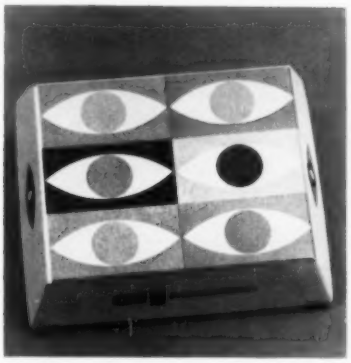
J. K. FOGLEMAN, art director; Brownjohn Chermayeff & Geismar, designers; Tom Geismar, artist. Pharmaceutical box for CIBA.

TED C. CoCONIS. X-46 box containing child's crystal radio receiver for Hearever Co.

WILLIAM STARK, Raymond Loewy Assoc. Grease container for Consumer's Cooperative.

S. NEIL FUJITA, art director. Peter Adler, designer, Marty Moskoff, artist. Gift record package for Columbia Records.

JEROME GOULD. Mr. and Mrs. gift box of overnight necessities for Hotel Sahara.



ANDREW SCHMITH, art director; Joseph Kramer (Kramer, Miller, Lomden, Glassman) designers. Sampler for Merck, Sharp & Dohme.

ROBERT M. RUNYAN. Litton potentiometer box for Litton Industries, Incorporated.

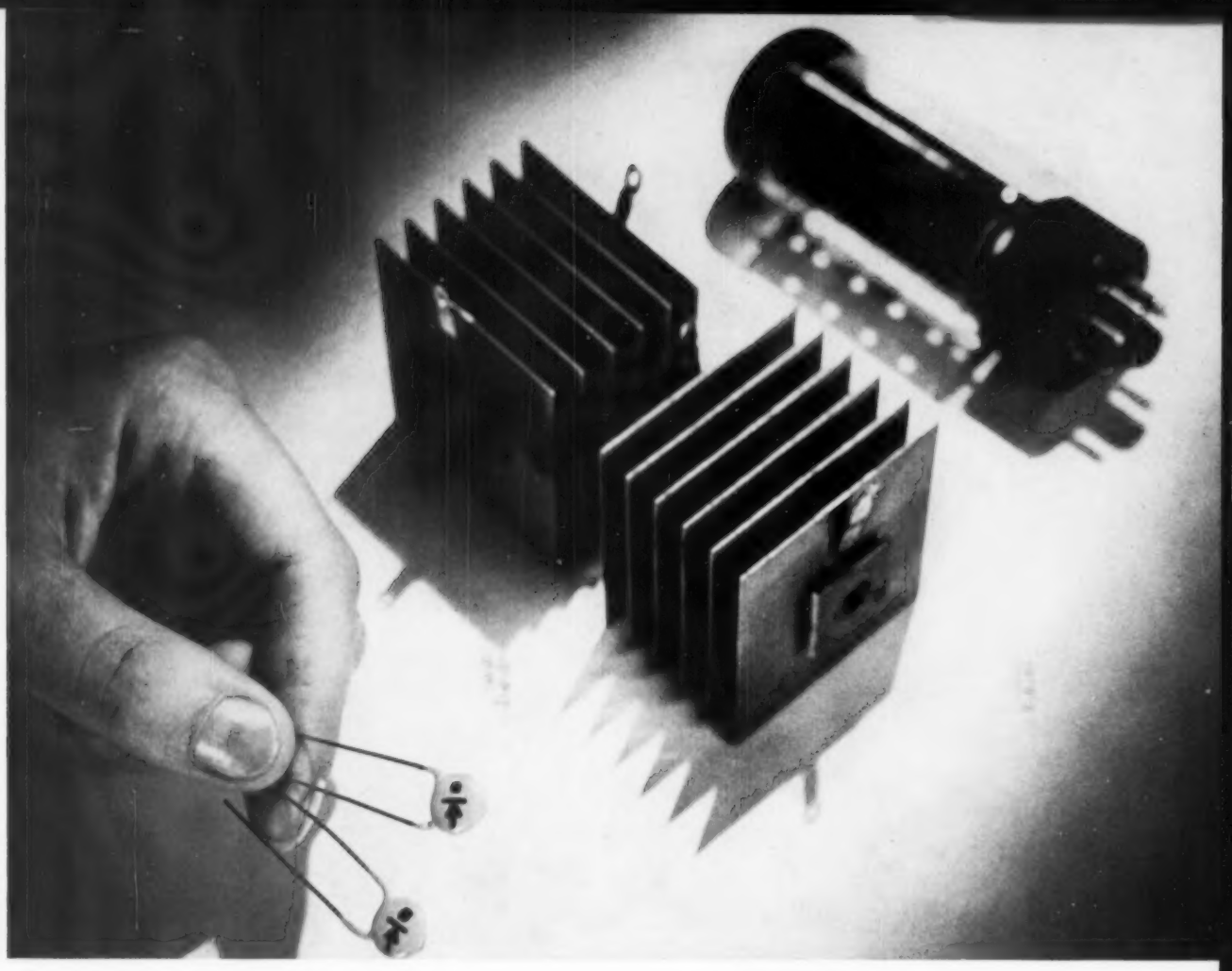
MAX ROGERS, Avon art director; Miles R. Grove, Bill O'Day, designers. Fire Engine No. 5 soap carton for Avon Products, Incorporated.

KENJI YOSHIZUMI, Dickens Incorporated. Croft Ale label for Croft Brewing Company.

J. CRIS SMITH, J. Cris Smith Design Associates. Fluf Rinse label for Zippy, Inc.

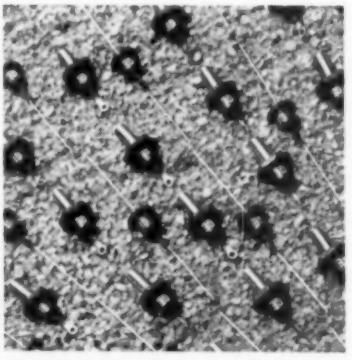
IRVING HARPER, George Nelson and Co. Homemaker cutlery box for Charles D. Briddell, Inc.

S. NEIL FUJITA, art director. Clara Genchy, designer. Carton for Columbia phonographs.

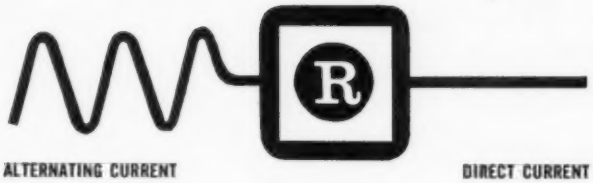


TINY UNITS SIMPLIFY AC-TO-DC CHANGE

Miniature rectifiers formed of silicon help make domestic appliances and industrial tools more compact, easier to service and operate.



Low current silicon rectifiers are used in dc power supplies, magnetic amplifiers, etc. GE types above are "pigtail" devices or stud-mounts.



Rectifiers are constructed to permit only one-directional current flow. They convert regular ac line-power into dc and help operate equipment which runs on dc only.

The tiny silicon rectifier replaces clumsier, less efficient selenium cells or rectifier vacuum tube, and looks like a mechanical component (Raytheon product below).

New developments in electronic components are contributing to intensify miniaturization. The replacement of certain types of vacuum tubes by transistors, the reduction in size of tubes still in demand, the storing of rows of office data files in small reels of tape—these and other changes have resulted in products and equipment that are more compact, have a neater, more logical inner structure, and are easier to cope with in every way. The picture at the top of the opposite page tells the story of another electronic component that has joined the miniaturization "march"—the *rectifier*, an important circuit element in communication equipment, lighting control and heavy power operating setups for industrial processes, where it performs the function of changing electric current from alternating to direct.

Components have caused the "shrinkage" in products, but improved production techniques and utilization of hitherto "idle" materials have in most cases been responsible for the component changes. The size reduction in the rectifier for radio or tv circuits shown here amounts to a change from 8.87 cubic inches (the tube) to 0.0333 cubic inches for the small disk-like unit. For industrial power use the change from the conventional to the new components amounts to a reduction of 99 per cent. The devices vary in volume from the pea-size unit shown on the opposite page to the considerably larger rectifiers needed for heavy power applications (page 70). But whatever their ratings, the new components are all made of silicon—a newly utilized material that is neither a conductor nor an insulator (see ID August, 1957 for a discussion of semiconductor devices).

The use of silicon and, to a lesser degree, germanium (another semiconductor material prominent these days because of its use in transistors) in the construction of current-changing rectifiers has literally swept the market. A host of companies are in the silicon rectifier business (General Electric, General Instrument, Westinghouse, Raytheon, International Rectifier, R. P. Mallory, Texas Instrument, Audio Devices among others), and sales for 1958 amounted to about 200 million dollars. There is good reason for this "good show" and an even brighter outlook. Silicon rectifiers are not only smaller but cooler, more efficient, capable of higher temperature operation than their older "brothers." They have a longer life-span and in most cases cost less. In short, they comply with the maxim which gives a new component entry in the miniaturization group of products: they offer more for less. Consequently the manufacturers are optimistic. Said H. B. Fencher, general manager of GE's semiconductor department, manufacturers of the most versatile member of this group, the silicon *controlled* rectifier: "Eventually, they

may be used extensively in kitchen food mixers, electric stoves, weather-conditioning equipment, and lighting controls . . . and may extend the use of simplifying, long-life electronic circuitry into many new mass markets that were previously closed because large, power-consuming, short-life electronic components were the only ones available."

Why rectifiers?

Most equipment that depends on electric power for its operation is fed by ac current. But the circuits of many of them need dc to do a proper job. Both the transmitting and receiving ends of nearly all communication apparatuses — radio, tv, hi-fi sets, radar setups, broadcast equipment, telephone instruments, sound recording units, etc.—require dc for message transmission and reception, and it is consequently necessary to change the ac current which powers the equipment to dc, which it needs to "perform." Similarly, much heavy power industrial equipment—welding machines, electric railway locomotives, electrolytic cells for the production of chemicals like chlorine, caustic soda, etc.—can be operated by dc only. Dc motors are much easier to control than ac types, and dc is better for many pump drives and other devices that use relays or electromagnets.

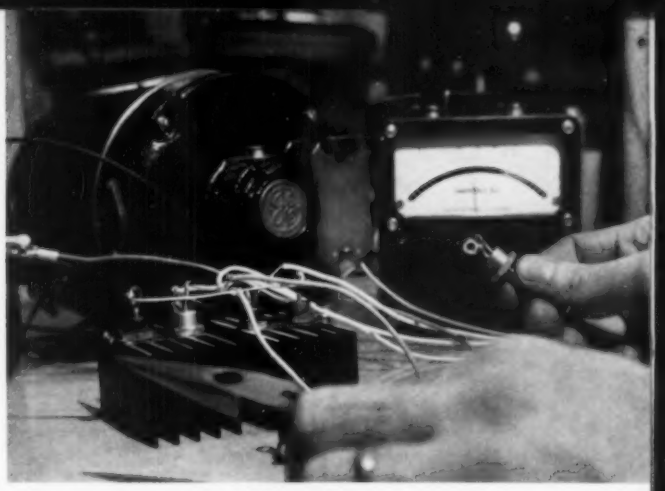
Since it is possible to supply electricity as either dc or ac from the power generating stations, the question is why are these machines not fed dc directly? The answer is twofold:

1) It is more economical to generate electrical energy at locations where coal, cooling water or water power is available in large quantities and to transmit it as ac rather than to generate small quantities of dc current at the actual locations where the energy is needed.

2) It is necessary to give equipment exactly the amount of strength (voltage and current) it needs and this is done by introducing a transformer between the supply line and the equipment. But transformers will only work on ac current. Consequently, for equipment requiring dc it is simplest to convert the available ac to dc; and this is largely done by means of converting devices such as rectifiers.

The old and the new

Two earlier types of rectifier components that have been widely used—selenium and copper oxide—actually belong to the semiconductor family, but the efficiency and current density of these two materials is far below those of silicon, which means that their heat dissipation is greater, and that much larger areas of material are needed for a given current. Selenium rectifiers (see page 68) consist of slabs of the non-metallic material, each slab capable of handling a certain amount of power. By varying these slabs in size and by using stacks of them, the rectifiers can be designed for both communication circuitry as well as industrial power applications. Copper oxide units can usually handle similar ratings but they cannot operate at the same temperature levels as selenium. From the point of view of component structure, the advantages of the new silicon units are very evident. They are not only "pea-size" by comparison, they remain relatively small even for large power installations,



To run dc motors needed in military equipment, or in such industrial operations as welding, ac supply must be converted. Rectifier's action on a motor is tested at GE.

GE's silicon controlled rectifier not only changes ac to dc, but controls amount of current fed into circuit. This new 50 amp unit is 2 inches high, weighs three ounces.

GE's germanium rectifier unit below replaces selenium rectifiers in tv sets. Germanium is used in applications where low current is needed at low temperatures.

and can easily be replaced in case of circuit breakdown. Silicon rectifiers are not likely to fade out—the life-span of the material is almost unlimited. But there is one major disadvantage of silicon components which the older units do not have: they cannot handle momentary overloads. Both selenium and copper oxide components have much more gradual breakdown characteristics than silicon, and can tolerate higher currents than their ratings actually specify without component failure.

In certain industrial applications it is not only necessary to change the current but also to control the amount of current that flows in a circuit. This type of control is needed largely in electric power circuits: switches for line regulators, dc motor control, automatic temperature control, motor speed control, light dimmers for theatres, etc. There are several ways to provide controlled dc from ac. Until recently gas thyratron tubes were the most popular. But these tubes consume a good deal of power because they contain heated filaments, heat up surrounding areas, and have a limited life-span. To keep them going in a circuit requires a good deal of maintenance. The thyratron is now also being replaced by a solid-state device, the silicon controlled rectifier, which is more complex than the ordinary silicon unit but offers similar advantages in circuit applications.

To make silicon rectifiers, material must be ultra-pure so that amounts of impurity that must be added for rectifying action can be controlled. At Raytheon silicon crystals are "grown" by immersing a silicon-tipped rod and slowly pulling it out.

The silicon controlled rectifier

The new circuit control element is, in fact, a combination of the transistor and a regular rectifier. Like a transistor, it acts as an electric valve to control the amount of current, and, like a rectifier, it permits current to flow in one direction only. The solid-state controlled rectifier, like the transistor, resulted from research at Bell Laboratories. Bell developed it as a switching device that could replace a telephone exchange component (the latching relay), and—to give the device a generic identity—called it the Thyristor. RCA also developed a similar unit for small power applications using germanium as its "action" element, but it was General Electric that introduced the new control principle into circuits for heavy power conversion and control.

Depending on size and amount of units needed, the silicon controlled rectifiers will function in circuits with power requirements that range from low to very high. The unit shown in the middle of the opposite page is a developmental sample of GE's 50-ampere unit now on the market for atomic submarines, missiles, jet planes, tv theatre lighting panels and other applications in similar power ranges.

Rectifier action

The rectifying ability of the silicon unit, like that of the vacuum tube, is inherent in its nature—its "inner" action. Direct current is drawn from the tube because of its ability to pass electrons from cathode to anode but not in the reverse direction. The action in the solid-state unit is similar, although the way in which it occurs differs. In any silicon units electrons move through a purified crystal of the material. In the regular solid rectifiers a junction is used between two thin slabs of the crystal. One slab has extra electrons imparted to it by tiny, extremely precise quantities of an impurity. The other slab has "holes" (a deficiency of electrons) produced by an addition of a different kind of impurity. When a voltage is applied across the two slabs, electrons and "holes" distribute themselves in such a way that current can flow across the slabs in one direction only (the junction prevents reverse flow), and direct current is the result. The regular silicon unit is a two-lead component (see page 68 for "pigtail" and stud-mount devices); the silicon controlled rectifier has an additional lead (see middle picture opposite page) through which is fed the tiny amount of current that starts the rectifier action and "fires" the circuit.

Rectifier manufacture

Production methods for manufacturing the regular silicon units are much simpler than those for the controlled rectifiers. After the pure crystal is "grown" (see above), it is sawed into thin slabs and "diced" to produce the tiny slivers used in the components. The slabs are etched to clean them, and two metal electrodes are attached. While regular silicon rectifier units contain two slabs, a controlled rectifier is made up of four slabs of silicon, and perfect aligning of these areas, as well as perfect distribution of the impurities, make for some tough production problems.

Methods of manufacture do not differ much whether the units are designed to handle less than one amp or hundreds of amps. But production techniques have by no means been perfected. To take the bulk out of the conventional rectifier, it was first of all imperative to find the materials that could do a better job. With this accomplished, further miniaturization and product diversity may result if and when experience provides improved production methods.

ARTHUR GREGOR

Novelty exhibits at IRE show included a demonstration by Martin Company of man in full pressure suit and proper chair for space flight, and Cubic Corporation's voltmeter with vocameter attachment which "voices" volt readings shown on voltmeter; tape in front of meter (above) stores recorded readings. Emerson & Cuming, Inc. introduced a new dielectric material, Eccospheres (left), made up of hollow glass microspheres, to improve insulating properties of plastics, rubber. One of the largest products shown was shakers and control console (below) by Ling Electronics Inc., which can create powerful vibrations for noise and sine wave vibration testing.

IRE SHOW:

The four-day run of the 47th annual Institute of Radio Engineers show at the New York Coliseum was largely a display of salesmanship. About 950 manufacturers of electronic components, metering and production equipment convened again to exhibit their wares, answer questions and collect customers. In the sales-consciousness of the exhibit the show merely continued along lines indicated in previous years, when product innovations and an almost exclusive stress on engineeringship were beginning to be replaced by well defined and often handsomely developed attention to product promotion. A trend increasingly evident at this year's show was the entertainment companies provided outside exhibition grounds. A good percentage of show participants accommodated prospective buyers and genuinely interested onlookers in hospitality suites set up in hotels throughout the midtown area where cocktails were served, specific inquiries were handled, and orders were taken. Although this gesture was particularly designed to make a good impression and chalk up sales, it also served to eliminate confusion created by the exhibitions. Product displays at the show were so strongly geared to advertise immediate improvements that it was not always easy to relate the product to a larger area of technology or even to know exactly what it does or how it does it. And the show's attendance of about 60,000 visitors did not give representatives sufficient time for lengthy explanations. These were handled at the Waldorf and elsewhere.

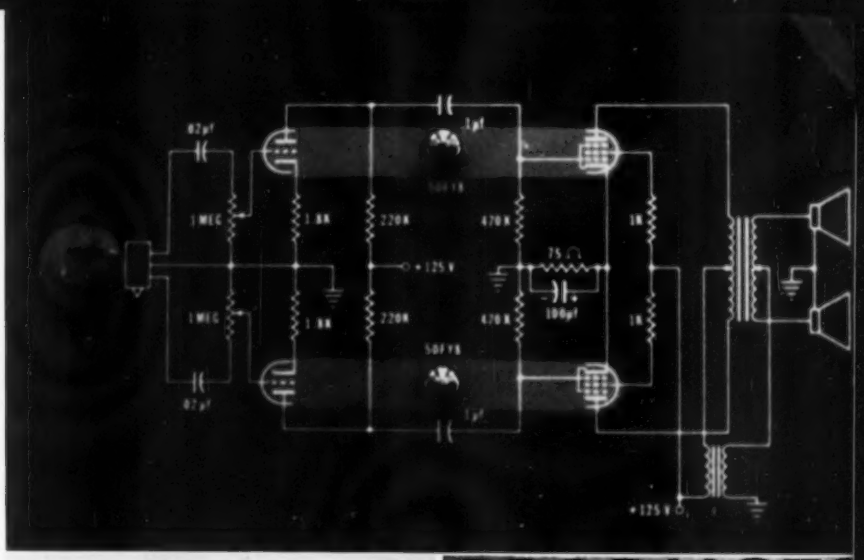
The key to much of the sales-pitch was *reliability*. The very professionalism of the show itself, as a market, tended to lessen the buyer's doubts of product performance and ease his fears of product breakdown, and the relative product safety of which he became convinced was generally justified. An industry that is competitive and increasingly market-conscious cannot tolerate loopholes.

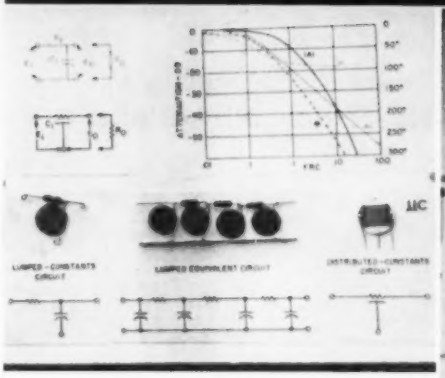
The electronics industry has come a long way from the days when it used to

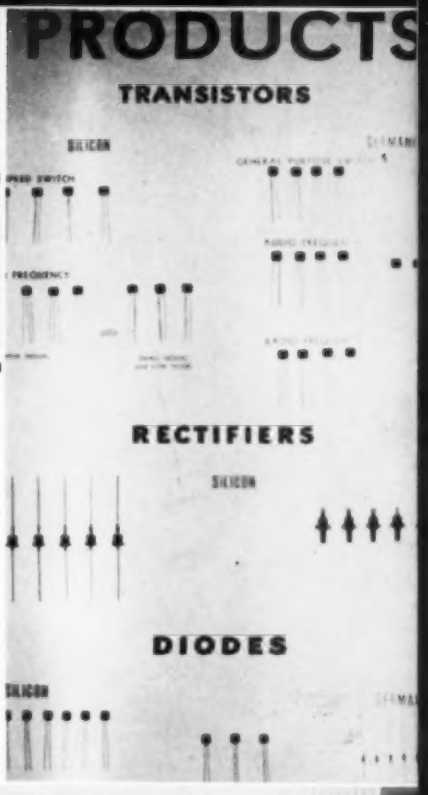
Sales more than news

convene at the Kingsbridge Armory in the Bronx, or the Grand Central Palace in Manhattan. Those were the days when visitors were rendered "speechless" as they gathered around booths demonstrating a tube that could "see" or a complex mechanism that could solve equations. It was not reliability that was promoted in those days but a feeling that new grounds were being broken. Reliability in product performance is of course desirable and should be perfected as far as possible, but has technology ceased to create marvels? Certainly not. The question is: why have the more creative aspects of engineering been less sharply indicated at this year's show than the marketable wares? Is there not room for both at an exhibit that aims to cover the full range of an industry? There were, of course, a great many papers delivered at technical sessions on topics as esoteric as the Perceptron, intricate computer performance, etc. But the line drawn between the promotable products and developments still in the laboratories was so sharp as to take the latter completely out of view.

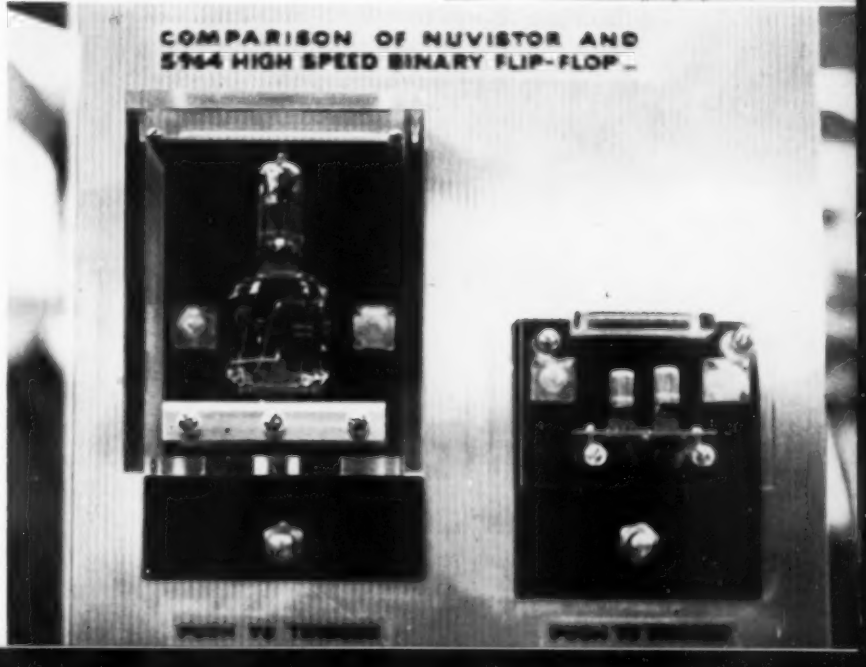
Among the products shown on the four floors (these were divided into exhibiting 1—systems, 2—components, 3—instruments, 4—production) the trends that were indicated were continuations of familiar developments. Miniaturization of tubes (RCA's Nuvistor, bottom right), circuitry (glob circuits, at right) and resulting equipment and mechanisms was the emphasis at many booths. Large companies like General Electric, Texas Instruments, Raytheon and others displayed their recent advances in semiconductors and solid state devices instrumental in making circuitry smaller and cooler. GE's new controlled silicon rectifier (see article on page 68) promises to do to some electric equipment (dc motor installations, lighting control) what the transistor has done to radio and tv. Some of the products illustrating these and other trends are shown on these pages.—*A. G.*







Circuit simplification and miniaturization were much in evidence. CBS laboratories revealed a circuit (top) for stereo recorder that can handle two sound tracks with only one amplifier as a result of newly developed tubes and cartridge; single amplifier will reduce cost of home stereo sets. Varo Manufacturing demonstrated a new trend in circuit micro-miniaturization. Thin films of magnetic and other electrical materials are deposited to form a glob (above) that can carry out such functions as amplifying and oscillating. Further advances in smaller electronic packages were indicated by stress on solid state components (right) and RCA's new miniature tube, the Nuvistor (below), a tetrode or beam power tube.



Both details shown here belong to everyday, utilitarian objects that haven't changed their forms significantly almost since the beginning of their histories. And both details are classic in that they occur in the classic place for details: the joining of two dissimilar materials. They exemplify the best in joints, because they achieve their purpose by using properties inherent in the materials rather than external joining agents.

Dishmops have not changed their shapes since Mrs. Noah shredded the end of a twig to get the post-diluvian mud out of her dinner-plates. The biggest improvement since then has been the substitution of a hank of string for the shredded end. Hair brushes have been similarly behindhand in changing: bristles made of animal hair were laboriously stuck into holes in a wooden back. Even the advent of plastics meant not a change but an imitation: hairlike bristles were made and stuck into holes in a plastic back.

SPRINGY SPONGE, PIERCED POLYSTYRENE UNIFY STRUCTURE AND JOINING DETAIL

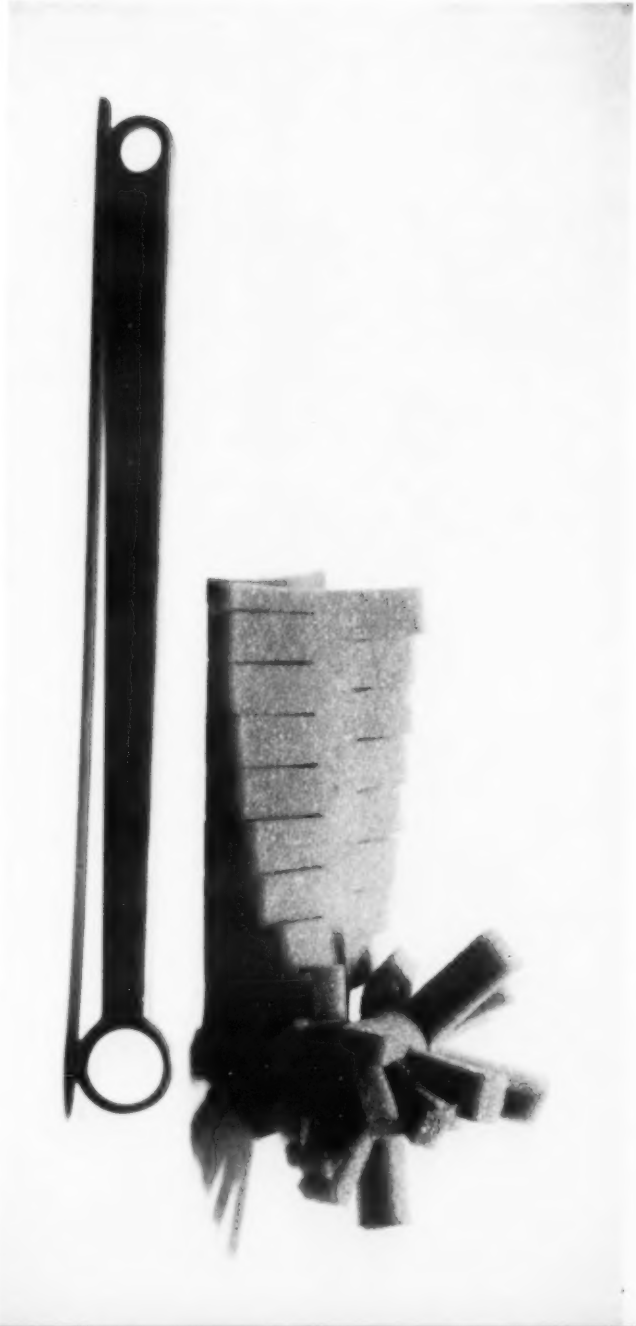
The dishmop shown in successive stages of assembly at the right is an anonymous, almost autochthonous, design; its earliest recorded moments were as a subject for discussion two years ago at a manufacturer's "new items" meeting, where members of the sales, engineering and advertising departments plan the next year's line.

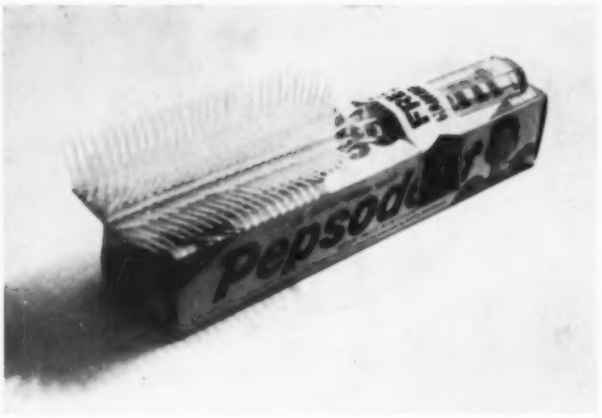
Empire Brushes' "Kitchen Puff" is a departure from the miniature yacht mop—the stick with a hank of cotton tied to the end of it. A polyurethane sponge, ¼-inch thick, 3⅜-inches wide, and 11-inches long, is cut into a double fringe, rolled up and inserted in a hole in the end of a injection-molded polystyrene wand. The elastic properties of the polyurethane cause it to try to unroll, but the ring restrains it. The outside edges of the sponge spring out, giving the mop the appearance of a soft porcupine, and providing a large surface area for holding lather. Both materials used are simple, and easily formed into a detail which, once seen, appears to be the most obvious solution to the problem. Yet one of the essential qualities of good detailing is inevitability: the impression that materials themselves are treated in the way they logically want to be and not just handled arbitrarily.

The top photograph at the right shows the two parts of the mop in disassembled state. In the middle the sponge is partially rolled. At bottom the mop is assembled.

Manufacturer: *Empire Brushes, Inc. Portchester, N. Y.*
Supplier: *Polyurethane foam, Nopco Chemical Co. North Arlington, N. J.*
Fabricater: *Super Household Products, Brooklyn, N. Y.*

J. S. Ward





BRISTLES AND BACK OF A TWO-PART HAIRBRUSH EXPLOIT ELASTICITY OF POLYETHYLENE, RIGIDITY OF POLYSTYRENE

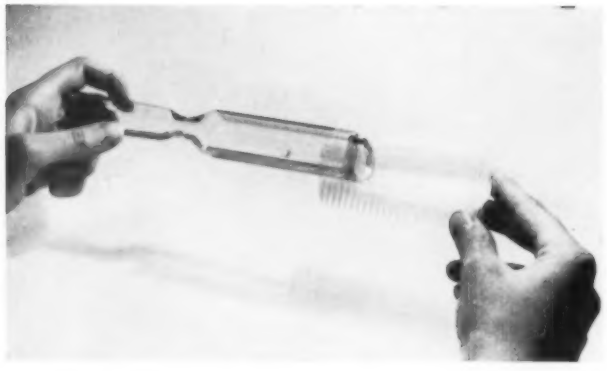
Plastics are such protean materials that using them in a way that exploits their unique qualities rather than their capacity to imitate wood or metal or cloth is as difficult as holding on to the old man of the sea. It has sometimes seemed natural to fabricate plastics along the lines of older methods of construction, designed for other materials and used out of an understandable desire to retain the prestige connotations attached to materials like wood and leather.

At right is an example of a design specifically for plastic, although some of its elements have been used in articles made of other materials. The hairbrush designed by Leger Salvy of Oyonnax, France, consists of two parts: brush and handle, held together by an integral system of interlocking profiled shapes.

The idea of joining materials to make a brush this way dates back (in this country at least) to 1877, when a man named Vannice patented a blackboard eraser in which a felt rubber wrapped around a T-shaped tenon was held in place by the pressure of a T-mortised handle. This and other similar designs relied on some kind of externally produced pressure, however, to keep the joint firm: a bolt with a mushroom shaped head is used in a 1913 scalp massager, for instance, to hold a rubber brush to a handle.

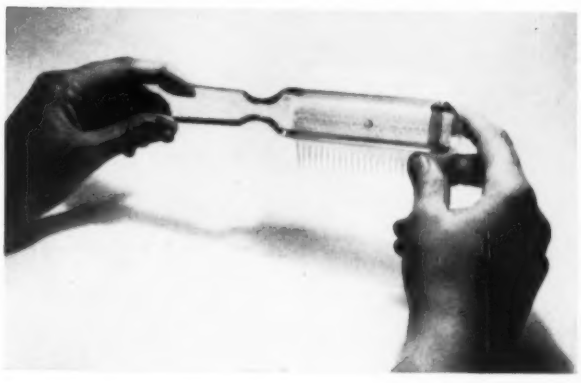
In the Salvy brush, the bristles and their backing are injection molded of polyethylene with an L-shaped flange at either side of the backing. The handle is also injection molded, of polystyrene, with grooves that accept the flanges on the brush. The photograph at the top of the opposite page shows how the two elements are joined. The strain put on the brush element by being curved to fit the handle holds it in place.

The brush was recently released in this country as a premium with a tube of toothpaste (see above, left). According to the maker, it has had considerable success in foreign countries.



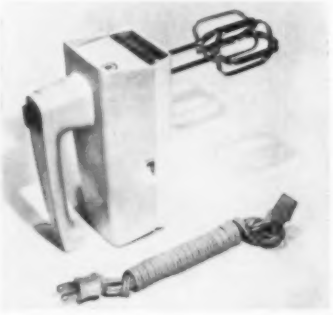
Manufacturer: *Dent and Vallis, Inc. Buffalo, N. Y.*
Suppliers: *Polystyrene, Monsanto Chemical Co., New York, N. Y.*
Polyethylene, DuPont Co. Wilmington, Del.

All photos: J. S. Ward

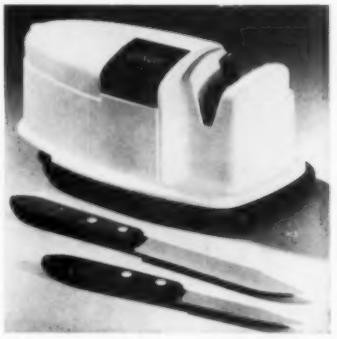


DESIGN REVIEW

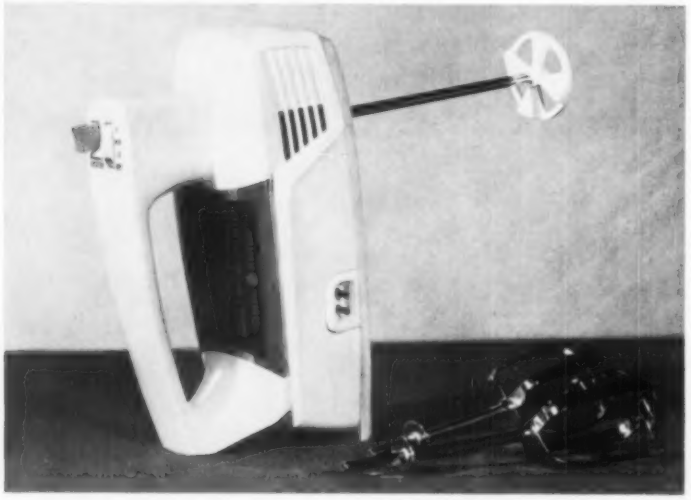
Electric kitchen tools, like larger kitchen appliances, have adopted the pushbutton in place of knobs, dials, and levers. Where there are selective operations, changes in color or shape are frequently used to help the consumer "read" each button's function — a necessary consideration as kitchens become increasingly mechanized. Further steps in mechanization are evidenced by the number of electrically operated accessories — can openers, ice crushers, knife sharpeners.



→ **Westinghouse two-tone** portable mixer in four color choices has dual controls in handle — a switch for three fixed speeds, a button for beater release. High-speed setting provides 1100 rpm for heavy duty mixing. Staff designed; $20 retail.



↑ **Cory electric sharpener** for knives and scissors has guides for proper blade angle. Motor shuts off automatically if too much pressure is applied. Black shield is on-off control. Palma-Knapp design. $16.95.

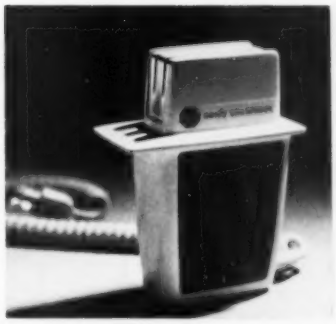


↑ **GE portable mixer,** model M-37, has drink mixer attachment with white nylon plastic foot. Housing is white, yellow, pink, or turquoise with matching detachable cord. Controls for speed and beater release are in handle, and are labeled and color identified (one is red, other is white) for quick visual distinction. Saddle plate has mixing chart. Designers are Paul Rawson, Walter Anderson. $19.95 retail.

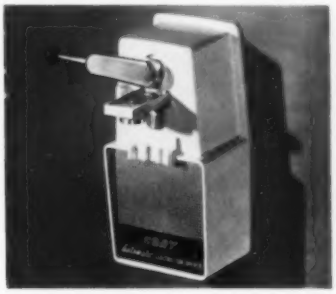
↓ **Electric ice crusher** by Adams-Pelouse has whirling, retractable blades, deposits cracked ice in removable base tray. Weight 4¼ lbs. Designer, Joseph Mango. $27.95.

↓ **Nutone Food Center** has added a sixth attachment, a vegetable shredder-slicer unit consisting of three stainless steel cutting plates, a white melamine bowl with clamp-on cover and pusher, and a turntable spindle which locks into power well. Two cutting plates are for thick and thin slicing, third is for shredding. Price of unit, $13.95.

→ **Burgess Vibrocrafters** knife sharpener is designed to be held in the hand. Vibrating motor operates conical carborundum stone to provide honing action. Two-piece housing is ivory melamine with contrasting side panels in brown. Extended lip is safety feature. Blade guide is chrome. Designed by Dave Chapman, Inc. $11.95.



↑ **Knapp-Monarch ice-crusher** fits on power unit of any K-M liquidizer, grinds ice fine or coarse. Housing and pusher are gray plastic, blades are stainless steel. Ice is ejected from spout. Designers are Walter Moore & Associates. $14.95.



↑ **Cory electric can opener** has wall-mount bracket, is exception to push-button rule. Lever pulls down to lock can in place, puncture top, start motor. Housing is white polystyrene with black and gold face plate. Palma-Knapp design. $29.95.

Cooking utensils powered by electricity tend to be specialized to the point of doing a single job — for example cooking hot dogs. Internal improvements include sealed-in heating elements that allow appliances to go into dishpan, and a percolator water pump activated by a heating unit that has no moving parts. Externally, the handle is the chief concern. On both electric and non-electric models, it has improved insulating properties — although the potholder has not yet been made obsolete.

↑ **Westinghouse Dog-O-Matic,** to be marketed this summer, skewers six hot dogs between electrodes, cooks them from inside out in 90 seconds. Current is released when lid is closed. Bottom is immersible. $9.95.

↑ **Westinghouse immersible** line, five units in all, has cast-in heating element, detachable control. Open phenolic plastic handle stays cool; long-handled style has cooking chart set into end. Fry pans are silicone-coated to prevent sticking.

↑ **Mirro aluminum** Comet cookware, bottom of line, now offers choice of handle style. In addition to standard metal version, it also comes with replaceable black plastic handles molded in hand-grip contours.

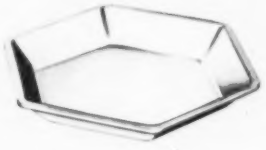
↑ **Spice set by Plastray** is composed of eight Bakelite polyethylene shaker-top containers stamped with names of commonly used seasonings. Bases come in six color choices with white tops and lettering.

← **Cornwall Cattlebrand** Thermo Tray uses lightweight, unbreakable heating element designed by Francis Brown, Jr. Tray surface pattern, by Rhea Simons, is Parkwood plastic laminate with gold anodized aluminum frame, walnut handles. Three sizes; 9 by 12-inch, $4.95.

↑ **Knapp-Monarch** corn popper has oven-proof glass top so progress can be watched, but current turns off automatically when corn is popped. Handles are heat-proof, measuring cup is included.

↑ **Westinghouse automatic** percolator eliminates difficult-to-clean spout, substitutes a molded guide in lid which directs coffee over a flange edge into cup. Also new is water pump without moving parts. $17.95.

↑ **Knapp-Monarch** miniature table oven has footed drawer-front for balance, dial settings from 200° to 400° F., cooking temperature chart. Casserole pan is included. Designers, Walter Moore & Associates.



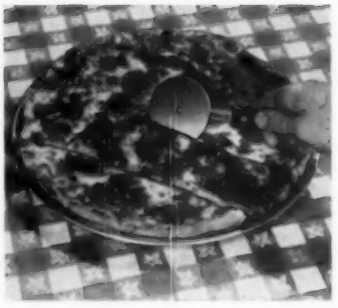
↑ **Mirro "Even Steven"** pie pan has a hexagon shape so that pie can be cut into six uniform pieces. It is made of stain-resistant Alumilite, corresponds in size to standard 9-inch round pan. Approximately $1.

← **Duralux** aluminum percolator has black Bakelite handle and knob, white dial control, red pilot light. Modified tapered silhouette leaves wide top for cleaning. Lippincott & Margulies, designers. $29.95.

Hand tools concentrate on refinements of shape or structure that make for ease of use or care. Plastics have become sturdy enough to use in ladles and basting spoons; cutlery turns up with a self-maintaining edge that cuts down the knife-sharpening chore; a familiar tool set appears in a new small size for use with small-scale cooking utensils. One of the few functionally new hand tools is a revolving knife that copes with the tricky business of cutting a pizza pie.

↑ **Dapol Plastics** kitchen tools, basting spoon, vegetable spoon, and ladle, are molded of Bakelite high-density polyethylene to withstand hot fat, hot dishwater, and detergents. In red, yellow, or ivory.

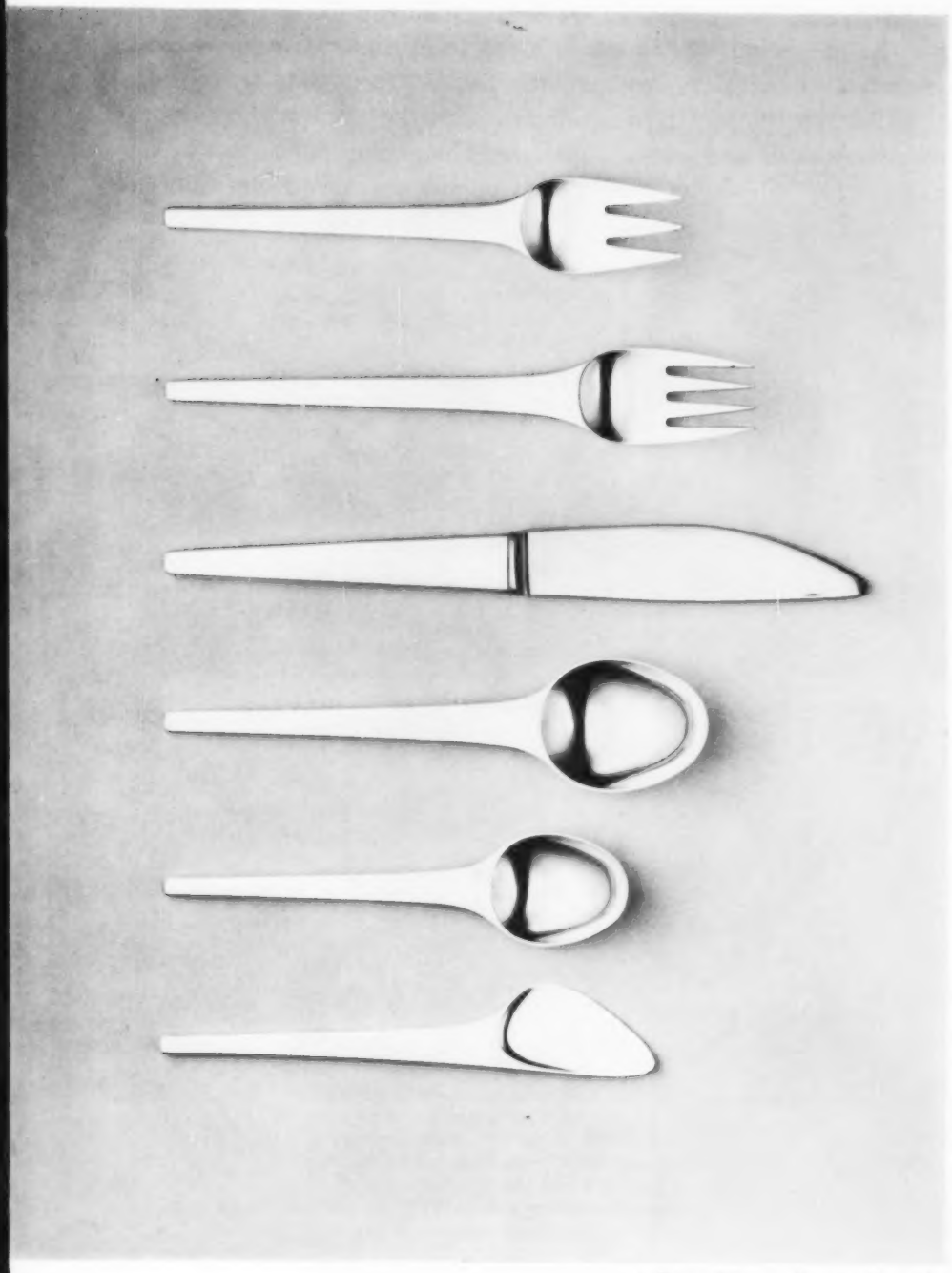
↑ **Vegetable brush** from a new line for National Brush by designer Jon W. Hauser has a plastic handle molded in one piece with an integrated hanger positioned off center.



↑ **Ekco pizza pie** cutter has revolving cutting wheel that rolls through sticky cheese; it can also be used for pastries, candies. Cutting wheel is stainless steel, handle is black Bakelite. Retail, 89 cents.

↑ **Robeson "Flame Edge"** cutlery has a thin layer of tungsten carbide fused to one side of steel blade. As steel wears, more tungsten carbide is exposed, so that knife sharpens in use. Staff design, Jerome Moberg.

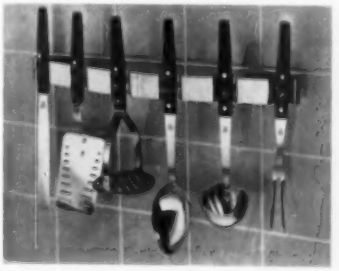
↓ **Japanese tool set** in stainless steel, imported by Scientific Silver Service, has air-cooled hollow handles. Fork, spoon, and spatula are one-piece construction. Rack with clamps is included. $14.95.



↑ **Caravel**, new silver pattern designed by sculptor Henning Koppel for Georg Jensen, tapers flat, slender handles into deeply scooped ovoid shapes of spoons and forks; crisp curve defines two elements. Butter knife is a diminutive spatula. Six-piece place setting, $79. Other pieces in group include pastry server, salad set (silver handles with black thermoplastic bowls), gravy ladle, meat fork, serving spoon.

↑ **Personalized paring knives** by Ekco offer seven variations in handle and blade shapes to suit all tastes. Left to right, Stubby, Scalpel, Spear Point, French, Sheepstoe, Clipper, Hawksbill. Each, 59 cents.

↓ **Flint "tools for two"** by Ekco, a scaled-down version of Flint "2000" line, is designed for use with small size cookware and/or small-family housekeeping. Snap-on wall bracket also duplicates larger set. $12.95.



Larger cleaning appliances tend to be more obviously self-propelling. This year's models ride on big wheels which gives them a cart-like appearance normally associated with industrial equipment. Their attachments travel with them in integral tool racks, possibly the best solution yet to the problem of transporting them. Smaller cleaning chores get some specialized help: a sponge rubber broom to be used wet or dry; an upholstery cleaner that applies shampoo from a plastic squeeze-bottle through a screw-on, miniature "vacuum cleaner" head.

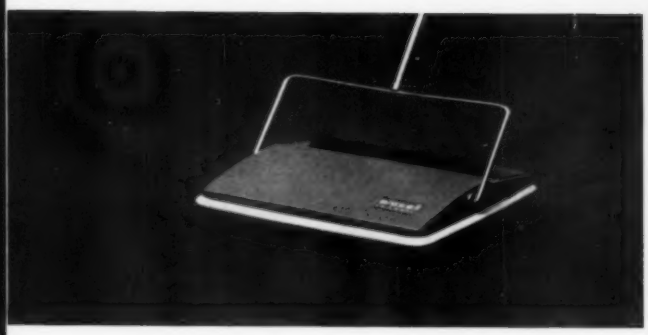
↑ **Stepladder with** stability, made by Howard B. Rich, Inc., has extra wide center step, knee-bar brace to lean against. Made of aluminum, it folds flat, will take roll-on paint trays. In 4, 5, 6-foot heights.

↓ **Hand vacuum cleaner** from Italy by Lesa comes with brush, also nozzle attachment that fits into base. In two versions: Kleenette, for home use, 110 volt motor, $14.95; Kleecar, for car, 12 volt, $15.95.

↑ **Bissell upholstery** cleaner combines squeeze bottle with screw-on chrome-plated head. Scrubbing surface is foam rubber pad ringed with Saran bristles. Design, Harley Earl. Kit with shampoo, $2.49.

↓**Biddie Broom by** Wells Specialty is meant for sweeping but can also be used as a mop. Handle and sponge rubber pad are color-matched; contrasting head is ivory polyethylene. Design by Good Design Associates.

↓ **Johnson floor** scrubbing and waxing machine now comes in a convertible model which includes rug cleaning attachment: a plastic bristle brush. Case is light blue with white bumper. Designed by Walter Dorwin Teague Associates. Price, with wax, cleaning powder, $59.90.

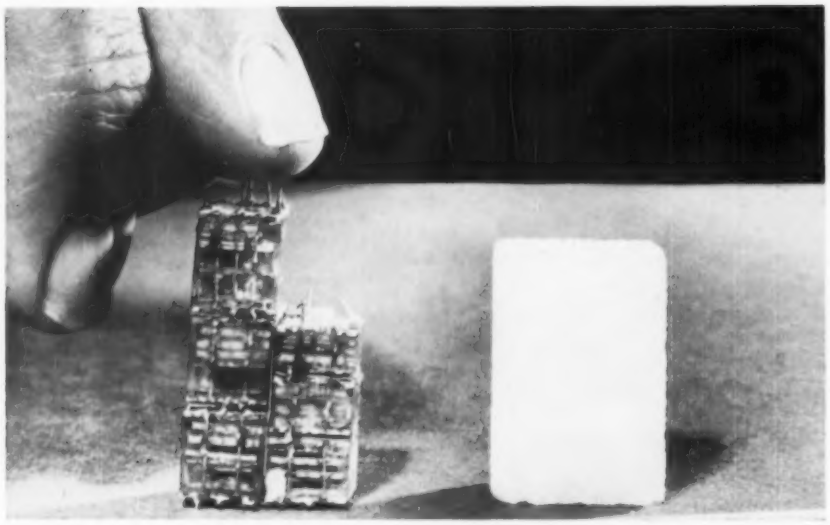


↑ **Bissell "Classic" sweeper** has case of triple-plated chrome combined with leather-grain vinyl. Sectional handle ends in curved top with plastic hand grip. Designed by Harley Earl. Retail, $23.95.

↓ **Lewyt vacuum cleaner** which it calls electronic has motorized brush attachment which rotates at 5000 rpm. Motor also operates headlight. Cleaner is green and sand with gold trim. $119.95, retail.

↑ **Westinghouse** mobile vacuum cleaner rolls on non-marking vinyl-tired wheels, can also stand on end. Attachments travel piggyback in Tool Caddy; cord wraps on brackets at rear for storage. Hose is flexible vinyl; fingertip control at top of wand regulates suction.

TECHNICS *a catalog of new products, materials processes and finishes*



Minute radio, tv components

A tremendous step forward in the march toward miniaturization has been made with the invention of "micro-elements." These little units are flakes of ceramic conducting, semi-conducting or insulating materials 0.3 inch on a side and 0.01 inch thick, each of which contains some element of an electronic circuit. Radio Corporation of America, their developer, sees them as being used in the broadest possible range of electronic subassemblies and equipments. Some idea of their size can be gained from the photograph above, showing a six-transistor radio the size of a sugar cube.

The genesis of the program that led to micro-modules (cubes made of a number of micro-elements) was the need for smaller parts for military electronic applications. As warfare becomes more complicated, more dependent on mechanical aids, so these aids become more complex, and where the fighter pilot of the first world war could lean out of his plane with a pistol to shoot down an enemy, his counterpart today, flying eight times as fast and attempting to hit something flying equally fast, must use a computer to determine his and his target's relative positions and speeds. There is very little room for the bulky machinery necessary, and smaller components are a must.

The transistor and the solder-dipped printed circuit, which came into use about 1950, and the roughly contemporaneous idea of modular assemblies, brought miniaturization to its present plateau of 50,000 to 60,000 components per cubic foot, which is about as small as components can get. What was needed was an entirely new approach on the component and materials level. Some work had been done on small, flat parts, occupying very little space, whose value ranges included almost all those required for the design of transistor circuits. There was still a need, however, to incorporate these small units into a three dimensional system of electronic equipment construction. And at this point the idea of the micro-module was born.

All parts—transistors, capacitors, resistors, coils, etc.—were designed to be incorporated in the ceramic squares of the micro-element. A capacitor can be made by using the basic square as the dielectric, applying the plates to either side of it. The range of capacities can be extended by increasing the number of layers in the sandwich. Similar methods can be applied to other parts. Some of the micro-elements can do the work of several conventional parts, since combinations can be included in one element. The basic squares are then lined up to form the micro-module. Although the micro-modules was developed as an inclusive system (that is, their designers envisioned electronics set-ups composed completely of micro-modules) they are compatible with presently used parts and components. For example, a micro-module filter circuit can be inserted in a piece of conventional equipment.

The most obvious advantage of the micro-module system is reduction in size of components themselves, but just as important is the fact that the supporting structures of the components can be eliminated, in many cases, and at least made considerably less bulky, thus contributing to volumetric efficiency in packaging. In a satellite, for instance, where more than anywhere else space is at a premium, the use of micro-modules would not only allow more kinds of equipment to be included, but also allow duplicates of assemblies to be carried so that greater reliability would be possible.

Although they were developed primarily for military use, micro-modules are expected to have an influence on consumer goods in the future. A five-transistor superheterodyne radio the size of a fountain pen has already been made (see photo above), and a very small television set, its surface determined by the size of its picture tube, with all its components in a frame around it, is projected. In addition to these, miniature record players and dictation machines, whose electronic parts could fit into a pocket or small purse, are envisioned. Button-sized batteries, already developed, would supply the electrical power for them. Such consumer equipment is far from commercial production now, but work already done on military items can be taken over wholesale for application to electronic home products. Source: Radio Corporation of America, Camden, New Jersey.

Radiation changes fluorocarbons

What is described as the first commercially important use of the technique of radiation grafting with Cobalt-60 has apparently successfully added bondability and surface-dye-acceptability to the fluorocarbon polymers (of which Teflon and Kel-F are the best known) at costs lower than those of conventional modification methods.

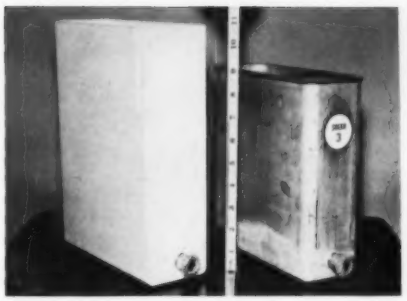
Fluorocarbons are tough, corrosion- and temperature-resistant, and possessed of a waxy surface to which almost nothing will adhere. Some of them are self-lubricating. They are widely used as insulation for electrical conductors and electronic com-

ponents, as gland packings, gaskets, pipe and hose liners, bearings, seals, and valve seats and discs.

Up to now the only way to color fluorocarbons has been to mix pigment with the plastic granules when the plastic is being shaped, except for Teflon. The new technique is not only less expensive than coloring while mixing, but allows more colors to be used, at the same time obviating the necessity of large inventories of colored fluorocarbons. Source: Radiation Applications, Inc., New York, N. Y.

Use of acrylic reduces costs

Molded acrylic canisters as replacements for stainless steel have saved a vending machine company 75 per cent of the cost per canister while increasing capacity 20 per cent. The steel canisters were used as containers for powdered ingredients in hot beverage vending machines. They were

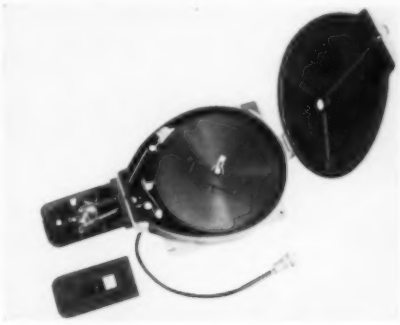


drawn from flat blanks in six operations, with an annealing step between each draw. The plastic containers are injection molded at one-quarter the cost, and molds for the process cost less than one-third the price of dies. The new canisters are 11 inches high, two inches taller than the old, a size that could not be achieved economically with drawn steel. Source: Rohm and Haas Company, Philadelphia, Pennsylvania.

Magazine holds 800 feet of film

The new model M-3 Multidata magazine, capable of holding up to 800 feet of 16mm film, is designed to be used with two cameras manufactured by Flight Research, Inc., models III and III-B. Separate feed and take-up drive systems permit cameras to operate freely without the inertial drag of a large reel of film, and allow them to be used for single-frame or motion picture operation at speeds up to 40 frames per second.

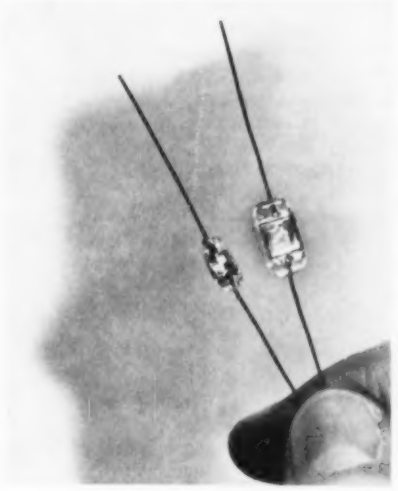
Mounting both feed and take-up reels on the same shaft permits the magazine to be little larger than a single 800-foot roll of film. The magazine is designed for the harsh weather conditions encountered in



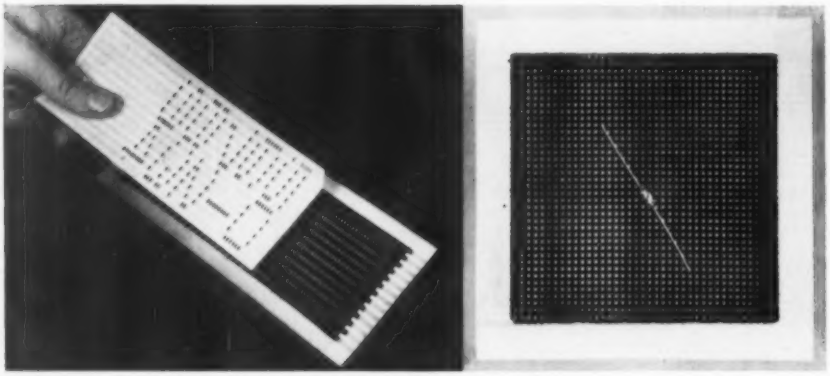
airborne operations, with a thermostatically controlled internal heater for use in low temperatures. An automatic cutoff switch is incorporated to stop the operation of the magazine, and the camera it is used with, at the end of the film supply. Manufacturer: Flight Research, Inc., Box 1-F, Richmond, Virginia.

Fusion-sealed glass capacitor

A glass-enclosed capacitor, the CYF-15, especially designed for use in moist environments, has been put on the market by Corning Glass Works. A new, high-temperature sealing method makes a moisture-proof seal around the edge of the part, and a lead of specially developed copperclad nickel-iron alloy makes possible a true glass-to-metal seal between lead and capacitor body, the manufacturer



says. The seal also anchors the lead to the body, permitting the capacitor to receive very rough treatment without breaking. In a demonstration test, sample capacitors have undergone boiling in salt water for more than 500 hours without appreciable change in performance. The CYF-15 has a range up to 510 micro-microfarads at 500 dc volts, and up to 1,200 micro-microfarads at 300 dc volts. These working voltages apply at temperatures up to 125° C. Manufacturer: Corning Glass Works, Corning, New York.



Photorectifiers replace diode arrays

A new device, called a photorectifier, which simplifies the arrangement and modification of diodes in an electronic brain, may have far-reaching effects in computer design. Logical networks, the "synapses" of electronic brains, are composed mainly of arrangements of diodes, and the complexity of the problem a computer can solve is directly proportional to the number of diodes in its "head". The conventional semi-conductor diodes presently used in most computers require time-consuming soldering and placing operations to be installed. In addition, they are relatively inflexible as regards modifying the network that they are parts of; complicated switching set-ups being necessary for any changes.

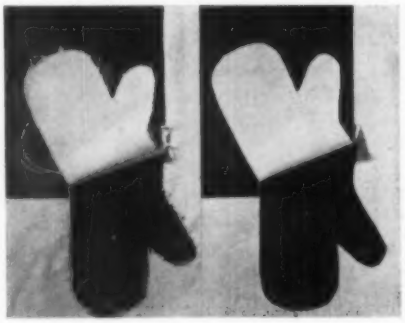
The photorectifier, a sintered cadmium sulphide cell sandwiched between a transparent conductor and a rectifying conductor, displays the following characteristics: under illumination it is a diode with a rectification ratio of about 1,000 (this means that it is a thousand times easier for current to flow through it one way than the other); in the dark it is virtually an open circuit.

Photorectifiers can be arranged in arrays in X-Y matrices (see photo), with densities as great as 256 per square inch. An X-Y matrix is best represented by a sheet of quadrille paper. If numbers are written across the top in each square, and a similar set down one side, any square can be exclusively identified by a pair of numbers, as 3 down and 4 across. In similar fashion, the transparent conductors can connect photorectifier cells in horizontal (X) lines, and the rectifying conductors connect them in vertical (Y) lines. In this way there can be no confusion or short circuits.

Because of their great possible density (a photorectifier cell is roughly one-third the size of a semiconductor diode), a small array of photorectifier cells can replace a large lattice of conventional diodes, and their unique quality of acting as an open circuit in the dark makes it possible to withdraw them from a circuit merely by darkening them, so that a programmer can change functions in a computer by changing masks over an array. This allows a single computer to perform a great number of operations. For instance, a computer designed for production control work can be adapted to inventory control without an expensive change of array; and general-purpose computers can be used for such specialized functions as mathematical table storage and language translation. These applications have been theoretically possible before, but putting them into operation was too costly, involved too bulky apparatus, or was impractical for other reasons. Manufacturer: The Rex Corporation, West Acton, Mass.

Fluid colors for polyesters

Pigments for coloring polyester resins are available in liquid form, eliminating agglomeration and filtering out of pigment, common where color pastes are used. Pigments come in 10 colors: black, orange, blue, gray, green, brown, red, turquoise, yellow and white. Manufacturer: Sherwin-Williams Company, Cleveland 1, Ohio.



Non-fraying asbestos cloth

A new asbestos safety cloth, said to be non-fraying along cut edges, lint-free, and to have greater abrasion resistance than plain asbestos cloth, has recently been developed. It has the thermal insulating qualities of plain asbestos cloth and is available in standard widths of 36 and 40 inches. Special orders can also be filled in widths up to 60 inches. It weighs about 2½ pounds per square yard. Manufacturer: Union Asbestos and Rubber Co., Fibrous Products Division, 1111 West Perry Street, Bloomington, Illinois.

All-plastic loudspeaker

The problem of resonance in loudspeaker frames has led to the invention of an epoxy resin basket which, since it is non-magnetic, remains unaffected by the lines of flux emanating from the voice coil. The cone is also of plastic—a rigid tri-polymer

with the look and feel of porcelain. According to the manufacturer, response is from 1 to 20,000 cycles per second without audible resonance, and with considerable fidelity to the natural sound. Manufacturer: Hartley Products Company, 521 East 162 Street, New York 51, New York.

Point-of-sale computer

A computer, designed to operate as an integral part of a cash register which itemizes purchases, has recently been developed. Its purpose is to speed up retailing operations. Since most presently used cash registers can differentiate between only 17 items at most, departmentalization of check-out counters is necessary in self-service department stores. Stopping at many registers impedes a customer's progress through a store, and makes him buy less. The Mastor computer can be attached to any cash register, and can handle up to as many as 500 items; several registers can be hooked up to one Mastor to simplify operations still further.

In addition, transactions stored in the computer's memory can be transferred to a mobile readout computer when the store closes. This means that daily totalling of sales can be done without laborious handwork. Manufacturer: Matronics, Inc., 444 Madison Avenue, New York 22, New York.

Beryllium breakthrough

One of the major obstacles standing in the way of the use of beryllium as a structural material in aircraft, missiles and, for the future, space ships, has been removed by the development of a technique for forging the difficult metal. Beryllium's high strength-to-weight ratio makes it a desirable metal for use in flight vehicles (ID, March, 1959), but its brittleness has prevented it from being worked easily. Previously, rough blocks of the metal, produced under little or no pressure, were laboriously machined into shape. Now, by means of a proprietary technique, powdered beryllium is forged in an inert atmosphere under high pressures into parts that need almost no finishing. Ductility is given to the metal by substituting a random arrangement of its hexagonal crystals (similar to those of magnesium) for its original lattice.

Parts forged in this manner are about as strong as those made of aluminum alloys, and a good deal lighter. It is estimated that using beryllium in place of aluminum for the structural members of a transport plane would effect a weight saving of 50 per cent, which would offset the higher price of beryllium ($80 a pound for powder at present). Much greater savings would occur in rockets. Beryllium Corporation of America says that 400 pounds would be saved by using beryllium in the last stage of a moon rocket, which reduces the necessary fuel load in the third stage by 2,000 pounds. Such a saving would reduce first stage fuel weight by 200,000 pounds. Another advantage of beryllium is in high-temperature applications: its melting point is 2,345° F. while that of aluminum is 1,220° F.

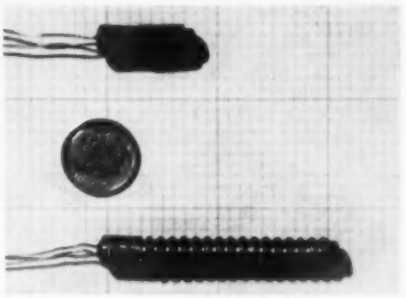
The photograph below shows the first beryllium part ever forged successfully, on the bed of an 18,000-ton forging press. It is part of the nose cone of a missile. Source: Wyman-Gordon Company, Worcester, Massachusetts.

Rigid polyurethane foam

A new class of closed-cell foams with the following qualities: permanent high-level fire resistance, high strength, ability to withstand high temperatures, low thermal conductivity, water resistance and permanence, can be manufactured from polyester resins newly available from the manufacturer: Hooker Chemical Corporation, Niagara Falls, New York.

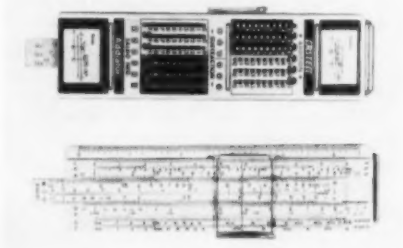
Tubing shrinks under heat

A heat-reactive tubing called "Irvington" brand No. 3024, that shrinks under heat to make a tight electrical insulating cover for smooth or slightly bumpy shapes has been developed recently. The tubing, which comes in continuous lengths, is stretched by a patented process. When a conductor is inserted in the tube and heat is applied, the tubing shrinks to its original dimensions in about five minutes, tightly enclosing the conductor. Manufacturer: Minnesota Mining and Manufacturing Company, Irvington Division, 900 Bush Avenue, St. Paul, Minnesota.



Tiny, one-shot bellows motor

A squib-actuated bellows motor, which provides linear movement for the performance of mechanical work, has been developed by Atlas Powder Company. A miniscule explosive charge is set off by electricity and forces the bellows out to its full length, an increase in size of about 2½ times. The motors have a long shelf-life — it can be measured in years — but it will work only once. It is used to press a button, pierce a diaphragm, or perform a similar operation involving linear movement. It can work around corners. Manufacturer: Atlas Powder Co., Wilmington 99, Del.

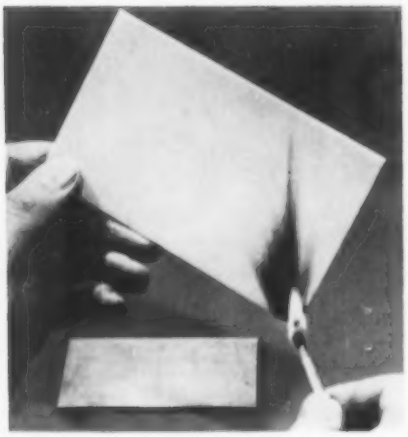


Adding machine-slide rule

A line of slide rules, with the normal calculating scales on one side and an adding machine on the other, is being produced by Faber-Castell. The rules come in four systems: Darmstadt, for physicists, etc.; Rietz, for mechanical and civil engineers; Business, for accountants; and Electroc, for electrical engineers and electricians. Source: Harrison Home Products, 565 5th Avenue, New York, N. Y.

Adhesives for bonding Teflon

Two new adhesives for cementing Teflon to itself or to other materials have been announced. One, Ray-Bond R-86009, is for use where flexibility in the bond is desired; it has good resistance to water and most chemicals. The other, Ray-Bond R-86044, is acid-resistant (except to acetic acid). Both are useable at 250° F. Manufacturer: Raybestos-Manhattan Company, Bridgeport 2, Connecticut.



Flame-retardant laminate

A laminate of cellulose paper and epoxy resin is said to possess unusual flame-retardant properties, remaining rapidly self-extinguishing even after five ignitions. The material, Dilecto XXXP-31EFR, has been developed for use as insulation for computers, radios, telemetering and guidance equipment, and for any application where permanent flame-retardant qualities are needed. It is also very moisture-resistant. Dilecto is very easy to work by cold-punching, and is much lighter than epoxy and glass fabric laminates. Available thicknesses range from 0.015 inch to 0.25 inch, in sheet sizes of 38 by 42 inches and 38 by 38 inches; semi-gloss finish in cream color only. Manufacturer: Continental Diamond Fibre Corp., Newark 107, Del.

Sealed beam projection lamp

Sealed beam lamps, similar to those which have been in use as automobile headlights for some years, are being produced by Westinghouse for use in motion picture and slide projectors. The new lamps produce about as bright a picture as conventional projection bulbs, using about one-quarter the power. Also, the new bulb contains its own optical system, making condensers and reflectors in projectors unnecessary. The sealed-beam construction insures that almost all the light produced is directed at the screen, which is not the case with ordinary projection lamps.

Westinghouse is also experimenting with variations of the lamp for use in display lighting, outdoor signs, accent lighting in houses and garden, and similar applications. It may be a year before the lamps come into use. Manufacturer: Westinghouse Electric Corporation, Lamp Division, Bloomfield, New Jersey.

Plastic coating for steel tubing

An extruded coating of thermoplastic, some 30 times thicker than paint, can be applied to welded carbon steel tubing for decorative effects. Steel tubing is used as a base, because it is strong, relatively cheap and readily available. The plastic coating assures resistance to chipping, rusting and corrosion from salt air, perspiration and mild acids. Almost any color can be applied to the plastic for a variety of decorative effects. The tubing comes in round, oval, rectangular, square, and other special shapes. Source: Formed Steel Tube Institute, Cleveland 15, Ohio.

Straw-colored acrylic

A new acrylic thermoplastic, with a heat-distortion point of 240° F., very tough and stiff, has been developed recently. It can be molded and extruded using conventional acrylic techniques. The natural resin is straw colored and moderately transparent. Although it is not yet available for general distribution, definite interest has been shown in it as material for housings, fasteners, handles and gears, as well as for such consumer items as radios, pens and sporting goods. It is called PL-12. Manufacturer: J. T. Baker Chemical Company, Phillipsburg, New Jersey.

Type R polyvinyl fluoride film

Type R polyvinyl fluoride film is now available in developmental quantities, the Du Pont Company has announced recently. The new transparent film has good weathering qualities, chemical resistance and mechanical strength, which the company predicts will open opportunities for its use outdoors. Manufacturer: E. I. DuPont de Nemours and Co., Wilmington, Del.

Epoxy-based roof decking

Glason, a decking material based on Bakelite epoxy resins, is said to stick better, last longer, resist weather damage better than conventional roof-decking materials. It is applied in a continuous surface in a wide range of colors, and it remains waterproof indefinitely, since its water-resistance does not depend on membrane or other conventional waterproofing mediums, but on its own imperviousness to water. Manufacturer: Twinsburg-Miller Corporation, Twinsburg, Ohio.

Thermoelectric generator

Thermoelectricity—the production of electricity directly from heat—comes a step closer to practicability with a 5-watt generator unit recently made by Minnesota Mining and Manufacturing Company. The generator operates at 6 per cent efficiency, which compares favorably with the efficiencies of a fraction of 1 per cent of previous generators. The new unit is about the size of a one-quart fruit jar, and is designed for use with a radioactive isotope heat source. It will be air cooled; similar units will be cooled by water or by radiation. Other models, to be built during 1959, will include some useful for commercial applications. The generator shown above was designed specifically to provide auxiliary power in space missiles. Their cost will vary, mostly according to size.

Conceivably, generators could produce as little as ½ watt or as much as several thousand watts. The basic principle of the generators has been known since 1823, when the thermocouple was invented (a thermocouple is two dissimilar conductors laid next to each other, which produce an electric current when heated) but it has never been applied on this scale before. Source: Minnesota Mining and Manufacturing Co., St. Paul 6, Minn.

Versatile laminate

Cladplate vinyl, which can be laminated with most metals as well as with plywood, hardboard and asbestos board, comes in a variety of textures: leather, wood grain and simulated cloth finish. A clear, protective coating is applied before embossing to minimize injuries during handling. It resists abrasion, corrosion, heat, humidity, alcohol, etc., very well. Manufacturer: North-East Laminates, Inc., Lowell, Mass.

Manufacturers' Literature Supplement

A bibliography of currently available technical brochures dealing with materials, methods, components, and machines

MATERIALS—METALS

1. **Process Chemicals for Metal Finishing.** Allied Research Products, Inc. Technical data file on the Iridite chromate conversion coatings for non-ferrous metals, Irilac clear protective coatings for all metals, Isobrite plating brighteners and ARP process chemicals and supplies.

2. **Special Metals Brochure.** Johnston & Funk Metallurgical Corporation. 8 pp. Wire, rod and shapes, now available in titanium, zirconium, tantalum, columbium and other special metals.

3. **Machining Aluminum.** Reynolds Metals Company. 32 pp. Data on machining practices, tool angles and designs, and tool materials. Proper speeds, feeds, lubricants and cutting compounds are explained. Charts and text cover eight major machining operations: turning, milling, shaping and planning, drilling, reaming, tapping, filing and sawing.

4. **Phosnic Bronze.** Chase Brass & Copper Company. 8 pp. Describes the various forms, tempers, and properties of the alloy, its composition, and a number of typical uses. Also includes discussions of endurance strength, creep and relaxation resistance, stress-strain characteristics, electrical and thermal conductivity, corrosion resistance, workability, and heat treatment.

5. **Buttweld Tubing.** Pittsburgh Tube Company. 60 pp. ill. "Handbook of Cold Drawn, Buttweld Mechanical Steel Tubing" describes the manufacture, uses, and economies of the buttweld product in industry. Pertinent metallurgical, mechanical and engineering data are included.

6. **White Metal Die Catalog.** White Metal Rolling & Stamping Corporation. Full scale, dimensional diagrams of several thousand dies, including rods, bars, tubes, structurals, solid shapes, hollow and semi-hollow shapes.

7. **Hastelloy Alloy C.** Haynes Stellite Company, Division of Union Carbide Corporation. 16 pp. Latest data on chemical, physical and mechanical properties, along with a guide to corrosion resistance. Also charts and graphs, data on high-temperature properties.

MATERIALS—PLASTICS

8. **Nylatron GS Mill Shapes.** The Polymer Corporation of Pennsylvania. Bulletin presents property advantages of Nylatron GS (molybdenum disulphide filled) nylon, used in such applications as gears, rollers, bearings, washers, wear strips and pads and other applications requiring long wear, life and exceptional resistance to creep or cold flow. Shows physical property data and available stock.

9. **Thermoplastics.** Westlake Plastics Company, Alphalux Division. 4 pp. Literature on Acrylux, Fluorolux, Styrolux, Hi-Styrolux, Ethylux, and Ultra-Ethylux. Incorporates a selector guide and properties chart.

10. **Marlex Polyethylene.** Phillips Company, 8 pp., ill. Discusses properties and industrial applications of rigid polyethylene.

11. **Vinyl Maintenance Top Coats over Phenolic Primers.** Union Carbide Plastics Company, Division of Union Carbide Corporation. 5 pp. Technical release No. 38. Bulletin explains how a new phenolic/vinyl system of maintenance coatings for metals eliminates the need for costly surface preparation by sandblasting. Formulation methods and exposure test data of panels coated by the new system are also included.

12. **Resistance of Elastomers to High Aromatic Fuels.** Thiokol Chemical Corporation. Report based on the results of a recent laboratory study comparing the effects of high aromatic fuels on oil-resistant elastomers indicates that the trend to higher aromatic hydrocarbon levels in fuels is a significant factor in compounding rubber goods to obtain the required fuel resistance and performance. Seven rubber types were evaluated in fuels varying in aromatic concentration up to 100 per cent. Tables of data and curves are included, illustrating the effect of aromatic content on volume swell, physical properties, and vapor permeability. Results were obtained showing the effect of immersion on the low temperature flexibility of these elastomers.

13. **Silicone-coated Glass Cloth.** Continental Diamond Fibre Corporation. Five bulletins, 2 pp. each. Describe properties and applications of glass tapes, fabric sheets, wrappers and die cut pieces, both silicone-varnished and rubber-coated.

METHODS

14. **Brazing Stainless Steels.** Harper Electric Furnace Corporation. 24 pp., ill. Booklet discusses four important aspects of the brazing process: (a) characteristics of base and filler metals; (b) brazing cycles; (c) selecting and using gas atmospheres; (d) construction and application of various types of furnaces.

15. **Soldering Aluminum.** Reynolds Metals Company. Booklet includes data on soldering fluxes, irons and flames, and information on soldering methods such as hot plate, dip,

furnace, friction, glass fiber brush, and ultrasonic operations. Types and properties of aluminum solders are explained.

PARTS AND COMPONENTS

16. **Switches and Actuators.** Electrosnap Corporation, Switch Division. 52 pp. Catalog ES-59 contains a glossary of terms used in the switch industry, with photos, specifications, dimensional drawings, and modifications information on the following switches and their actuators: sub-sub-miniature "Peanut" switches, sub-miniature snap action switches, single pole, double pole, triple pole, and multipole types, special actuators, lighted pushbutton panel switches (from 1 to 4 lamps), environment-free switches, hermetically sealed switches, and die-cast enclosed switches.

17. **Temperature Controls.** Fenwal, Inc. 8 pp. Brochure MC-177 describes Thermoswitch controls and mounting wells. Complete operating specifications and dimensions, available modifications and special features.

18. **Optical Products.** Bausch and Lomb Optical Company. 24 pp. Illustrated index listing current Bausch & Lomb catalogs, divided into consumer, opthalmic, and scientific and technical products classifications, corresponding to the major product divisions of the company. Catalogs of allied products are grouped together for quick, easy reference. Each catalog entry includes a cover illustration and brief descriptive data. A factual account of the contents is included and each catalog number is specified. A product index in the back of the book permits selection of proper catalog by product reference.

19. **Motors and Blowers.** Heinze Electric Company. 16 pp. Describes standard line of Heinze sub-fractional horsepower motors and blowers. Photographs and diagrams illustrate 2- and 4-pole induction motors, capacitors motors, universal motors, gear motors, single and double blowers, and blower heater units.

20. **Transformers.** General Electric Company, 24 pp. Reference for selecting small power and control, general-purpose and special-purpose transformers.

21. **Metal Gaskets.** Garlock Packing Company. Bulletin describes design, construction and utility of Guardian spiral-wound metal gaskets, lists the various types available for special applications. Also indicates compressibility and resistance features of the metal gaskets; includes charts suggesting recommended sizes of gaskets in relation to pressure seals, and complete specifications on round, oval, square, flat side, diamond and pear-shaped Guardian gaskets.

22. **Curtain Walls.** Albro Metal Products Corporation. Catalog contains information about a complete line of custom-designed metal curtain wall for all types of building construction. Schools, hospitals, industrial and office buildings are among those structures which can be quickly and cheaply built with this family of systems.

23. **Large Waveguides.** I-T-E Circuit Breaker Company, 4 pp., ill. Fifth bulletin in a series describes and illustrates products ranging from simple sections of straight waveguide through plane-turners and transitions, and such waveguide test equipment as simulated loads, slide-slug tuners and slotted lines.

24. **"O" Rings.** Garlock Packing Company. 20 pp. Bulletin, dealing with the design and application of "O" rings, discusses materials of construction, dynamic and static applications, use of back-up or non-extrusion rings, and groove design for this style of packing.

25. **Universal Joints.** Curtis Universal Joint Company, Inc. 12 pp., ill. Catalog covers entire line of single and double universal joints, complete with prices and specifications.

26. **Instrument and Control Switch Bulletin.** Allis-Chalmers Manufacturing Company. Describes construction features of switches used in conjunction with circuit breakers, transformer tap changers, motor-operated rheostats, instruments, and many other types of electrically controlled apparatus. Units covered include heavy-duty control switches for use in steel mills, chemical plants, petroleum refineries, and other industrial applications. These are designed for ⅛- to 2-inch-thick panel mounting and are available with up to 14 stages (14 control circuits).

27. **Sealed Relay Catalog.** General Electric Company. 24 pp. Bulletin GEA-6628 contains information on hermetically sealed relays for military and general purpose industrial applications. Photographs, circuit diagrams, coil data, and specifications are included.

MISCELLANEOUS

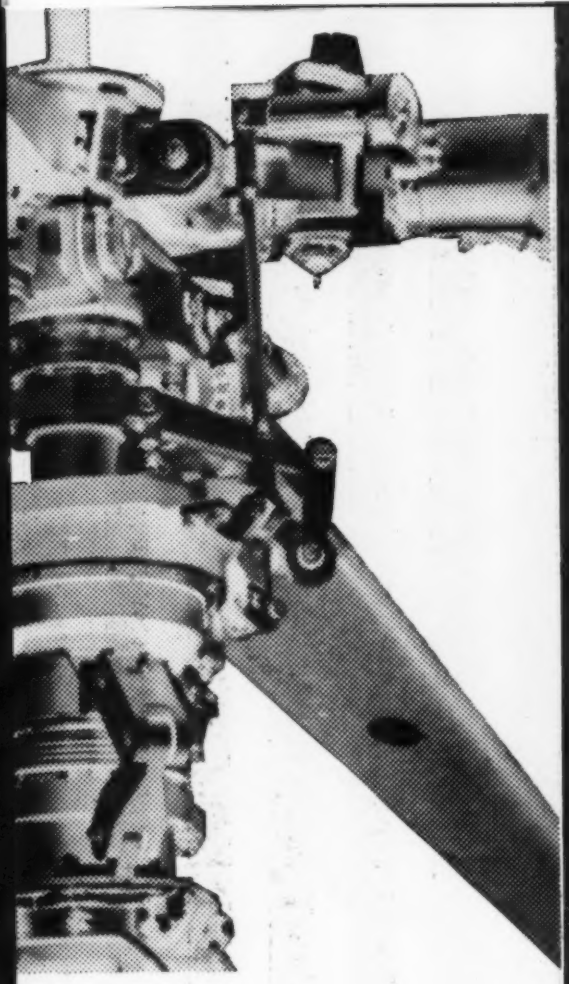
28. **New Burroughs Catalog Folder.** Burroughs Corporation. Brochure contains condensed descriptive information and application data on Burroughs Beam Switching Tubes, Nixie indicator tubes, decade counters, pulse control instruments, optimeters, beamplexers and visual decoders manufactured by the company. A complete listing of more than twenty items of available literature is included on a literature request card.

29. **Bearing Lubrication Manual.** Miniature Precision Bearings, Inc. 25 pp. Deals with subjects such as oil and grease lubrication, properties of lubricating oils and greases, military specifications, standards, and special lubricants. Supplies data and information on the various types and brands of oils and greases available to bearing designers and users. Blending charts, nomographs and other data are also included.

30. **Antenna.** The Gabriel Company. Catalog contains data sheets on parabolic antennae and accessories, passive reflectors, commercial communication antennae, other unclassified military antennae, and waveguide and transmission lines.

31. **Special Typewriter Keyboards.** Remington Rand Division of Sperry Rand Corporation. A method of using a standard manual or electric or proportional-spacing typewriter for special impressions needed in the field of electronics and electricity is the subject of a new booklet, the first in a series designed to show how any of 18 different fields can make profitable use of interchangeable typewriter type.

32. **Glass Textiles for Industry.** Hess, Goldsmith and Company, Incorporated, 32 pp., ill. Broad view of glass fibers, including discussions of types, properties, weaving processes, uses, and a history of the company. Illustrations show typical applications, and stages in production. Tables give sizes and specifications of glass tapes and broad glass fibers; densities, yarn sizes, tightness of weaving, and suggested applications.



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Manufacturer's Literature

33. **Pumps and Motors.** Pesco Products Division, Borg-Warner Corporation. 4 pp., ill. Brochure describes pumps and motors designed specifically for high temperature hydraulic systems. Performance charts show the effect of inlet temperature on pump performance at full flow, full pressure, and through cut-off at rated speed for typical pump models.

34. **28 Volt DC Motor.** Hoover Electric Company. Bulletin describes a new 1.6 hp, 28 volt dc motor, suited for applications in aircraft, missile, ordnance, marine and industrial installations. Gives outline dimensions, mounting, performance curve.

35. **Magnetic Core Storage Products.** Telemeter Magnetics, Inc., 4 pp. Brochure describes ferrite storage and switch cores, core arrays, sequential and conversion types of core storage buffers, transistorized computer memory modules, and Data Translators designed to provide compatibility between data systems utilizing different codes and formats.

36. **Dial Thermometers.** U. S. Gage, Division of American Machine and Metals, Inc. 12 pp., ill. Catalog describes a completely redesigned line of indicating dial thermometers for temperament measurements in the range of −40° to + 1000°F. Catalog gives specifications for both direct and remote reading types, and contains information on the four types of filling mediums as well as thermometer case sizes, materials, and styles. Tables give useful selection data and dimensions for cases, bulbs, and bulb connections.

37. **Bryant Hi-Lo Torches.** Bryant Industrial Products Corporation. Data sheet contains engineering specifications on new venturi torch burner, the Hi-Lo torch, which is a wide-range modulating burner; capacities range from 120,000 to 1,800,000 BTU/hr. in the low pressure series, and from 200,000 to 9,300,000 in the medium-pressure series.

38. **Industrial Regulators and Welding Equipment.** Modern Engineering Company. 24 pp., ill. Brochure evaluates 50 important design features found in oxy-acetylene welding and cutting equipment and industrial regulators produced by 19 leading manufacturers.

39. **Pneumatic Valves.** Ross Operating Valve Company. Installation and maintenance information as well as dimensional and parts data about pneumatic valves. To facilitate easy reference, the valves are grouped according to methods of operation by air, cam, manual and solenoid.

40. **Selenium Rectifiers.** Syntron Company. 10 pp., ill. Catalog presents complete descriptions, data and specifications for cell sizes in a range from one-inch square to 12 by 16 inches, and for stacks of practically any size. Also illustrates rectifier circuits and gives four pages of continuous dc current ratings for 26, 33, 36, 40, 45, and 52 volt RMS cells.

41. **High Frequency Germanium Transistors.** General Transistor Corporation. Brochure G-150A. Covers specifications of high frequency germanium alloyed junction transistors, types 2N444A through 2N447A, and 2N519A through 2N523A. These improved "A" versions provide higher voltage ratings and generally tighter specifications than were previously found in the same types.

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For Your Calendar

Through April 29. "Art in Advertising" exhibit. Chicago Public Library, Chicago.

April 21-28. "Europak 1959". Fifth European packaging exhibition. Amsterdam, Holland.

April 26-30. American Institute of Decorators' national conference. Plaza Hotel, New York.

April 28. Society of Plastics Engineers' technical meeting: reinforced plastics in pleasure boat, aircraft, and missile design. Adolphus Hotel, Dallas, Texas.

April 26-30. Symposium on packaging and transportation of chemical products, sponsored by the Manufacturing Chemists' Association's packaging committee. Engineering and Scientific Center, Cleveland, Ohio.

May 2 - June 5. 32nd annual exhibition of Design in Chicago Printing. Chicago Art Institute.

May 2-18. 48th International Trade Fair. Paris.

May 3 - June 14. "20th Century Design, U.S.A." Exhibition at the Albright Art Gallery, Buffalo, New York.

May 5-22. Third International Trade Fair. Tokyo.

May 7. Society of Plastics Engineers' technical meeting: plastics in the metals industry. Penn-Sheraton Hotel, Pittsburgh.

May 8-19. Third annual U.S. World Trade Fair. New York Coliseum.

May 11-13. Joint automation conference, sponsored by the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the Institute of Radio Engineers. Pike Congress Hotel, Chicago.

May 16. Package Designers Council: fourth annual meeting. Silvermine Guild of Artists, South Norwalk, Connecticut.

May 18-19. "Appliance Technical Conference" of the American Institute of Electrical Engineers domestic appliances committee. Cleveland, Ohio.

May 18-20. 61st annual meeting of the American Ceramic Society. Palmer House, Chicago.

May 20-21. Building Research Institute conference on building illumination. Statler-Hilton Hotel, Cleveland.

May 22. Society of Plastics Engineers' regional technical conference: encapsulation, printed circuits, etc. Van Orman Hotel, Fort Wayne, Indiana.

May 25-28. Design Engineering Show. Convention Hall, Philadelphia.

June 1-20. 27th International Samples Fair, Barcelona. U.S. exhibit by Charles H. Clarke, Office of International Trade Fairs.

June 1 - September 15. "Glass 1959". Exhibit at the Corning Museum of Glass, Corning Glass Center, Corning, New York.

June 9-30. "British Artist-Craftsmen". Lincoln, Mass. (Smithsonian Institution, traveling exhibit.)

June 14 - August 16. "Fulbright Designers". Hagerstown, Maryland. (Smithsonian Institution, traveling exhibit.)

June 14 - July 31. "Contemporary Indian Crafts". Minneapolis. (Smithsonian Institution, traveling exhibit.)

June 17-27. International Plastics Exhibition. London.

June 19. Regional technical conference of the Society of Plastics Engineers. "Plastics in the Automotive Industry". Detroit.

June 21-27. Aspen International Design Conference, Aspen, Colorado.

June 22-24. Fifth annual creative problem-solving institute. University of Buffalo, Buffalo, New York.

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