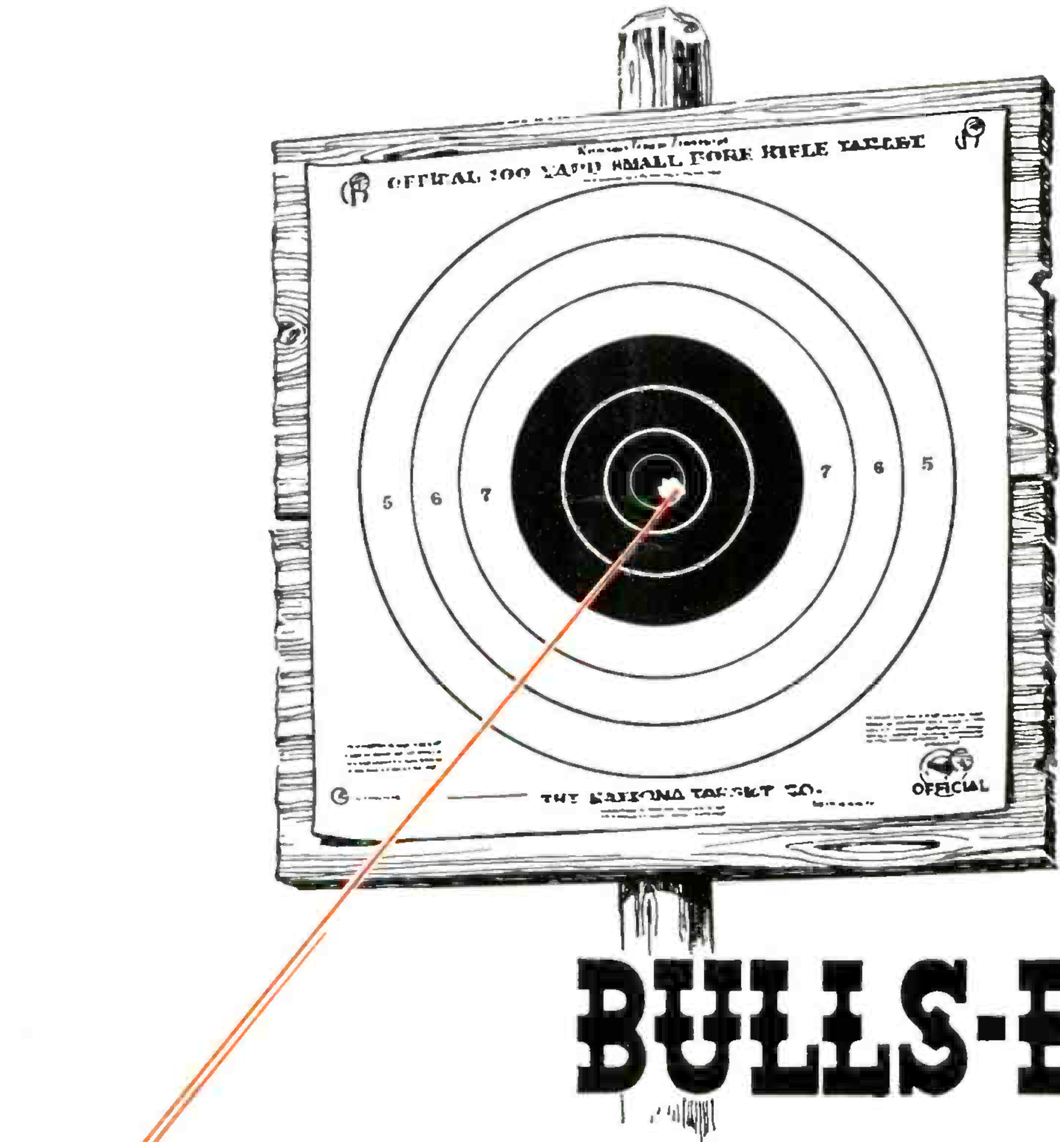
TELEVISION ENGINEERING

MARCH, 1951

Checking the electrical characteristics of picture tubes.



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TELE-VISION ENGINEERING

Including Radio Engineering, Communications and Broadcast Engineering. Registered U. S. Patent Office.

Research . . . Design . . . Production . . . Instrumentation . . . Operation

VOLUME 2 — MARCH, 1951 — NUMBER 3

MONTHLY FEATURES

Cover Illustration

Examining picture tubes for electrical characteristics such as breakdown, shorts, cut-off bias, bias for given light output, heater-cathode leakage, screen quality, etc. *(Courtesy Tung-Sol)*

Editor: LEWIS WINNER

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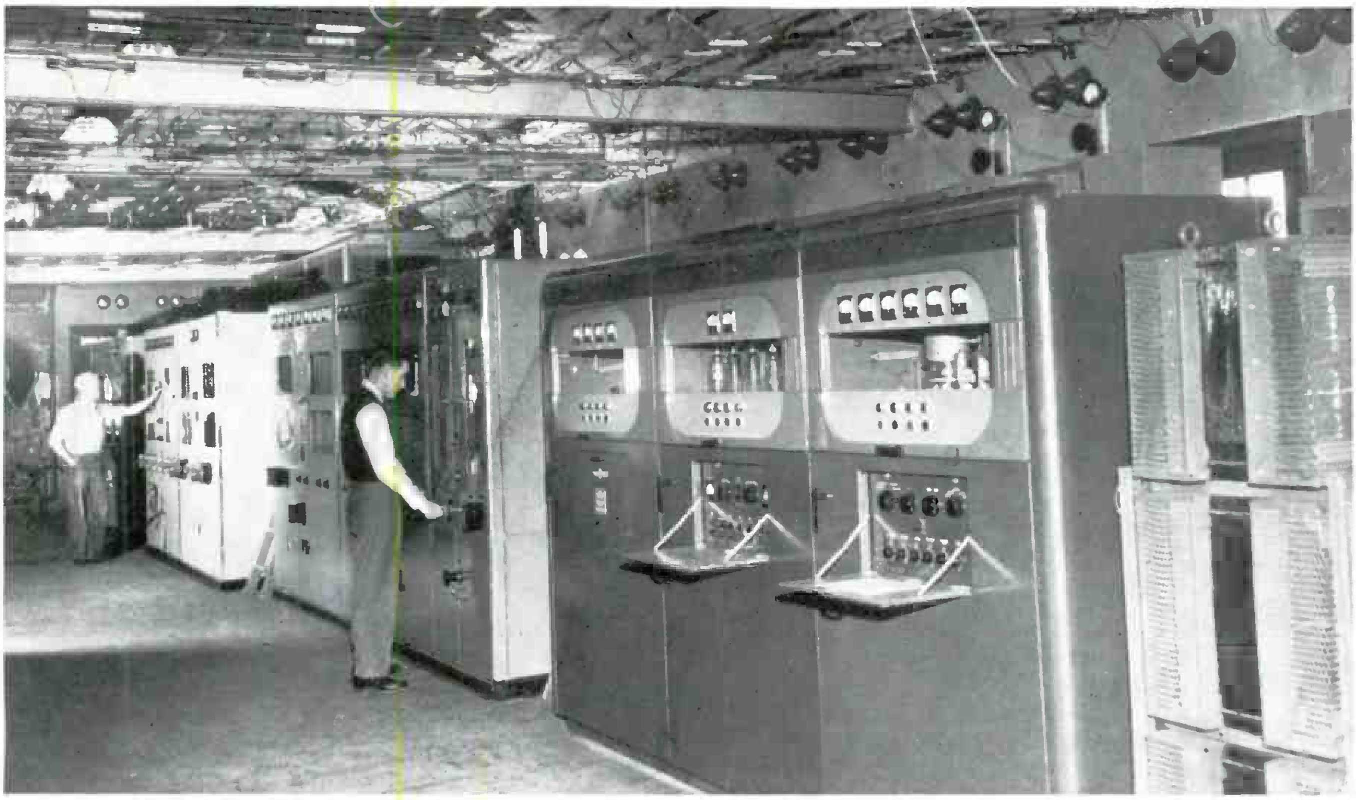
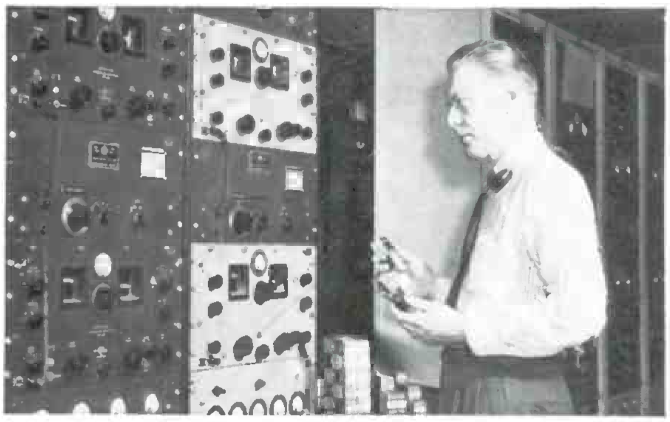


An aisle at the giant Press Wireless transmitting station at Hicksville, Long Island, N. Y., showing 3 of the 35 transmitters (from 2.5 to 50 kw output), in constant use. These transmitters beam news to North America, Central America, and South America, Europe, Africa, the Middle East, and to Iron Curtain countries, including the U.S.S.R., through the Voice of America and United Nations broadcasts. All the transmitters are keyed and controlled with equipment using Sylvania Radio Tubes.

SYLVANIA RADIO TUBES HELP PRESS WIRELESS CARRY THE NEWS TO ALL THE WORLD!

Voice of America broadcasts to Russia and the Iron Curtain countries . . . United Nations broadcasts to the world . . . news stories and pictures for the world's newspapers, magazines, and radio stations . . . this is the vital 24-hour-a-day task of the far-flung transmitters and receivers of Press Wireless, Inc. Jointly owned by leading newspapers and news services, Press Wireless is handling the biggest job of news transmission the world has ever known!

With such an urgent mission, dependability is the keynote. And naturally, to insure that dependability, Press Wireless uses Sylvania Radio Tubes by the thousands in its equipment. Like expert production and design engineers everywhere, Press Wireless' staff has found by experience that Sylvania precision, uniformity, and reliability add up to quality that can't be beat. For complete characteristics of radio tubes for every application, or for help on your special problems, write Sylvania Electric Products Inc., Dept. R-1503, Emporium, Pa.



At the Press Wireless Receiving Station at Baldwin, Long Island, N. Y., all 29 receivers use Sylvania Radio Tubes in many applications. Tuned to London, Paris, Rome, Moscow, Madrid, Buenos Aires, Mexico City, and many other news centers, they receive code and voice transmissions as well as teletype, and radio photos for dissemination to all America.

SYLVANIA ELECTRIC PRODUCTS INC. 1901-1951 50th ANNIVERSARY FIVE DECADES OF PROGRESS

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RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; FLUORESCENT TUBES, FIXTURES, SIGN TUBING, WIRING DEVICES; LIGHT BULBS; PHOTOLAMPS; TELEVISION SETS

THE CERAMIC CORES THAT PAVED THE WAY TO BETTER TV

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- Lighter weight, smaller sizes for more compact construction, lower costs of finished equipment
- Much higher permeability
- Less corona effect
- Lower cost

Technically, Stackpole Ceramag Cores are molded from a metallic oxide powder mixture which, when properly handled during processing, promotes cubic crystal growth. This results in a non-metallic material having low eddy current loss and exceptionally high permeability.

Practically, Stackpole's skill in the highly critical fabrication of these cores in production quantities has resulted in lower costs and higher standards of performance and dependability for the nation's leading television receivers.

Besides the more popular standard Ceramag core types illustrated above, many specials are regularly supplied.

Electronic Components Division

STACKPOLE CARBON COMPANY, St. Marys, Pa.

TELEVISION ENGINEERING

LEWIS WINNER, Editor

March, 1951

Cheering Prospects on the Station Scene

WITH THE RELEASE of the news that NPA would allow construction of buildings for TV broadcasting, and a disclosure that the freeze block is scheduled to be lifted, industry faces those golden moments for which they have been waiting for so long.

In clearing the decks for station housings, NPA declared that the action was taken to assure the greatest possible freedom of operation to the nation's broadcasting facilities.

The FCC edict was described as providing for the immediate authorization of stations in those areas where no exceptions were filed and where interference was reported to be nill.

As indicated several months ago in these columns, several manufacturers have a backlog of materials which can be used for the construction of new transmitters, and it is understood that there are also quite a few transmitters waiting to be shipped to the boys as soon as the licenses are granted.

The next few months may find TV at a new peak of activity.

*Studio Lighting**

THE BUILDING OF LARGER studios housing multiple stages, which has accented the needs for versatile lighting facilities, has limelighted an intriguing phase of the TV art, in which are involved not only the manufacturing industry, but installers, operators and even set owners.

Today, four types of equipment are used in studios . . . field lights, spotlights, strip lights and effects lighting. The floodlights can be either incandescent or fluorescent, the incandescent floods usually containing lamps of from 250 to 2,000 watts and providing wide-angle distribution of moderate intensity illumination. Fluorescents have also been used effectively. Spotlights of 500 watts up to 5 kw are usually located in the popular cylindrical-ventilated metal housings, which in some instances have a built-in iris. The third type of lighting, the strip light, use 150 to 300 watt reflector lamps to provide general shadowless illumination. A motor-driven *effects disk* is usually used to provide the fourth type of lighting, for effects.

In applying these lights, three techniques are normally employed. In one, called base lighting, either incandescent or fluorescent lamps are used to supply complete set lighting. Then there is the familiar accent lighting, and the modeling and fill lights.

*Based in part on a report prepared by Westinghouse and NBC.

The development of the image orthicon has helped to solve many lighting problems. However, there are still a host of variables to worry about. For instance, it is necessary to consider the proper quality of light for a given camera pickup characteristic, to obtain a satisfactory rendition of colors in a suitable gray scale for black and white pictures. It has been said that the solution of this difficulty will permit a greater use of color in scenery and costuming which can provide a more favorable psychological effect on performers, a result which will certainly be noted with interest on the screens at home.

Although studio lighting practices have reached a point where it is possible to recommend definite approaches to produce standard effects and satisfactory pictures, practically every show has a special problem to solve that is often a challenge to not only the lighting fraternity, but even to those at the transmitter.

The subject of lighting has been found to be of such importance that it is being considered as a topic for a special symposium by a professional group of the IRE.

TV Meeting Time

THE NEXT FEW MONTHS will see the presentation of more major papers on TV than ever, at meetings throughout the country.

At the IRE national conference in New York City, always an event of the year, TV has become a spotlight feature with dozens of sessions devoted to discussions, disclosing unusual developments of the day.

In one national IRE report, by Tyson and Weissman of Sylvania, for instance, covering problems of *uhf* tuners, there are recommendations for *rf* amplifiers which will improve the noise figure and reduce local oscillator radiation. Suggested for the amplifier is a new type of disk-seal planar triode, in a grounded-grid circuit, continuously tunable over the 475 to 890 mc band, and capable of providing a power gain of 15.

The conservation programs have been adopted as a basis of several convention papers. In one, authored by Levine and Moskowitz of FTL, appears data on the characteristics of voltage doublers and triplers using selenium rectifiers with load currents from 100-500 milliamperes.

At the annual NARTB meeting in Chicago, April 15-19, TV will also be quite an item with papers on high gain ultrahigh antennas, video switching, flying spot-scanners, etc.

Complete reports on these and many other TV sessions will appear in TELEVISION ENGINEERING. Hope you will enjoy them!—L. W.

TVE-grams . . . .

The Management Front

Metal Conservation Programs: Thousands of tons of six critically scarce metals . . . cobalt, aluminum, silicon steel, ferrite, copper and nickel . . . are scheduled to be saved as the result of ingenious component and circuitry developments by several TV chassis makers.

During a demonstration of a receiver, especially designed by Philco to conserve materials, it was revealed that the new model eliminates entirely the use of cobalt and reduces the amount of aluminum needed by 68%, silicon steel by 58%, ferrite by 51%, copper by 26% and nickel by 15%. It was noted that if a conservation program such as this could have been put into effect by the industry during '50, and if each company could have accomplished the same percentage reduction in use of critical materials, the total estimated savings would have been about 4600 tons of copper; 27,600 tons of silicon steel; 440 tons of cobalt; 224 tons of nickel; 2950 tons of ferrite (which includes 20% nickel oxide), and 2100 tons of aluminum. This estimate was based on the official total of 7,463,800 receivers produced in '50.

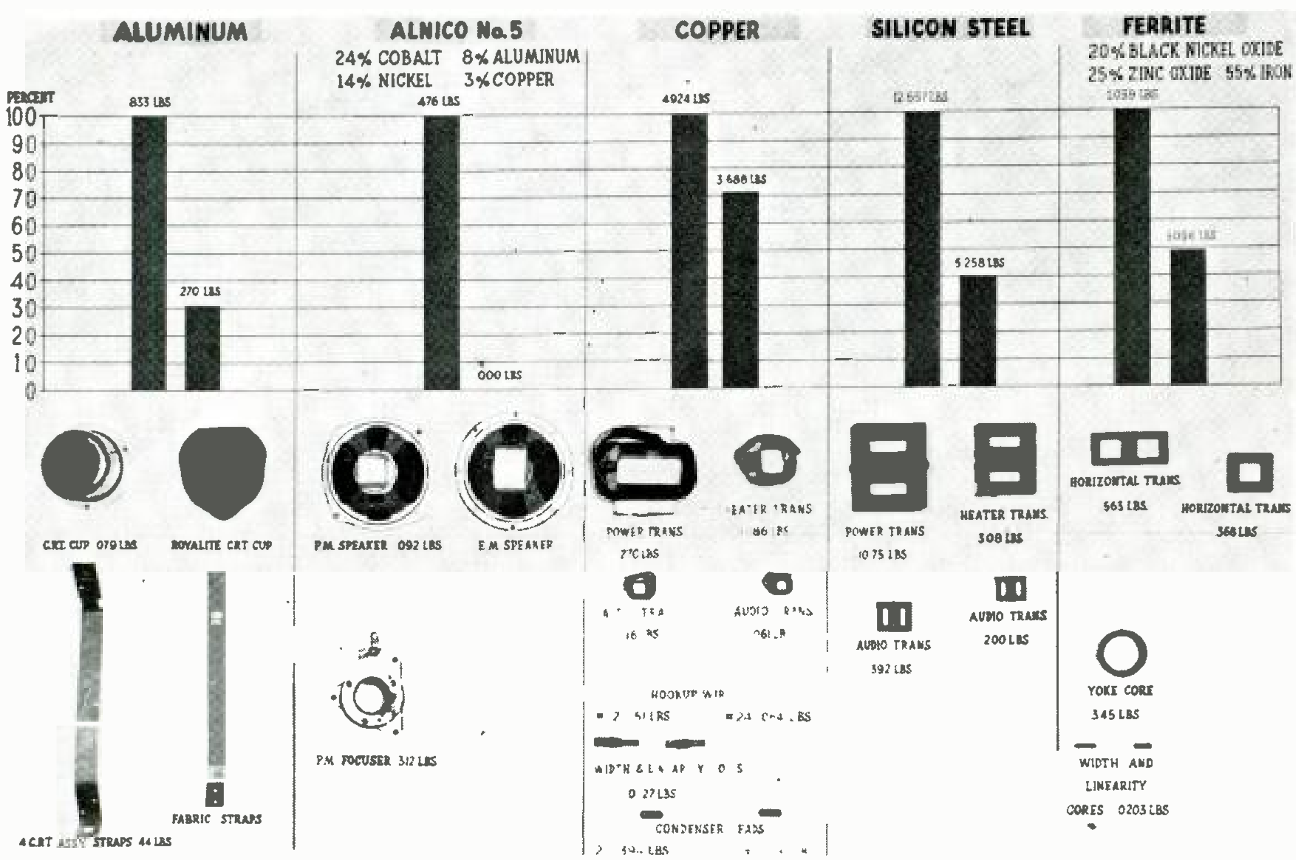
Specifically, the chassis modifications have involved removal of aluminum picture tube frame assembly straps, and replacement with fabric material. The aluminum picture-tube protective cup has been replaced with royalite and fibre cup. It has been found possible to remove one electrolytic by the use of electrostatic focus. It was also possible to reduce an amount of aluminum foil in some electrolytics by use of a lower-voltage power supply.

Alnico 5, employing 24% cobalt, 8% aluminum, 14% nickel and 3% copper, has been eliminated entirely in these models. The permanent-magnet speaker has been replaced with an electromagnetic type. The *pm* focuser has been replaced with electrostatic focusing, and the beam bender has been replaced with an Alnico No. 3 beam bender, using no cobalt.

Copper economies have been affected by removing power transformer and replacing with a smaller filament transformer for a new plate power supply with selenium rectifiers and voltage doubler. Wire size for hookup wire in chassis has been reduced from 22 to 24 wire. The width and linearity coils have been removed through use of new deflection circuit. The size of the horizontal output transformer coil has been reduced by using a new circuit and a new 6V3 damper tube. In addition, wire has replaced the ribbon-type ground and mounting straps.

A total reduction of 51% of ferrite or saving of 0.529 pound per receiver was achieved by reducing the size of the hori-

Chart disclosing scarce material savings in new Philco chassis. Bar at left represents materials used on current receiver design; materials used in the new chassis are shown in the right-hand column. Amount of aluminum used in the present design is shown as 100% or 0.833 pound, while in the new receiver the amount is 0.270 pound or a saving of 68%. Total weight saved by the new chassis and picture tube assembly is 12.12 pounds or about 30%.



Reports and Reviews of Current TV News

zontal output transformer core by using the new 6V3 damper. A newly developed non-critical core material, flake iron, has replaced the ferrite core in the deflection yoke. Width and linearity control cores have been replaced by use of new circuits using resistor type width control and no linearity control.

A conservation chassis developed by RCA was also described as providing substantial savings in critical materials. These models feature a plastic cup over the end of the picture tube on the rear of the cabinet instead of aluminum; shorter mounting bushings on some variable controls, saving approximately 10% of the brass in these controls; reduction in the length of copper wire leads on paper and ceramic capacitors (20% copper saving); the use of copper-clad steel wire instead of copper wire leads on wire-round resistors and chokes; and the use of Alnico 3 magnets (no cobalt required) for beam benders, instead of Alnico 5 magnets.

All austerity-type models will use the recently-announced electrostatic picture tubes. In describing this changeover program, and the recommended use of electrostatic focusing, RCA said that electromagnetic focusing would require the use of a focusing coil with approximately 2 pounds of copper wire and with an adjustable *dc* current flowing in the coil. The *dc* power supply handling capacity would have to be increased to furnish this current. This in turn would require more copper and iron in the power transformer, or more electrolytics and selenium rectifiers which require aluminum. This program would obviously be impractical because, although it would save cobalt in the magnet material, it would use much more copper, aluminum and steel. It was therefore decided to change to electrostatic focusing. It was disclosed that the shift to the use of electrostatic-focused tubes will cost slightly more per instrument because of the cost of the special components involved, but these special components do not involve critical materials.

According to RCA, by the end of the second quarter of '51, practically all sets will use electrostatic focusing.

The conservation trend will also be carried over to receiving tubes. A report from RCA disclosed that during the first quarter of '51, they will effect a 30% reduction in the present usage of copper grid side rods through usage of nickel-plated iron wires. Copper is also used in the lead wires which connect the elements of the tube to the base. It now appears probable that a saving of approximately 19% can be effected by a reduction in the diameter of the leads used.

Green Light for Repair Parts: A special priority rating, DO-97, has been assigned to parts and accessories used in repair, which will assure delivery on the same accelerated scale as orders authorized by the military.

Commenting on this ruling, NPA administrator Manly Fleischmann said that: "We cannot let the need for materials and equipment to build new facilities interfere with the maintenance of existing capacity. We can afford a few pounds of metal today to keep a machine running rather than several tons tomorrow to make a replacement machine. And in this way we avoid the loss of production and employment that would result if we allowed our present equipment to fall into disrepair." In his opinion it is . . . "essential that the Nation's present production and service facilities be kept in good repair so that they can operate at the maximum rate consistent with direct defense requirements." The purpose of the new rating makes this possible. According to the government official it was believed that this new program . . . "will not interfere in any manner with the defense program because the materials required constitute a small percentage of the total supply."

Research

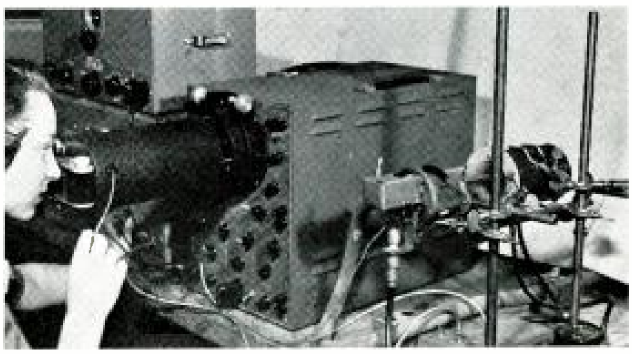
Sub-Miniaturization in Action: A walkie-talkie with miniaturized components, that may set a pattern for production on the video line has been produced for the Signal Corps by RCA.

The walkie-talkie, a 16-tube affair known as the AN/PRC-10, is the smallest tunable radio transmitter-receiver of its type ever produced. It incorporates complete sub-assemblies such as the FM discriminator unit and the *if* stage, each containing many components, which have been scaled down and compressed to fit in metal cylinders no larger than a miniature tube.

To accomplish this reduction in size, new coil techniques were developed. The equipment boasts the smallest tuning

At the recent award presentation to the National Bureau of Standards by the AIEE and the IRE in recognition of the Bureau's contributions to science and engineering in the past 50 years. Left to right: T. G. Le Clair, president of the AIEE; Dr. E. U. Condon, director of the National Bureau of Standards; I. S. Coggeshall, president of IRE, and Dr. E. Weber, chairman of the joint AIEE-IRE committee on high frequency measurements.

Bureau of Standards apparatus for studying internal friction of crystals. The decay of free torsional oscillations of a composite piezoelectric resonator can be observed on 'scope. From these measurements, it is expected that the effects of crystal imperfections on semiconducting properties will be revealed.



coil of its type ever manufactured. It is smaller than a dime in diameter, and about ¼" thick, and has a *Q* approaching 100.

Special manufacturing techniques were also called into play in turning out the equipment. Resistance-type soldering was employed in the *if* stages and other small components. Instead of soldering irons, electric current was used to directly fuse the parts with a special flux. The miniature *if* transformers are expendable capsules.

The transmitter-receiver unit is 3" deep, 9½" high, and 10½" wide, and weighs only nine pounds. The entire equipment, including battery power supply, carrying harness, handset, two antennas, operating handbook, and spare parts, weighs only about 25 pounds.

The small receiver-transmitter chassis supports the miniature *rf*, mixer and receiver oscillator circuits, the *if* amplifiers and discriminator, crystal calibrator, squelch and audio sections, and transmitter oscillator and *afc* functions.

The *rf*, mixer, and oscillator circuits are located in individual boxes, except for the antenna coil, which is separate and common to both transmitter and receiver.

Of particular interest are ¾" diameter cans, 2" long, which enclose *if* amplifier sub-assemblies, consisting of a subminiature tube, coils, resistors, and capacitors. The assemblies are hermetically sealed in the cans. The cans have 7-prong plugs similar to miniature tube bases, and plug into sockets located in the *if* chassis. The discriminator cans are similar to the *if* cans, except that two germanium diodes are used in place of the sub-miniature tube.

The receiver of the new equipment uses a superhet circuit for the reception of FM over a *vhf* frequency range. A signal entering the antenna is resonated in both the antenna and the antenna coil. It is then amplified in two *rf* stages. These stages are gang-tuned to the operating frequency. The *rf* signal and the local oscillator signal are fed into a mixer to produce the desired intermediate frequency in the mixer plate circuit.

The *if* signal is amplified in five identical *if* stages, connected in cascade. These stages are sealed plug-in units, with all components of each stage in an individual housing. The stages are connected as grid limiters, and operate as cascade limiters if the signal strength is great enough.

Performance characteristics of the transmitter show an output of approximately 1 watt. The receiver sensitivity is .5 microvolt with 2.5 milliwatts output. Its selectivity is 80 kc at 6 db down.

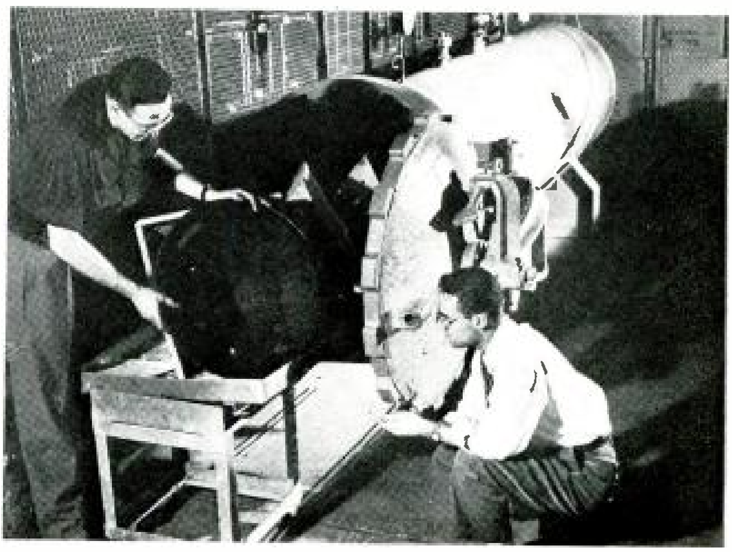
RF Micropotentiometer: Extremely simple devices which produce *rf* voltages at a very low impedance and at a wide range of frequencies have been conceived and developed by M. C. Selby of the National Bureau of Standards. Known as *rf micropotentiometers*, they provide accurate voltages from 1 to 10^5 microvolts without the use of attenuators at frequencies up to 300 mc and above. Thus, convenient standards of low voltages are made available which should greatly reduce equipment and shielding problems encountered in calibration of present-day commercial voltage generators, attenuators, voltmeters, and other *rf* equipment.

The micropotentiometers should prove especially useful in measurements of receiver sensitivity. Here the large disagreement between various standard voltage generators at high frequencies and low voltage levels has been due to three major causes. First, generator output impedance and receiver input impedance are not ordinarily known as functions of changing frequencies. Second, extreme care is necessary in using precision voltage-dropping attenuators. Finally, the long-time calibration stability of *vtvms* is uncertain. For these reasons, manufacturers of voltage generators have not been able to guarantee the accuracy of their equipment at all frequencies. Development of the micropotentiometers appears to have removed most of the obstacles to standardization of receiver sensitivity.

The new instruments consist essentially of appropriately housed and mounted current-carrying elements together with means for monitoring the currents they carry. Their electrical constants are simply determined by using known *dc* voltages and currents. The current-carrying elements are annular membranes, either metallic or nonmetallic, of various radii, thicknesses, and electrical resistivities. Monitoring may

TV picture-tube baking and annealing oven located in G.E.'s plant at Syracuse. Oven, used for experimental work only, is located in the test lab of the tube building.

Pressure tank used by G.E. to spot-check metal television picture tubes to determine their strength. A pressure of several atmospheres is exerted on each tube.



TVE-grams . . .

be accomplished by means of thermocouples, thermoelements, bolometers, stable *vtvms*, or other devices whose indications are independent of frequency. Thermoelements have been used in measurements of 1 to 100,000 microvolts at frequencies from zero to 300 mc and also for 100,000-microvolt measurements in the region of 1000 mc.

These micropotentiometers are the first low-impedance (of the order of milliohms) devices which provide *rf* voltages in the microvolt range and which make these low voltages available without the use of attenuators. They thus provide useful tools for many problems where constant voltage and low voltage sources are required. The devices are inherently frequency insensitive up to and above 300 mc. Extremely low and essentially nonreactive output impedance facilitates their use for checks and references with standard voltage generators. They may be used for direct calibration of percentage-modulation indicators. By means of known voltage ratios, the units may be used to extend the range for checking attenuators up to 120 db or higher.

Materials and Methods

Solders That Conserve Tin: The development of a group of solders which it is claimed permits savings of 50% or more in the tin normally used for solders was announced recently by the metals conservation committee of the Federated Metals Division of American Smelting and Refining.

The tin-conserving solders are basically silver-tin-lead alloys as compared with the usual tin-lead variety. The addition of a small percentage of silver is said to permit a marked reduction in the tin content, at the same time giving a joint at least as good as that given by the original alloy.

It was pointed out that in television tube manufacture, ST-20N can be used in place of solder with much higher tin content.

The same fluxes can be used as heretofore, and the identical means of application are completely satisfactory. ST solders do require slightly more heat to melt, but this is said to be compensated for by the fact that too much heat is not as harmful as it is to the usual tin-lead solders.

Sub-Miniature Tantalum Capacitors: A series of sub-miniature tantalum capacitors, notable for stability over wide ranges of time and temperature, has been developed by Fansteel.

Excluding connection leads, the capacitors occupy less than 1/10 cubic inch. The capacitor, which is polarized, consists of a porous tantalum anode permanently sealed into a fine silver cathode which also serves as the container.

Nine standard capacitors are available, ranging from 30 mfd at 6 volts *dc* to 3.5 mfd at 75 volts *dc*.

Personalities in the News

McDaniel Becomes RTMA Head: Glen McDaniel, vice-president of RCA, will be the first full-time paid president of RTMA. He will take office about April 1.

Robert C. Sprague, who has been serving as both president and chairman of the board of RTMA, resigned as president, effective when McDaniel takes office, but will continue as chairman of the board.

McDaniel was unanimously recommended for the presidency of RTMA by the reorganization committee, headed by former RTMA president Max F. Balcom.

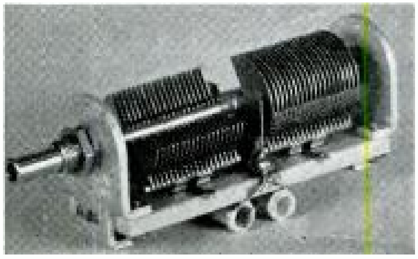
McDaniel has been associated with the radio-television industry since early '46 when he joined RCA Communications Inc., as vice president and general attorney. Recently he has been serving on the staff of Brig. Gen. David Sarnoff, RCA chairman of the board, and Frank M. Folsom, RCA president.

James D. Secrest, who has been serving as general manager and secretary of the association, will continue in this capacity under the reorganization program.

Trends

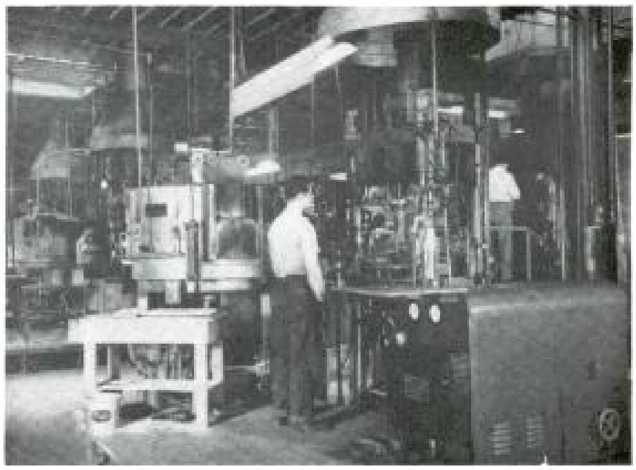
High Power at Ultrahighs: A sealed-off klystron amplifier tube suitable for use in the final amplifier stage, and providing a continuous power of 5 kw, has been developed by members of Varian Associates and Stanford University.

The tubes will be included in a new ultrahigh transmitter, developed by G.E., which it is claimed will provide the highest power ever achieved in the 480-960 mc bands.—L. W.



Above: Five 50-ton moulding presses being used for the manufacture of Vee-D-X lightning arresters and antenna insulators. Plant also has compression presses, ranging from 15 to 200 tons, for use with thermosetting plastics. A small injection press moulds small thermoplastic parts for use as insulators on antennas and for open transmission line. Left, top: Millen industrial version of its grid-dip meter. In addition to having an individually hand calibrated direct reading dial the model has an extended frequency range to cover the 220 kc to 300 mc bands. Left, bottom: RF capacitor, with a constant total capacitance and adjustable temperature coefficient, developed by NRL.

Pelleting glass-bonded mica[1, 2] for injection molding.



Preheating furnaces and molding presses.

VHV/UHF INSULATION

Molding, Machining and Fabrication Procedures With Which Those in Research, Design, Procurement and the Plant Should Be Familiar to Achieve Product Efficiency, When Using UHF/VHF Insulation Such as Glass-Bonded Mica.

AT THE VERYHIGH AND ULTRAHIGH frequencies, insulation is an extremely critical item, requiring careful consideration of not only chemical and electrical properties, but mechanical characteristics, too, for molding, machining and fabrication. Should, for instance, such factors as thickness, taper, flatness, radii or tolerances be too broadly evaluated in relation to both efficiency and production-line costs, there can be plenty of gloomy days ahead.

Tolerances are, of course, particularly acute problems. In handling insulation, employing, for instance, glass-bonded mica[1], which incidentally is widely used for 7 and 9-pin miniature sockets, tuner components and capacitors, it is necessary to consider the lengths and widths of the pieces needed. On lengths or widths up to one inch, the normal tolerance is ± .002 inch; on lengths or widths up to 2½ inches the tolerance becomes ±.005 inch; and on lengths or widths up to 5 inches, there's a tolerance of .010 inch required. Hole center tolerances must, of course, receive close study, too.

Insulation Thickness

Thickness possibilities represent another spec factor which must be watched carefully. Glass-bonded mica insulators thinner than 1/16 inch are not practical for molding. Short tubes of about ¼-inch diameter have been molded with a wall thickness of .030 inch; but it has been found that wall thickness must be increased when the length exceeds about ¾ inch. This particular insulation possesses an interesting metal-insert feature permitting anchoring by grooving, threading or knurling. Such metals as brass, cold-rolled steel or Monel are preferred as inserts.

In the molding of sheet glass-bonded mica insulation, the compression meth-

[1]Mycalex, processed according to a technique developed by Percy B. Crossley in which powdered glass is mixed with powdered mica, the mixture heated until the glass becomes plastic and the plastic material cooled under pressure to form the desirable insulation.

(Left)

Cutting glass-bonded mica[3] with diamond wheel.

(Right)

Fabricating glass-bonded mica[3] with convertible contour saw.

[1], [2]*Mycalex 410* and *410X*.
[3]*Mycalex 400*.

Tube socket production line.

Socket center shield assembly and inspection.

Production and Application Techniques

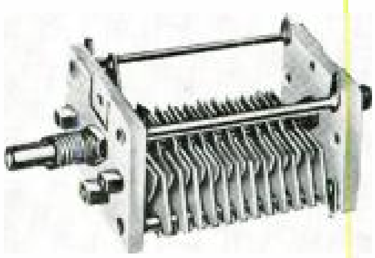
by RALPH G. PETERS

od is employed, instead of the injection method. Accordingly, the design and application engineer must consider the characteristics of this process in his specification planning. At the plant where the glass-bonded insulation is processed, only 60-pound batches of powdered mica and powdered glass are mixed at a time, enabling the electrical properties of the resultant sheets to be controlled.

Preforming Sheets

Using a 500-ton press, with pressures held from one-half to one minute, preformed sheets 14 x 18 inches in area and from one to four inches thick may be made. These sheets are placed in a drying room where they are left under a 120° temperature from four days to two weeks, depending upon their thickness.

Typical glass-bonded mica capacitor.



Molding Procedure

At the end of this period, the sheets are placed into a conveyor furnace where they are heated to 1,250° *F*, taking from one-half hour for thin sheets, to three hours for the thicker ones. When they emerge from the furnace they are molded by a 500-ton press, causing them to shrink to about one-fourth their original thickness.

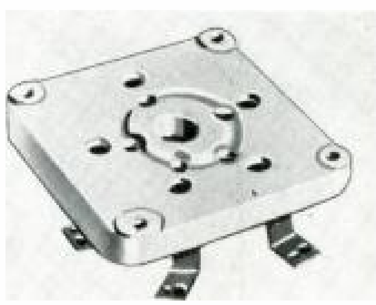
Annealing

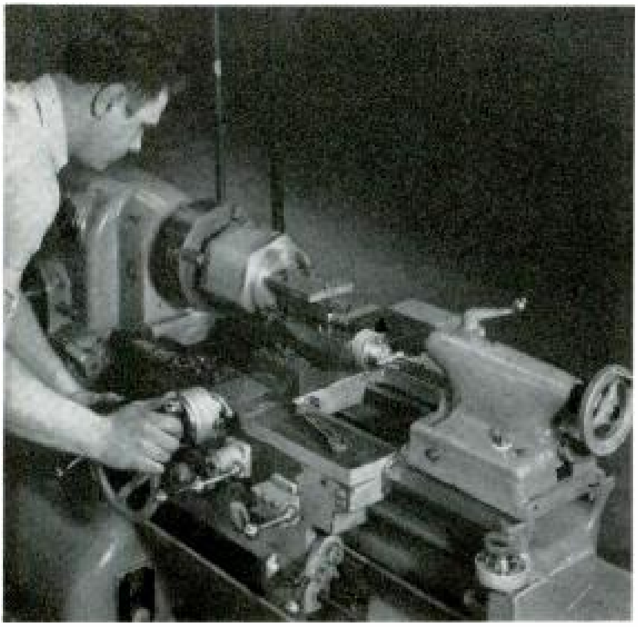
They are then placed in a conveyor-annealing oven where the temperatures vary from 700° at the beginning of the operation to 200° at the end of the line. The conveyor belt speed varies according to the thickness of the sheets.

Component Processing

The methods used to process components, such as sockets, must also be considered carefully in making up blueprints for parts for chassis installation. For instance, in the fabrication of miniature glass-bonded mica sockets which, incidentally, require the use of the injection-molding technique, pellets about the size of a quarter and one-half inch thick are first processed. Previous to this, the powdered mica and powdered glass have been mixed

A hf glass-bonded mica socket.





Tool maker machining mold for large coil forms.

Jig boring of precision mold.

for twenty minutes dry, and then another twenty minutes with water added.

Heating-Drying Rooms

The pellets are placed in a rotary furnace, dried out, and heated for twenty minutes to a temperature of 1100°. Then the four or five plastic pellets are transferred to the injection chamber and injected into a mold, heated to 600-700° F, which allows the charge to solidify after filling the mold cavities. The molded cluster is placed in an annealer as soon as removed from the mold.

After the cluster cools, the molded sockets are broken off, sharp edges burnished, and placed on a production line.

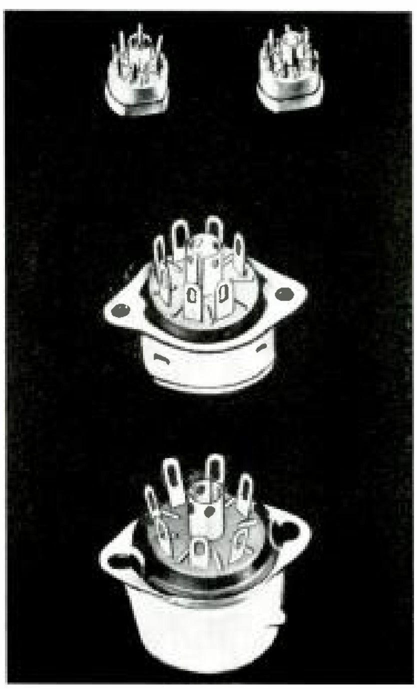
Final Fabrication Steps

On a conveyor belt that moves between two lines of workers, contacts are placed into the holes provided. At the end of the line they pass through a bumping machine where the contacts are spread to keep them in place. They are mounted on a metal saddle, the edges being crimped to hold the socket firmly in place. A center shield is added, and after final inspection, the units are shipped to the manufacturer for insertion into the chassis.

Required Machining Equipment

Where it is believed to be practical to machine the insulating material in the home plant, it is necessary to study the available facilities. To machine glass-bonded mica insulation, one should have cutting, drilling, threading, tapping, grinding, as well as slotting, flycutting and finishing equipment. In the instance of the mica insulation, two methods can be used for threading. One involves a lathe with a tool-post grinder and the use of a fine grain silicon carbide or aluminum oxide wheel with a *V* edge. A tungsten-carbide tool can also be used, chasing the thread as with metals. For slotting, there are three possible methods that can be used. One involves the use of a metal-bonded diamond wheel of proper width on a cutter or milling machine. In the second instance, a milling cutter, preferably tungsten-carbide tipped, can be used. The third method involves the use of a shaper with a tungsten-carbide tool bit. Small cuts should be taken, about .005 inch. In all cases water is preferred as a lubricant.

Assortment of subminiatures which use glass-bonded mica insulation.



Specification Considerations

In specifying an insulation, there are a variety of unusual conditions which must be considered, conditions which not only revolve about the available facilities in the home plant, but those that might prevail at a fabricating source.

End-User Provisions

It is also necessary to be familiar not only with the methods which must be used to produce the required product, but the physical and electrical properties of the component when it reaches the eventual user.

Credits

The writer wishes to express his sincere thanks to the Mycalex Corporation of America for illustrations and data supplied for this report.

Determining Amplifier Sensitivity With Noise Diode

by BERT ELY

Noise Diode Disclosed as Means of Securing a Statement of the Relative As Well As Absolute Sensitivity of Wide-Band Amplifiers.

IN TV RECEIVER DESIGN, the noise-factor has begun to receive particularly careful consideration. For the value of the noise factor, in expressing the potential sensitivity of an amplifier, and the use of a noise diode, to determine noise factor, have been found to be extremely important in wide-band amplifiers. According to W. K. Squires, design engineer of the Colonial Radio and Television Division of Sylvania, the usual measurement of sensitivity, stated in input voltage, provides no information about the noise characteristics of the amplifier and thus does not describe the ability of the amplifier to reproduce a weak signal. In addition, the standard sensitivity measurement is also claimed to have another disadvantage: it does not correlate well with noise factor. Through the use of the noise diode, it has been found possible to obtain a statement of the relative as well as absolute sensitivity.

Discussing these factors in a paper at the recent IRE Syracuse meeting, Squires pointed out that the standard noise output is such that with an equal value of peak signal it will completely modulate the picture tube. Subjective tests have indicated that a picture of half noise and half signal very nearly represents a minimum usable picture; therefore, this output level produced by the receiver internal noise should represent maximum usable gain, and in a receiver utilizing *agc*, a further increase in output would result in a reduction in gain. Accordingly, it was pointed out, the standard noise output is the actual noise output, due to internal noise, of an amplifier having maximum usable gain.

Reviewing the concept of sensitivity factor and its correlation with noise factor, Squires declared that an ideal noiseless amplifier, having maximum usable gain, would have a noise factor of *unity* as well as a sensitivity factor of unity.

While a noise factor of less than unity is not possible, he said, a sensitivity factor of less than unity is possible, indicating that the amplifier has unnecessarily high gain, and thus inefficient economy of design. The additional gain does not improve the sensitivity, because any increase above standard noise output results in compression and in the case of *agc*, an actual reduction in gain. Thus, according to Squires, when a receiver proves to have a sensitivity factor of less than unity, either its gain should be decreased with accompanying cost savings, or its noise factor should be improved to take advantage of the existing gain.

Measurement Techniques

Disclosing that in a practical amplifier the noise factor would be greater than unity, Squires added that if an amplifier had a noise factor of ten and maximum usable gain, it would have a sensitivity factor of unity. However, if the noise factor were improved to a figure of five times, and the gain unchanged, the sensitivity factor would now be two. Thus, although the noise factor had been improved, the existing gain could be considered insufficient to take full advantage of the improvement.

In an analysis of the technique for the measurement of sensitivity factor it was shown that it is similar to noise factor measurement. Since the two terms are so closely related, a combined measurement procedure is convenient. The use of a noise diode was described as making possible a measurement of sensitivity in conventional terms of volts at input to produce standard output.

In a description of some practical sensitivity-determination tests, the sensitivities of three receivers measured on channel 6 were shown:

Receiver	SF	NF	Peak Microvolts Sensitivity
A	36.3	24.9	444.0
B	0.1	9.8	15.7
C	2.0	9.6	61.6

Receiver *A* was described as having two *if* stages and designed to be a low-priced receiver intended for metropolitan sales. As a result, its gain, even with a relatively narrow bandwidth of 2.4 mc, was insufficient to take advantage of the noise factor of the tuner. It would require an increase in power gain of 36 to take full advantage of its rather mediocre noise factor, which would then result in an input sensitivity of 49.3 microvolts.

Receiver *B*, however, we were told, had much more gain than necessary, with four *if* stages, a bandwidth of 3.2 mc, a high gain tuner, as well as a two-stage video amplifier. This high gain resulted in the output stage overloading on the receiver internal noise. The sensitivity factor measurement was made by reducing the receiver gain by a known amount to prevent overloading, and correcting the resulting readings for the gain reduction. It was pointed out that again this means that the sensitivity, as stated in input voltage, is misleading since the receiver would be incapable of producing a minimum usable picture at that level because of overload. The receiver power gain could be reduced by a factor of ten without

(*Continued on page* 30)

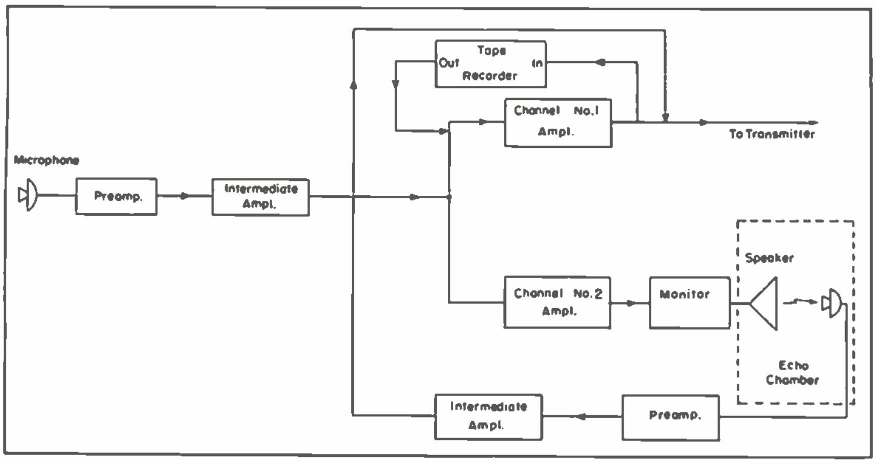


Figure 1

Dubbing setup with an echo-chamber speaker and regenerating-type recorder. For simplification, pads and volume controls have been omitted.

Tricks in TAPE RECORDING

by HERBERT G. EIDSON, Jr.

Chief Engineer, WIS and WIS-FM; Technical Director, WIST

Use of Tape Found to Permit Processing of Variety of Effects Through Splicing, Dubbing and Speed Control

(Above)

WIS operator Donley using a non-automatic type of splicer in repairing a broken tape.

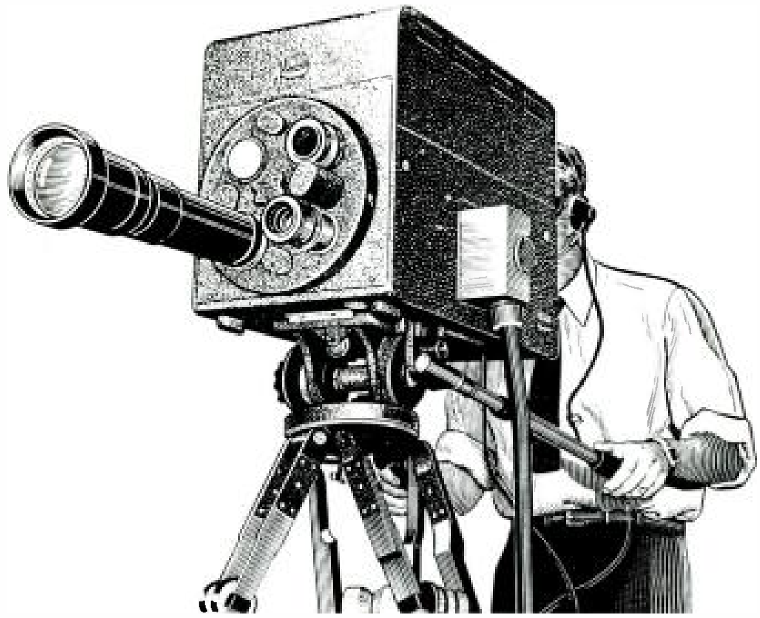
(Below)

The two tape machines currently in use at WIS. Model at right is fixed-portable. Both can be remotely controlled from the adjoining master-control room.

Tape Recording, not too long ago considered a pure and simple gadget with limited applications, appears to have routed its hobby status and become a solid member of the talk-and-listen society. According to a survey on tape's acceptance, practically all of the network stations and many of the independents have become consistent tape users.

One reason for tape's growing popularity has been its flexibility, a feature which has made it possible to introduce a variety of unique innovations in recording and playback. For instance, the use of tape at our station has enabled us to process many novel effects for programs. In one interesting application of this production technique, we were able to provide a striking introduction to a network show, to build up audience interest.

Originally, the program had been heralded by a few melodramatic chain-break spots such as . . . "——so don't miss Dimension ——X-X-X-X-x-x-x-x-x-——"; the row of fast repeating x's faded off into the distance, with an erie, hollow sound. After the network show became a regular portion of the week's schedule, these spot announcements from the network were discontinued. To help build a larger audience for this show, we decided to duplicate the spot and produce the odd sounds originally made by the network. A tape recorder, feeding back into itself, some amplifiers, and an echo chamber provided the eerie results. The hollow sound was, of course, caused by an echo chamber, while the repeating x's were made by the regenerating tape recorder, with the control operator slowly fading out the last portion of the spot to keep positive oscillations from building up to a crescendo, thus preventing overloading in all amplifiers and distortion. The system used is illustrated in Figure 1. It will be noted that the echo-chamber speaker reproduces that which is connected to the input of the two channel amplifiers: the output from the microphone on the far left and the slightly delayed sounds from the same source. The delay is prompted by the physical placement of the tape recorder play-back head; that is, an inch or two beyond the recording head. Thus, the tape must travel this short distance before the playback can reproduce it. This time delay amounts to .275 sec-



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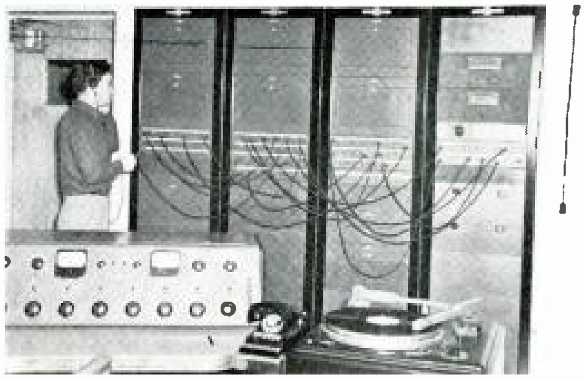
Section of master-control board that is directly related to the tape recorder operation. Buttons at top right control tape audio. Shield cones to right of right turntable contain remote push-buttons; see illustration on p. 28.

Patch panel in master-control room, used in setting up special effects between recording room and master-control board.



ond for the machine we use* when it is running at 7.5 inches per second. Since the output of the recorder reproduces what is being fed into its input, and its output is directly exciting its input, positive regeneration results; this will build up in several seconds, if the gain control in the input is not faded out.

There is another delay in the echo room which affords the hollow sound desired. The amount of delay, in this instance, can be controlled by placement of the microphone and speaker, and by the amount of electrical energy allowed to mix with the output of the upper channel shown feeding the transmitter in Figure 1. Without the tape recorder, the echo chamber could add depth or hollowness to anything fed into it, a good balance being found when the original is about 20 db greater than the returning echo being superimposed. The channel *1* amplifier acts as an isolating amplifier for the echo system. If it were not used in this manner, an acoustical howl would develop, due to the *round-robbin* arrangement of the echo amplifiers and their associated equipment.

It has been found that often there is need for a *Donald Duck* effect. Changing the speed from 7.5 inches per second to 15, with the flip of a switch, has provided the desired result. This is handy, too, for quick cueing of tape programs. With a little practice, operators can learn to understand every word spoken, even though the tape is running on playback at twice the speed at which it was recorded.

Splicing

When tape becomes old from constant use, it is sometimes subject to breakage even during a program playback. When this happens, it does not pay to attempt to splice the break. Instead, it is better to take the loose end and wind it quickly around the receiving reel and let her go again. Splicing can follow.

Two systems of spotting a point in the tape for later return are used at our station. In one method, a soft lead pencil is used to mark the exact spot to be removed with a cutter. If a general location is to be found, a slip of paper is used. As the machine operates in playback position the white paper is allowed to catch between the windings of the tape as it rolls itself up upon its receiving reel. When this reel is unwound in rewind position, the paper will fly out, and you have the section required for editing, etc.

Dubbing

Football games carried by our station, local, remote or network, are tape recorded in their entirety, using two machines. When the game is over, these tapes are carefully listened to by the sports editor for copy which can be used in a weekly sports review. Such sections are dubbed over to another tape. Using this system, no tape need be cut. Tapes can be erased and ready the next day for the following week's

(*Continued on page* 28)

*Ampex.

Patch panel and switch selector panels in recording room. Disc recorder is at left and small wire recorder at right under case.

Echo chamber in the WIS studios, a 12-foot room with hard plaster on all walls and ceiling. Only units in the room are the speaker and microphone.

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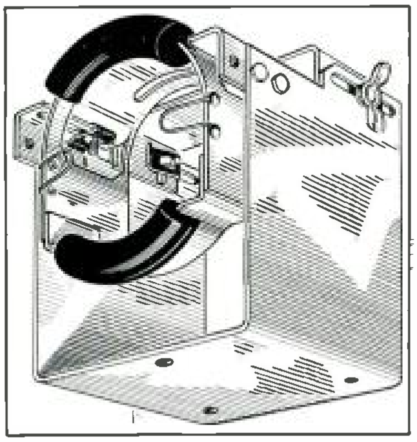
Hardware's Contributions to the Streamlined TV Chassis



Self-retaining *speed nut* used to fasten the focus coil rack onto the deflection yoke assembly. The nut is a U-shaped type, with spring arms to hold it in place while the fastening is being made.

by E. M. JEFFERY

Introduction of Recently-Developed Simplified Fasteners for Nut, Clip and Clamp Use in the Assembly of Deflection Yokes, Focus-Coil Racks, Transformers, Coil Forms, Tuners, etc., Found to Accelerate Production, Affect Substantial Time and Material Economies and Provide Improved Performance.

THE TV RECEIVER PRODUCTION LINE, which in the early days was usually replete with complex operations at practically every step, has now become a model of streamlined simplicity from stem to stern, not only electronically, but mechanically, too. In several instances, small pieces of hardware appear to have become major contributors to this trend. In one plant[1], fasteners[2] have been the helping hand, saving time and material in assembly.

In some applications the fasterners have been found to permit the performance of as many as eight operations in the time ordinarily required for one.

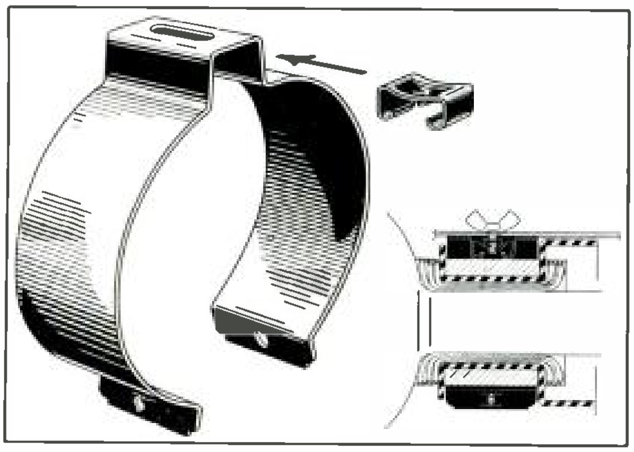
In the heart of one assembly[1], a deflection yoke clamp, made of heat-treated spring steel .025" thick, serves to mount the yoke to the hood and to provide a solid support for the picture tube. In one end lug of the yoke there's provision for a No. 6Z tapping screw which can be tightened by only one turn.

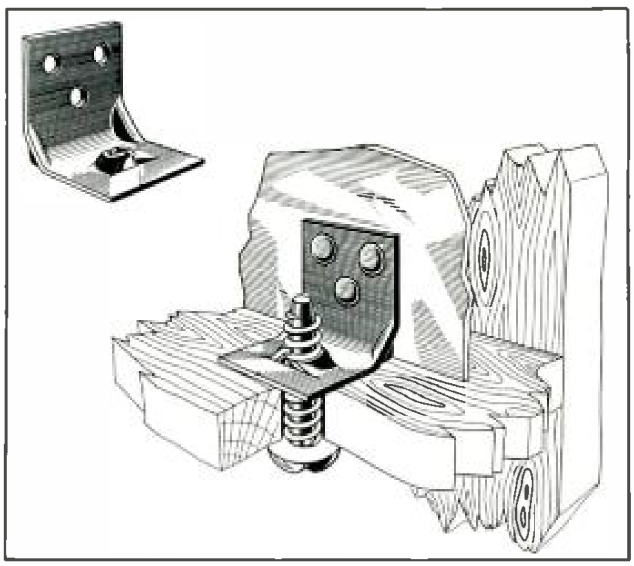
The channel section of the yoke acts as a floating *speed nut* retainer, provid-

[1]Philco. [2]Tinnerman Products Speed Nuts, Speed Clips and Speed Clamps.

*Used in Philco chassis.

Deflection yoke clamp used for mounting the yoke to the hood and provide a solid support for the picture tube.* Channel section (at the top of the yoke in the sketch) acts as a floating *speed nut* retainer.





Speed nut angle bracket for mounting chassis to the cabinet.

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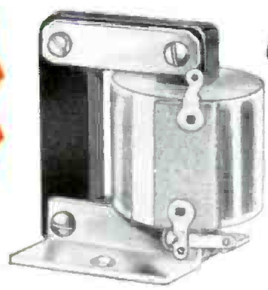

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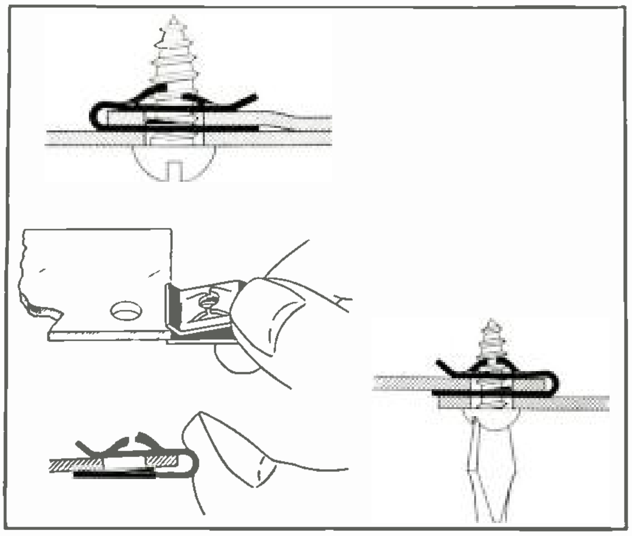


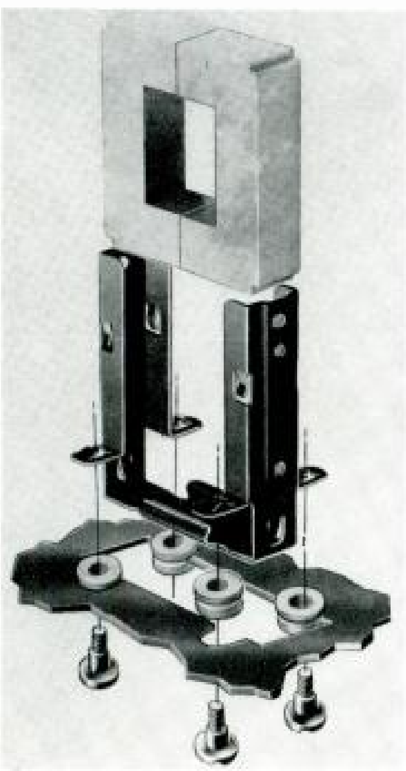
U-shaped type of *speed nut*, used on focus coil rack, to minimize v.bration and keep assembly from going out of focus.

Push-ons on studs on television window plate.

ing resiliency required to clamp iron cores onto the deflection yoke firmly, though not excessively. A special *speed nut* has been developed to serve as a floating nut in the retainer, although this is still in the experimental stage.

In another chassis application a self-retaining nut is used to fasten the focus coil rack onto the deflection yoke assembly. U-shaped, it is slipped on, holding itself in place and eliminating the use of an ordinary nut. When the bolt is tightened the locking action of the *speed nut* has been found to prevent vibration and keep the assembly from going out of focus.

Speed nut brackets used in the assembly and mounting of transmitters*.



Special fasteners have also been used in the assembly and mounting of transformers. Made of .020″ heat treated spring steel, this fastening retains two horse-shoe-shaped transformer cores in perfect alignment when mounted on the chassis. Four screws installed from the bottom side of the chassis engage *nut* mounting tabs. Grommets between the tabs and the chassis provide a *floating* mount and prevent contact between the assembly and the chassis. The bracket contains eight tabs to hold the core firmly in place by spring tension.

Chassis to Cabinet Mounts

The fastener has also been found to be useful in mounting chassis to the cabinet. In this instance, the hardware consists of a special angle-bracket (1″ wide, made of .040″ thick heat-treated spring steel), in which a basic *speed nut* is formed in one arm of the bracket. Four of the brackets are riveted to the chassis, and it, in turn, is secured to the cabinet by four 14B tapping screws. Replacing an expensive tapped bracket, this fastener has been found to result in a saving of time and material, amounting to nearly 45 per cent.

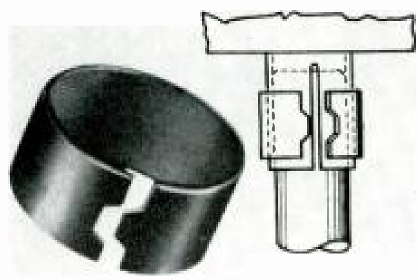
Push-on type *speed nuts*, which can be applied over integral studs and other unthreaded parts, are also features of many chassis assemblies. Their use has been found to eliminate inserts in plastics, and the machining of die castings. They can be applied by hand or by means of a countersunk tool which pushes the nut down on its stud and locks the assembled parts in firm spring tension.

It has been found that the push-ons can be applied to studs of different cross sections. When pushed onto a stud of D-shaped section they may be removed when given a quarter turn.

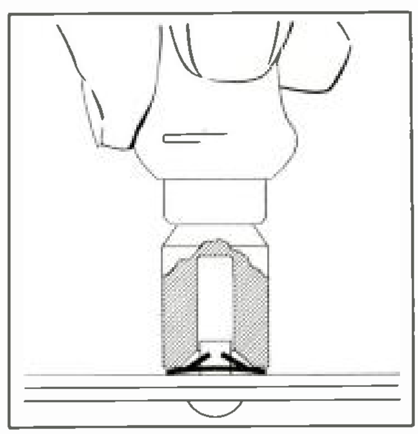
To secure dial and bezels on the cabinet, the push-ons can be applied to plastic studs protruding from the inner surface of the cabinet, a step that can eliminate threaded inserts.

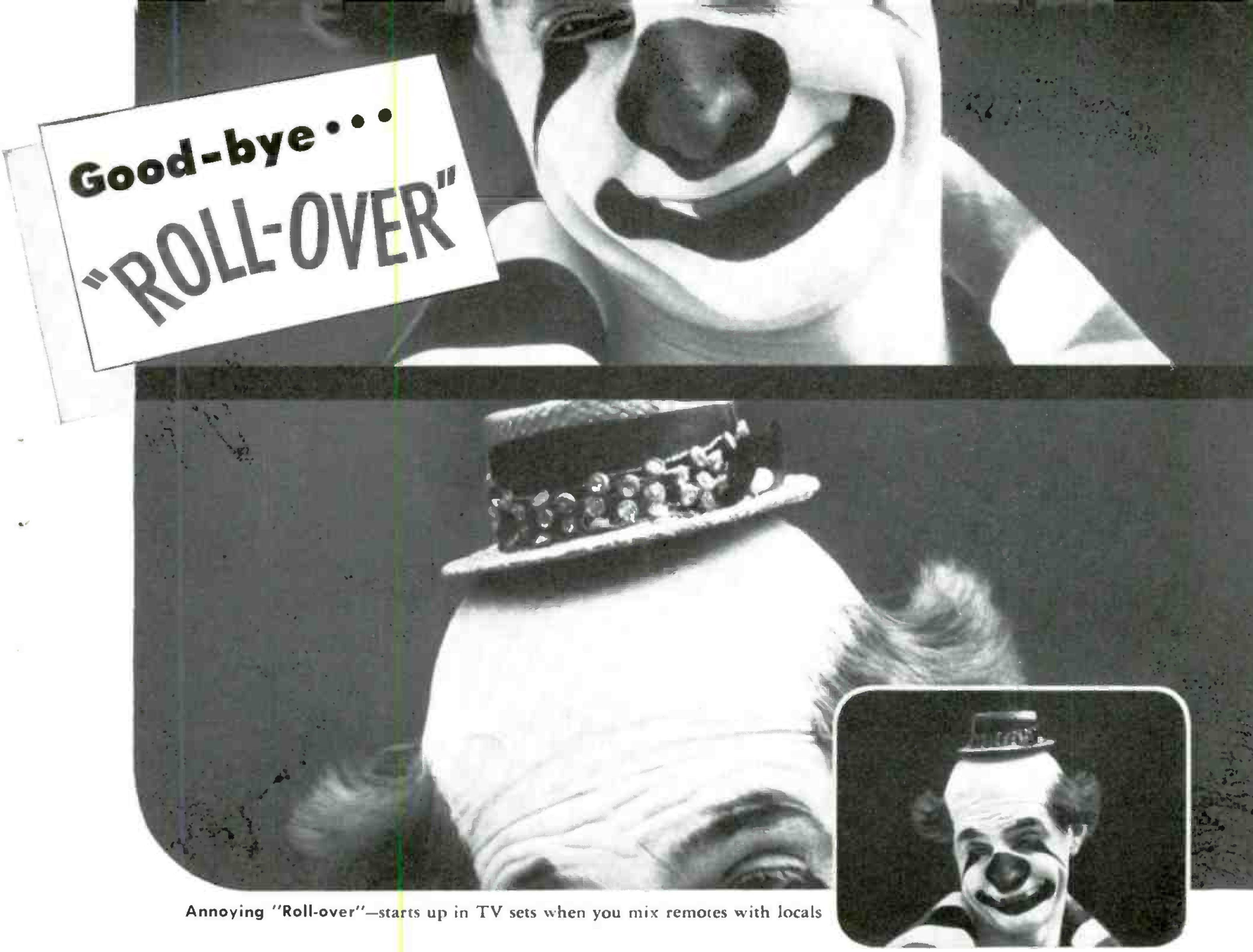
One manufacturer has been using the push-ons to install plastic window plates, which have eight studs molded integrally. The wooden cabinet, built to fit into a crevice in the window plate, receives the eight studs. As they pro-

Compression rings which are adaptable to thermoplastic hub-to-shaft assemblies, including tuning knobs and dial pointers.



Tool for applying push-on type of *speed nut* onto stud.





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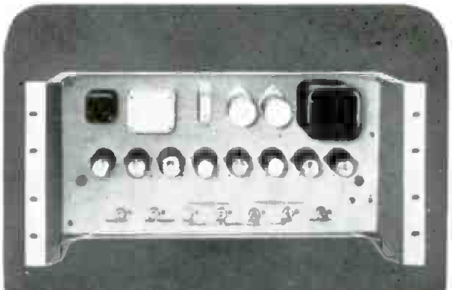

RCA GENLOCK, Type TG-45. This is the simple, automatic system that electrically locks two separate television pick-up systems together.

TELEVISION BROADCAST EQUIPMENT

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Kick presses employed in production of experimental fasteners. The experimental step involves the production of a design sketch, determination of the composition and gage of metal and equipment required, and the number of units to be made. This information is turned over to the development engineer, who, through consultation with the tool design superintendent, works out the design of tools necessary for production. The experimental part is then produced on a series of foot presses, with about 200 experimental pieces being produced, 50 going to the customer and 150 kept at the plant. The experimental setup is kept intact until the customer gives the part final approval.

View of press room where the fasteners are formed. Fasteners are made from coil ribbon steel. Strip steel is slit into required widths of a strip slitter. Slitting operation is claimed to afford a substantial saving in the production of the fasteners, because it reduces the amount of raw stock to be inventoried. The more complicated forming operations are done on wire forming machines, equipped with press heads and slides that operate the forming tools. (Each slide is operated by a roller in a cam track. Cams as well as dies are made at the Tinnerman plant.) Machines may produce as many as 15,000 completed pieces in an hour. Before the stock is run through the forming machine, it is lubricated thoroughly with a thin film of oil on either side. Excess of oil is wiped off.

trude through the cabinet the push-ons are pressed down over the studs, making the plate secure.

This assembly operation makes it unnecessary to drill holes in the plate and fasten the plate and cabinet together with ordinary bolts and nuts. It would, of course, be impractical to thread the plastic studs to receive ordinary nuts.

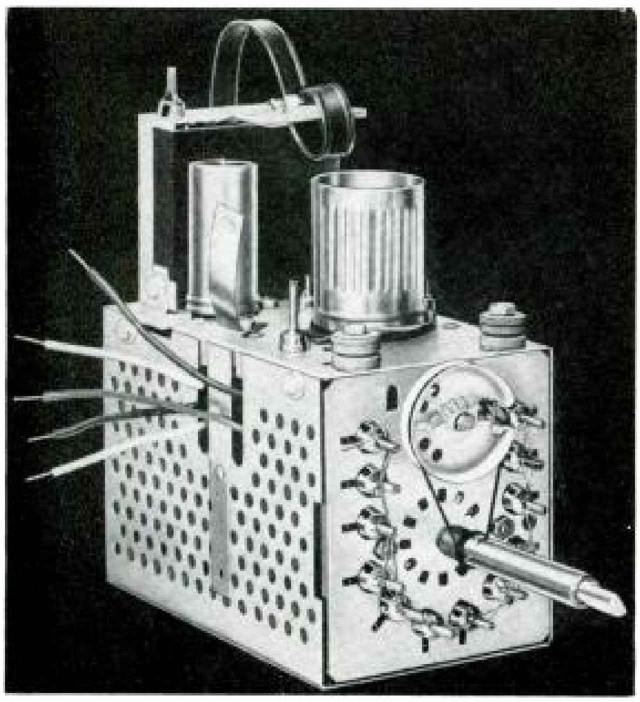
To accelerate installation of coil forms, tuning-type fasteners have been evolved. They hold the coil forms in position, provide tension on the adjustment screws, and mount the coil tubes securely on the chassis. The fasteners, a modification of the *speed nut*, are vibration-proof. In one chassis[1] there are 16 coil forms per tuner, each snapped into place with the fasteners. This technique is said to have affected a 35 per cent increase in the production rate and an assembly saving of 20 per cent over old coil-attaching methods.

Tubular clips, which can either provide a permanent lock or permit an unthreaded member to slide in or out, are being used on many chassis. The permanent type may be inserted into a hole, causing cam-like prongs to compress. Once inserted the prongs spring out to hold the clip in position. The hole in the second part of the assembly line is lined up with the first, and a rivet or other unthreaded member is inserted. The rivet engages the turned-in end of the clip, which bites the clip and locks it securely.

Tubular clips are being applied in a tuning assembly to lock into position pins that hold small pulley wheels. The spring tension grip prevents vibration from the rivets.

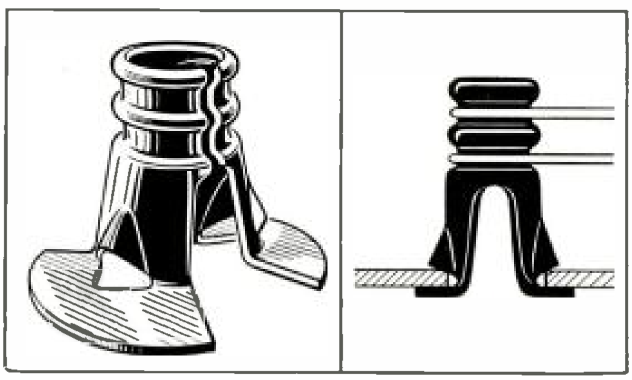
Compression rings, another modification of the *speed clip*, have also been found to be a chassis-production aid. They are adaptable to all types of thermoplastic hub-to-shaft assemblies, including tuning knobs and dial pointers. They can be used on hubs molded to engage a serrated or D-shaped shaft. After the knob is assembled on a ser-

(*Continued on page* 32)



(Left)

Speed nut type of tuning fasteners which hold coil forms* in position, provide tension on the adjustment screws, and mount coil tubes securely on the chassis.



(Above)

Tubular type of *speed clip* which serves as a guide post for dial pulleys. Compressed by hand, it is quickly inserted into a hole is a panel. When the pressure is released, expansion holds it firmly.

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- **CAN BE TAPPED THREADED, GROUND, SLOTTED**
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- **ADAPTABLE TO PRACTICALLY ANY SIZE OR SHAPE**

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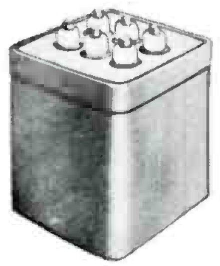
CHARACTERISTICS OF MYCALEX GRADE 410

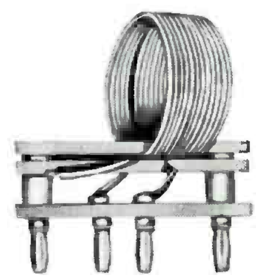
Meets all the requirements for Grade L-4A, and is fully approved as Grade L-4B under Joint Army-Navy Specification JAN-1-10

Power factor, 1 megacycle	0.0015
Dielectric constant, 1 megacycle	9.2
Loss factor, 1 megacycle	0.014
Dielectric strength, volts/mil	400
Volume resistivity, ohm-cm	1×10^{15}
Arc resistance, seconds	250
Impact strength, Izod, ft.-lb/in. of notch	0.7
Maximum safe operating temperature, °C	350
Maximum safe operating temperature, °F	650
Water absorption % in 24 hours	nil
Coefficient of linear expansion, °C	11×10^{-6}
Tensile strength, psi	6000

***MYCALEX* is specified by the leading manufacturers in almost every electronic category**

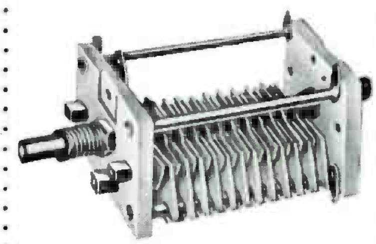


TRANSFORMER WITH MYCALEX-METAL ASSEMBLIES TO GIVE TIGHT SEAL

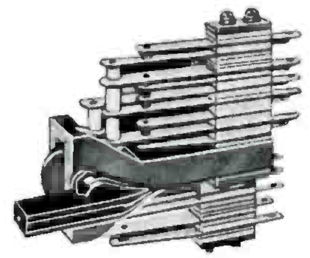


MYCALEX COIL HOLDER AND BASE

TERMINAL BASE ASSEMBLY FOR FIRE DETECTION EQUIPMENT



CONDENSER WITH MYCALEX LOW-LOSS END PLATES



MULTI-POSITION LEVER SWITCH WITH MYCALEX SPACERS

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A Proposed Numbered Frequency Band Subdivision Plan

by CHESTER W. YOUNG, Director, Electromagnetic Spectrum Research Laboratory

Proposed System Said to Permit Reference to Smaller Portions of Band in Simple Systematic Manner and Facilitate Identity of Frequencies Under Discussion Without Involved Explanatory Remarks.

THE PROBLEM OF FREQUENCY-BAND designations has concerned many and prompted several interesting studies.[1,2,3,4] As a result of one of these investigations, an AIEE committee evolved a frequency-band numbering designation plan, which was found to be a very commendable contribution. However, it was felt that further simplification could be achieved by a subdivision of these decades into nine groups each, and accordingly the system shown in Figure 1 was conceived.

A system, well known to those involved in wartime research, development, and field operations, used a similar method of designation which was convenient for discussion under conditions of military security. In this approach the spectrum was divided into frequency ranges of 390 to 1550 mc for the *L* band, 1550 to 5200 mc for the *S* band, 5200 to 11,000 mc for the *X* band, and 11,000 to 33,000 mc for the *K* band. These bands, whose limits had to be memorized, were broken into numerous subdivisions which also had to be memorized, e.g., the S_g band covered 2700 to 2900 mc. These subscripted divisions had a purposely haphazard arrangement, so that particular frequencies of one band could not be deduced after one had learned the frequencies of another band.

The proposed subdivisions, however, have a logical sequential arrangement of numerical order, each decade being subdivided similarly. As can be seen in the chart, the range of *1* to *2* of each decade has the number *1* preceding the band number. The range from *2* to *3* has the number *2*, the range from *3* to *4*, the number *3*, etc. Thus, a band designation of *7-10* would indicate the frequency range from 70 to 80 kmc, the rule being: The band subdivision number (the first number) designates the coefficient of the factor *10* and the band number (the second number) designates the exponent of the factor *10*, the product being the number of cycles per second of the lower limit of the band under discussion. Thus, the band subdivision *7-10* designates a lower band limit of 7×10^{10} cps and an upper band limit of 8×10^{10} cps. The band *7-10* would be read *seven ten*. In verbal conversation of bands and subbands differentiation would be made thus: *1-3* (*one three*) and *13* (*thirteen*). Bands of frequencies below one cps would be written as *3(−4)* and read *three minus four* to distinguish it from *3-4*, *three four*.

Two objections might be raised to such a system. The first would probably be: "If security does not demand coding, why not state the frequencies directly?" Where it is satisfactory to do so, it would be better to state the frequencies. (The author has found a tendency among some to continue the X and S-band nomenclature, even though security does not require it, because it is easier and for another reason which follows.) When speaking of techniques and equipment which are peculiar to certain bands, the statement of definite frequencies poses the question: "How do these techniques work at nearby frequencies?" Thus, when one desires to speak generally, it is quite often better psychology and less exacting to speak in band designations.

In the second objection there appears the point involving the reason for such a breakdown into smaller pieces than the decade designations of band numbers. This could be answered by the observation that in discussing the techniques of certain bands, e.g. *7*, *8*, *9*, and *10*, the techniques change considerably within the decade range. This would necessitate either breaking the bands into specific frequencies or smaller bands. The latter has been proposed.

It is understood that when specific frequencies can be stated in a discussion, it is advantageous to do so. Likewise, when band numbers will suffice for the discussion, they should be used. However, when neither of these meets the immediate conditions, it is advisable to have known to all participants a standard system which can be called

(*Continued on page* 30)

[1] *Proposed Frequency Band Designations*, page 471, Electrical Engineering, AIEE: May, 1947.

[2] *Proposed Frequency Band Designations*, page 672, Electrical Engineering, AIEE: August, 1949.

[3] Fleming-Williams, B. C., *The Frequency Spectrum* (Letter to the Editor), Wireless Engineer: May, 1942.

[4] Booth, C. F. *Nomenclature of Frequencies*, The Post Office Electrical Engineering Journal: April, 1949.

Right: Figure 1. Proposed numbered frequency band subdivision nomenclature.

Band Number	Coefficient:	1	2	3	4	5	6	7	8	9
	Scale	1	2	3	4	5	6	7	8	9 (10)
-10	100 pC (200 pC, 300 pC, 400 pC, 500 pC, 600 pC, 700 pC, 800 pC, 900 pC, 1000 pC)	1(-10)	2(-10)	3(-10)	4(-10)	5(-10)	6(-10)	7(-10)	8(-10)	9(-10)
-9	1mμC	1(-9)	2(-9)	3(-9)	4(-9)	5(-9)	6(-9)	7(-9)	8(-9)	9(-9)
-8	10mμC	1(-8)	2(-8)	3(-8)	4(-8)	5(-8)	6(-8)	7(-8)	8(-8)	9(-8)
-7	100mμC	1(-7)	2(-7)	3(-7)	4(-7)	5(-7)	6(-7)	7(-7)	8(-7)	9(-7)
-6	1μC	1(-6)	2(-6)	3(-6)	4(-6)	5(-6)	6(-6)	7(-6)	8(-6)	9(-6)
-5	10μC	1(-5)	2(-5)	3(-5)	4(-5)	5(-5)	6(-5)	7(-5)	8(-5)	9(-5)
-4	100μC	1(-4)	2(-4)	3(-4)	4(-4)	5(-4)	6(-4)	7(-4)	8(-4)	9(-4)
-3	1mC	1(-3)	2(-3)	3(-3)	4(-3)	5(-3)	6(-3)	7(-3)	8(-3)	9(-3)
-2	10 mC	1(-2)	2(-2)	3(-2)	4(-2)	5(-2)	6(-2)	7(-2)	8(-2)	9(-2)
-1	100mc	1(-1)	2(-1)	3(-1)	4(-1)	5(-1)	6(-1)	7(-1)	8(-1)	9(-1)
0	1C 300 MM	1-0	2-0	3-0	4-0	5-0	6-0	7-0	8-0	9-0
1	10C 30 MM	1-1	2-1	3-1	4-1	5-1	6-1	7-1	8-1	9-1
2	100C 3MM	1-2	2-2	3-2	4-2	5-2	6-2	7-2	8-2	9-2
3	1KC 300 KM	1-3	2-3	3-3)	4-3	5-3	6-3	7-3	8-3	9-3
4	10KC 30 KM	1-4	2-4	3-4	4-4	5-4	6-4	7-4	8-4	9-4
5	100 KC (200 KC, 300 KC, 400 KC, 500 KC, 600 KC, 700 KC, 800 KC, 900 KC, 1000 KC) 3KM	1-5	2-5	1KM 3-5	4-5	5-5	6-5	7-5	8-5	9-5
6	1MC 300 M	1-6	2-6	3-6	4-6	5-6	6-6	7-6	8-6	9-6
7	10MC 30 M	1-7	2-7	3-7	4-7	5-7	6-7	7-7	8-7	9-7
8	100MC 3M	1-8	2-8	3-8	4-8	5-8	6-8	7-8	8-8	9-8
9	1KMC 30cM	1-9	2-9	3-9	4-9	5-9	6-9	7-9	8-9	9-9
10	10KMC 3cM	1-10	2-10	3-10	4-10	5-10	6-10	7-10	8-10	9-10
11	100KMC 3mM	1-11	2-11	3-11	4-11	5-11	6-11	7-11	8-11	9-11
12	1MMC 300μ	1-12	2-12	3-12	4-12	5-12	6-12	7-12	8-12	9-12
13	10MMC 30μ	1-13	2-13	3-13	4-13	5-13	6-13	7-13	8-13	9-13
14	100MMC 3μ	1-14	2-14	3-14	4-14	5-14	6-14	7-14	8-14	9-14
15	1BMC 300mμ	1-15	2-15	3-15	4-15	5-15	6-15	7-15	8-15	9-15
16	10BMC 30mμ	1-16	2-16	3-16	4-16	5-16	6-16	7-16	8-16	9-16
17	100 BMC 3mμ	1-17	2-17	3-17	4-17	5-17	6-17	7-17	8-17	9-17
18	1TMC 300p	1-18	2-18	3-18	4-18	5-18	6-18	7-18	8-18	9-18
19	10TMC 30p	1-19	2-19	3-19	4-19	5-19	6-19	7-19	8-19	9-19
20	100 TMC 3p	1-20	2-20	3-20	4-20	5-20	6-20	7-20	8-20	9-20

C – Cycle per Second
pC – Picocycle per Second
mμC – Millimicrocycle per Second
μC – Microcycle per Second
mC – Millicycle per Second
KC – Kilocycle per Second
MC – Megacycle per Second
KMC – Kilomegacycle per Second
MMC – Megamegacycles per Second
BMC – Billion Megacycles per Second
TMC – Trillion Megacycle per Second
M – Meter
μ – Micron p = Picon = Micromicron

Characteristic Impedance

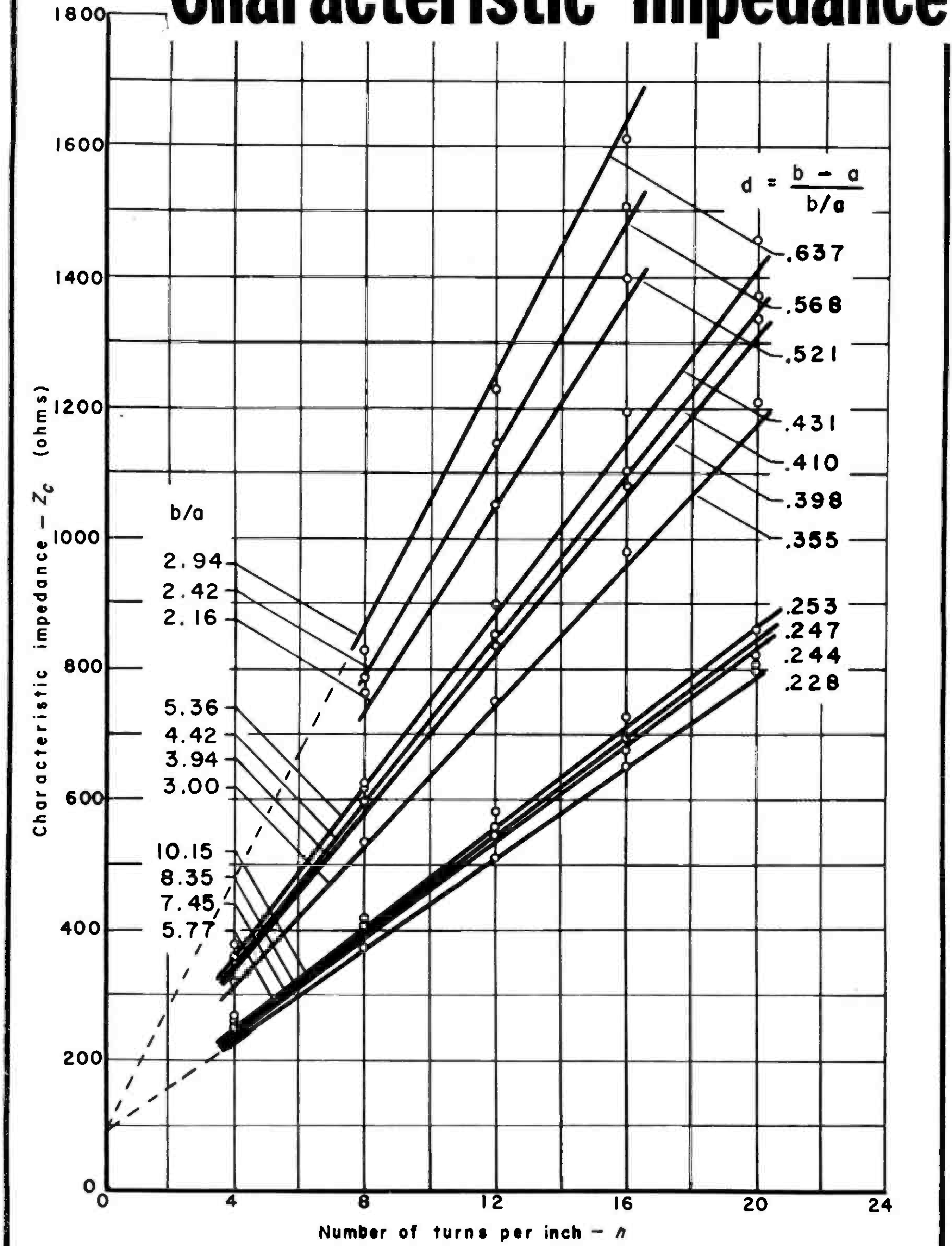


Figure 1
Impedance chart with experimental point plots: values of characteristic impedance plotted as function of n.

# of Shielded Coils

by CHARLES SUSSKIND,

Dunham Laboratory, Yale University

A NEW TYPE OF WIDEBAND power resistor proposed recently[1], having an almost constant resistance from 0 to 80 mc, called for, as a recommended design method, a coil of resistance wire enclosed in a shield, an approach based on transmission-line theory. As a preliminary step in the development of such a device, the characteristic impedance of similar coils wound with low-resistance wire was investigated, and an interesting result was obtained.

Reviewing the characteristics of a solenoid enclosed in a cylindrical shield, we find that such an arrangement constitutes a four-terminal network consisting of series inductance and resistance L and R, respectively, and shunt capacitance and conductance, C and G, respectively. If there is little or no resistance in either branch (or, alternately, if $R/G = L/C$), the characteristic impedance of this network is given by

$$Z_c = \sqrt{\frac{L}{C}} \qquad (1)$$

The inductance can be calculated very accurately by a method proposed by Moullin[2] and Phillips,[3] which will also yield a value for the capacitance between the coil and a grounded shield. The actual calculations are quite complex and involve the use of Bessel functions; furthermore, no account is taken of self capacitance which must be considered separately.

In an attempt to arrive at a simple semi-empirical formula for predicting the characteristic impedance directly, some coils (of varying coil diameter a and number of turns per inch n) were enclosed in several shields (of various shield diameters b), and measurements of short-circuit L and open-circuit C

(Continued on page 31)

[1]Krauss, H. L., and Ordung, P. F., Electronics; August, 1950.
[2]Moullin, E. B., JIEE; 78, 1947; and Proc. IEE; 133, 1949.
[3]Phillips, F. M., Proc. IEE; 138, 1949; and 77, 1950.

Tape Recording

(*Continued from page 16*)

games and their main points of interest.

Unusual games serve as the basis of special fifteen-minute programs. Here again two machines are used: one contains the first reel of the game and the second, portions of the big game with comments from our sports announcer.

Chrome-plated shield cones used to protect remote-control tape buttons. From top to bottom: Pilot lamp to indicate when recording is being done; button to record; *on* button and last, *off* button.

The machines are both stopped and started often, to permit recording of telephone conversations between the announcer and the coach of the local team or perhaps star of the game.

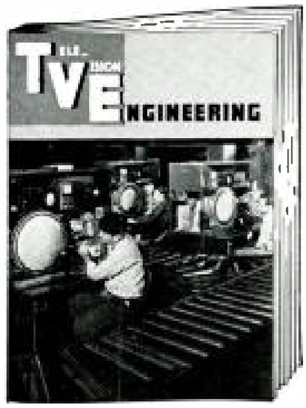
Some time ago, we were told how an opera star's day was saved by tape. The star had recorded one of her most popular renditions for one of the networks and upon playing back, it was found that one of her highest notes was a little flat. She could not be reached for a re-recording and the situation was quite desperate. A musically-inclined and enterprising audio engineer fortunately solved the problem. He searched through the tape in an effort to locate the same note, but on proper pitch. The note was found and dubbed onto another tape. Then this bit was spliced into the place of the flat note. The opera star's reputation had been saved and no listener knew that a dubbed note had been responsible.

A similar incident occurred at our station. One of our national accounts wanted a series of spot announcements disc recorded to serve as a master for pressings to be distributed to several hundred stations. But one man seemed to appeal to the client for the vocal work and this person had just resigned from our announcing staff. Nevertheless, he was brought back to town for this job which took the good part of one afternoon. All twenty of the short spots were put on tape for subsequent dubbing on platters. The next day our program director found that most of the announcements contained a fault. A key word that was singular had been pronounced as plural. Since it would have been embarrassing to recall this announcer to correct this mistake, editing was sought as a solution. And deft use of a pair of scissors did solve this problem. The *s* was cut out of the tape at the proper places, and the tape spliced together. All was well!

Have you ever heard *one* girl sing as a trio? One day, one of the unusually talented singers from a college glee club walked into our studios and wanted to know if one voice could be recorded three times carrying three different parts of a song to make up a trio. We thought it could be done and were willing to give it a try. We first recorded her pleasing voice taking the lead of the simple tune selected. This tape was set up to play into the second tape recorder while at the same time the alto part, sung by our talented visitor, was fed also into the input of this second recorder. A bridging amplifier, connected across the output of the first tape machine was fed into earphones which the artist wore. Thus, she was able to hear the lead part she had just sung, so she could keep exactly the correct pitch and tempo. When the two parts were safe on recorder 2, the process was repeated, playing back into the first recorder, while the vocalist heard her voice singing the two previous parts, simultaneously with her rendering the final tenor portion of the trio. Upon playing back the completed tape recording we were all surprised to learn how well it did sound; for the harmony was very good.

WIS recording room showing cabinets used for storing of tape and disc recording, and records of all activity taking place in this room.

Group Subscription Plan



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Noise Diode

(*Continued from page* 13)

deteriorating the performance and with accompanying cost savings. If the cost saving was negligible, the additional gain might better be used as bandwidth increase.

The third chassis, *C*, had nearly the optimum gain to fully utilize its noise factor, featuring three *if* stages with 2.4-mc bandwidth, a relatively high gain tuner, and a single video amplifier stage. An increase in power gain of two times would enable the receiver to take full advantage of its noise factor.

It was pointed out that these measurements emphasized the need for the correlation of noise factor and gain, for when the noise factor is poor, high gain is unnecessary, and when noise factor is good, high gain is essential. Thus, if the noise factor deteriorates from channel 2 to 13, the gain should decrease also, to maintain a sensitivity factor of unity. It is recognized, of course, Squires said, that the actual economies of production may prevent attainment of unity sensitivity factors, just as they prevent attainment of low noise factors. However, he felt that a sensitivity factor of unity provides a definite performance criterion.

Subdivision Plan

(*Continued from page* 24)

upon to facilitate mutual understanding. The advantage of the AIEE proposal, together with this additional subdivision, lies principally in its use as a tool permitting engineers working in different portions of the electromagnetic spectrum to communicate their ideas to each other.

Bright Beam Lamp

An adjustable industrial lamp, featuring a two-lens condensing system and reflector that is claimed to project an intense uniform beam of light for close work operations. A variable-size spot of light ranging from 5/8" to 3" diameter is obtained by sliding the focus tube back and forth. Has a removable daylight filter. Source of light is a small bright burning bulb. (Lindly & Company, 80 Herricks Road, Mineola, L. I., N. Y.)

Shielded Coils

(*Continued from page* 27)

were carried out on a bridge at 1 mc. well below the self-resonant frequencies of all the configurations. The values of characteristic impedance obtained from (*1*) were plotted as a function of *n*. Curves corresponding to various values of b/a are shown in Figure 1. It will be seen that the values of b/a for successive curves do not fall into any proper sequence.

Recognizing that the characteristic impedance depends on the coil-to-shield *spacing* as well as on the diameter ratio, the curves were re-labelled in accordance with the quantity

$$d \equiv \frac{b-a}{b/a} \qquad (2)$$

The values of *d* were found not only to follow the proper sequence, but the several curves which appear to be straight lines emanating from the same intercept on the $n = 0$ axis, were found to have slopes which are directly proportional to *d*. In other words, the characteristic impedance can be given by the general relationship

$$Z_c = Adn + B \qquad (3)$$

where *A* and *B* are constants. The straight lines shown are actually plots of (*3*), with $A = 153$ and $B = 90$ ohms, and are seen to fit the experimental points fairly well.

The value of characteristic impedance should be ideally independent of the coil length; nevertheless, end effects and other considerations will probably combine to change the values of *A* and *B* for lengths other than the one investigated (11″ coils in 12″ shields). Likewise, the wire size will probably affect the results very little; however, the values given for these constants are entirely correct only for the one wire size considered (.032″ diameter.) It might be possible to correlate *A* and *B* with the geometrical dimensions. At any rate, the investigation should be extended to determine the exact limits over which an equation of the form (*3*) obtains. The maximum values of *L* and *C* considered here were 58 μh and 26 mmfd, respectively. The only limitation known at present is that (*3*) fails for $b/a < 2$.

Credits

The work described was supported in part by the U. S. Army Signal Corps, under Research Contract W-36-039-sc-33649.

Personals

E. P. H. James, formerly vice president of the Mutual Broadcasting System, has been named director of public relations for the Corning Glass Works center project at Corning, N. Y.

W. L. Rothenberger has been appointed manager of sales operations of the RCA tube department. He will coordinate the activities of the renewal sales and equipment sales sections. *L. J. Battaglia* is now manager of the renewal sales field force. *L. F. Holleran* has been appointed manager of sales administration. *G. C. Brewster* has been named manager of the sales planning section, and *M. R. Stoecker* has been appointed manager of the product-distribution section. *Lawrence LeKashman* is now manager of the advertising and sales promotion section. *Howard S. Gwynne* has been appointed assistant to the general sales manager of the tube department.

Dr. R. M. Bowie has been appointed to the staff of the vice president as director of engineering of Sylvania Electric.

R. M. Bowie

Allan Easton, formerly chief engineer of the production engineering division of Teletone Radio Corp., is now chief of the microwave section of Radio Receptor Co.

William Hargreaves has been appointed vice president in charge of engineering of the Transicoil Corp., 107 Grand Street, N. Y. 13.

Robert V. D. Campbell and *Joseph Chedaker* have joined the staff of the research division of Burroughs Adding Machine Co., Philadelphia.

Robert B. Combs has joined the sales force of the Steiner Plastics Mfg. Co., Inc., 47-30 33rd St., L. I. C., N. Y.

Paul Sturgeon has been named manufacturer's rep for the Gramer Transformer Corp., covering New England. *Elmer Jordan* will cover Michigan and *L. Parker Nardine*, Philadelphia.

John A. Green, 6815 Oriole Drive, Dallas, Texas, is now sales rep in the southwest territory for Amperex Electronic Corp.

John M. Miller, Jr., has been appointed chief engineer of the TV and radio research and engineering department of the Bendix Television and Broadcast Receiver Division. Prior to this appointment, Miller served as a radar principal research engineer, was in charge of audio engineering for radio, phonograph and television, and was a principal TV receiver engineer.

TV Hardware

(*Continued from page 22*)

rated shaft, the compression of the ring harnesses the cold flow tendency of the plastic and prevents the knob from loosening.

These clips, made of heat-treated spring steel, are applied by means of a tool, consisting essentially of a cylinder which expands the rings and permits its being slipped quickly and easily over the hub. Thus, set screws and other inserts usually required to hold the hub can be eliminated.

On many chassis cable-type clips are being used to carry one or more cables or groups of wires fastened to a panel. The lip on this form of clip is pressed forward into a hole until the lip snaps tightly onto the panel.

As guide posts for dial pulley cords, tubular forms of *speed clips* are being used. These are spring-steel versions of the machined studs they have been designed to replace. Snapped into place they are said to retain their position rigidly.

Credits

The author is grateful to Tinnerman Products, Inc., Cleveland, Ohio, for supplying the assortment of illustrations and operational and application data for this manufacturing-trend review.

Instruments

RC Oscillator

An RC oscillator with a range of from 1-120,000 cps in five overlapping bands has been developed. Circuit uses a bridge stabilized type oscillator.

The dial is said to be calibrated to within 1½% ± .1 cps. Two output circuits are provided. One delivers 0-20 volts *rms* into a 1000-ohm lead. Second circuit has an internal impedance of 300 ohms with terminal voltage from 0-1 volt *rms*.

Hum, microphonic noise and the effects of power line surges are said to have been kept below .1% of the output signal, and harmonic distortion below .2% in the audio range.—*Model M-2; Southwestern Industrial Electronics Co., P.O. Box 13058, Houston 19, Texas.*

Frequency Converter

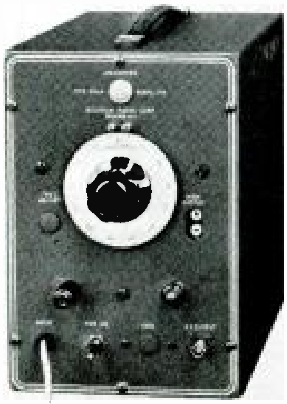
A frequency converter accessory having unity gain, designed for use with an FM signal generator* to provide frequency coverage from 0.1 to 55 mc, is now available. Combination of instruments permits continuous coverage from 0.1 to 216 mc.

Univerter is provided with a frequency increment dial which is calibrated in increments of 5 kc from +300 kc through zero to −300 kc. This permits making selectivity measurements on narrow band receivers.

The *rf* output voltage across a 53-ohm load connected at the unity gain jack is continuously variable from 0.1 microvolt to 0.1 volt by means of the signal generator attenuator. The gain is constant within ±1 db over the entire frequency range of the instrument.

The output impedance at the unity gain jack is about 53 ohms.—*Type 207-A Univerter; Boonton Radio Corp., Boonton, N. J.*

*202-B.



TV Parts

Stamped Television Tuner

A TV station selector having an *if* output of 41.25 to 45.75 mc has been developed.

The tuner is of the rotary switch type employing inductances for each of the 12 channels. Inductances and wiring are die stamped on bakelite wafers. Tuned circuits are employed in the input, *rf*, oscillator and mixer circuits. The *rf* stage uses a 6BC5 while the mixer and oscillator use a 6J6.—*Franklin Airloop Corp., 43-20 34th St., Long Island City, N. Y.*

Phenolic Molded Cap Electrolytics

Plug-in and twist-prong electrolytics featuring a phenolic molded cap structure that hermetically seals the container have been announced. Available for high or low voltage requirements.—*Illinois Condenser Co., 1616 North Throop St., Chicago 22, Ill.*

Miniature Paper Capacitors

Miniature paper tubulars with a capacitance range of from .001 to 1 mfd have been announced. They are assembled in metal tubes with glass-metal terminals and are said to operate from temperatures of from −55° to +125° C. Voltage operation is 100 to 600 *vdc*.—*Type PG; Pyramid Electric Co., 1445 Hudson Blvd., North Bergen, N. J.*

RF Capacitors

Bypass and feed-through vehicular capacitors for the suppression of *rf* interference are now available.

Capacitors are hermetically sealed. For operation over temperatures from −55° C to +85° C. Non-inductively wound with short internal connections.

Provided with three bracket styles: NF 10072 is equipped with a universal mounting bracket. All have terminal studs with fastener screws.—*MC and NF Series; Cornell-Dubilier Electric Corp., South Plainfield, N. J.*

Production

Splice Caps

Splice caps for *pigtail* splicing of electrical wires are now available in an open-end construction which is said to facilitate their installation and inspection.

Only two sizes of splice caps are said to be required for all most frequently used combinations of two or more wires ranging all the way from two No. 18 to three No. 8. Snap-on insulators of fixed insulating value are said to eliminate necessity for taping of joints and insure against insulation breakdown in service.

A hand-operated *pres-sure* tool installs both sizes of splice caps. This tool features a four-way crimping action, which is said to be equally effective on solid or stranded or on combinations of solid and stranded wires.—*Buchanan Electrical Products Corp., 1290 Central Ave., Hillside, N. J.*

Coil Winders

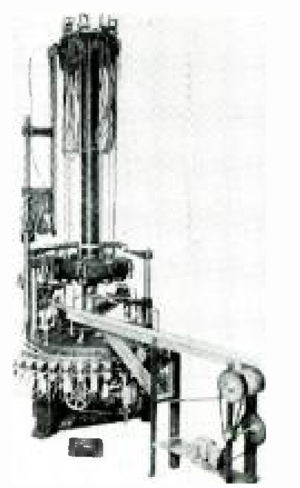
Coil winders for automatic paper feed and for manual paper feed have been announced. Featured are speeds up to 3000 rpm for automatic operation, with 25 inserts a minute said to be obtainable with single or laminated sheets. Winders are equipped with automatic wire-turn counters.—*No. 107, 108; Universal Winding Co., P.O. Box 1605, Providence, R. I.*

Automatic Bulb Blowing

An automatic bulb blowing machine is now available. Machine is 130" high with no side supports.

Featured are motor-operated cutting knives to replace old style flame cutting, chucks to reduce the waste of tubing ends and an airblo system on the lower part of the unit for adjustments.

The machine can be equipped with automatic tube feed elevator which returns the feeding chuck automatically to leading position. Provides speeds up to 2400 per hour. Bulbs can be blown into a mold of any design or shape, up to 2½" *od* by 5½" overall length, including stem or tubulation.—*Kahle Engineering Co., North Bergen, N. J.*



VWOA News

The 26th Dinner Cruise

THE TWENTY-SIXTH ANNIVERSARY of VWOA, celebrated on February 25 during the annual dinner-cruise at the Hotel Astor in New York City, featured presentation of the Marconi Memorial Medals of Achievement to George F. Shecklen, executive vice president of Radiomarine Corporation of America; J. R. Poppele, vice president and chief engineer of WOR and TBA prexy; Louis G. Pacent, president of the Pacent Engineering Corp.; and Haraden Pratt, vice president and chief engineer of the Mackay Radio and Telegraph Co.

Another highlight of the evening was the annual award of the Marconi Memorial Wireless Pioneer Medal to Charles D. Guthrie, one of the earliest of pioneers in Navy wireless activities and recently radio supervisor of the War Shipping Administration; and E. C. Cochran, also a Navy wireless pioneer, who recently retired from the FCC after a lifetime of government service.

In presenting the Marconi Memorial Medals of Achievement, for pioneering work in radio and communication, to the four veterans, ye prexy revealed that each of the oldtimers had quite a record of contributions on the books. For instance, during the early part of Pacent's career, many short-wave experiments were conducted with Marconi. The idea of transmitting American short-wave signals to Europe actually originated with Pacent, who presented the plan to the Radio Club of America's board of directors prior to World War I. Years later, in 1921, the first short-wave transatlantic message was transmitted from Greenwich, Conn., by station 1BCG and received in Scotland.

Renewing Poppele's career, which began officially at the outbreak of World War I, when he served as a radio operator on commercial vessels and in the Army Transport Service, ye prexy said that speaking instead of keying seemed to be of greater interest to Jack and so in '22, a short time before WOR began operating, he became one of the station's two engineers. A few weeks after the station went on the air, he became its chief and only engineer.

Today, in addition to being chief engineer of WOR and heading a staff of 115 technicians, he is a vice president of the station and a director of the Mutual Broadcasting System. As such, he is in charge of all AM, television, FM, and facsimile engineering projects for General Teleradio, Inc. (WOR).

WHEN YOU CHANGE YOUR ADDRESS

Be sure to notify the Subscription Department of TELEVISION ENGINEERING, 52 Vanderbilt Avenue, New York 17, N. Y., giving the old as well as the new address, and do this at least four weeks in advance. The Post Office Department does not forward magazines unless you pay additional postage, and we cannot duplicate copies mailed to the old address. We ask your cooperation.

Industry Literature

Stackpole Carbon Co., Electronic Components Division, St. Marys, Pa., has issued a 42-page catalog, RC-8, which covers standard lines of fixed and variable resistors, line and slide switches, iron cores, choke forms and capacitors. Also includes data on single, dual-shaft and special purpose volume controls, 3-amp slide switches, and non-metallic cores in *U*, *E*, width control and segmented deflection yoke types.

Electro-Voice, Inc., Buchanan, Mich., has released a bulletin, 160, illustrating and describing a *Slimair* dynamic microphone.

E. H. Titchener and Co., Binghamton, N. Y., has issued a folder covering the design and production of wire forms, welded wire assemblies, wire and strip metal assemblies, and light stampings. Contains cost saving idea information.

A. W. Franklin Manufacturing Corp., 43-20 34 St., Long Island City 1, N. Y., have published a 20-page catalog describing specifications for acorn, picture tube, ceramic, laminated, miniature, octal and wafer type sockets; terminal strips, connectors, plugs and pin board assemblies. Includes details on circuit stamping process that can be used for loop antennas, amplifier circuits, cable assemblies and television tuners.

The Thomas and Betts Co., Elizabeth 1, N. J., has released a 40-page bulletin, Sta-Kon 61, detailing pressure terminals and connectors for applications on wire sizes from 26 through 250 mcm. Featured is a section listing Armed Forces procurements numbers with the corresponding catalog numbers.

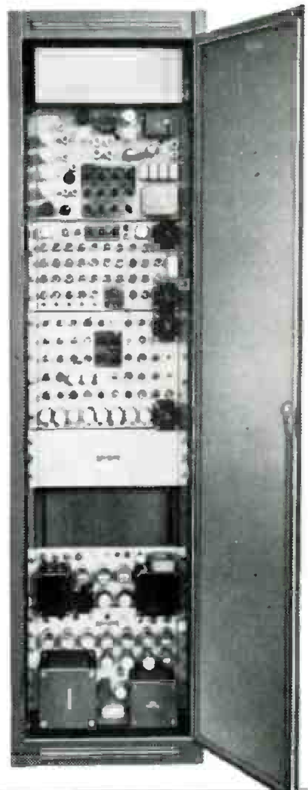
The Sponge Rubber Products Co., Shelton, Conn., has released a 20-page booklet covering the properties of and test data on cellular rubber. Covered are grades of sponge rubber, compression influence of heat and aging, flexing, tensile and elongation, heat and sound insulating value, staining, resistance to oils and chemicals, toxicity, and cementing.

Buchanan Electrical Products Corp., 1290 Central Ave., Hillside, N. J., have issued a 4-page bulletin, 750, describing pressure connectors for solderless splicing and terminating of electrical wires.

Triad Transformer Mfg. Co., 2254 Sepulveda Blvd., Los Angeles 64, Calif., has published a catalog, TR-51, detailing a line of electronic transformers. Included are a series of transformers for regulated power supplies, television chassis and details on a hi-fidelity amplifier kit.

Kay Electric Co., Pine Brook, N. J., has released a 64-page catalog, A51, covering audio and microwave measurement instruments, sweeping oscillators, marker oscillators, analyzers, attenuators, frequency meters, reflectometers, etc.

Manufacturers Engineering and Equipment Corp., 2115 Stratford Ave., Willow Grove, Pa., has published an 8-page bulletin describing *Sweepmaster I*, a video sweep generator which can be used for alignment of broadband amplifiers, checking proper termination of cables and location of self-resonant components.



Briefly Speaking . . .

Electrostatic picture-tube production, prompted by the cobalt-copper conservation program, has begun to roll along at quite a pace in over a dozen plants. Tubes of the 14, 17 and 20-inch rectangular types are being featured in most runs. . . . Dr. James H. Mulligan, Jr., assistant professor of electrical engineering at N. Y. U., is now supervising a Signal Corps *rf* signal-voltmeter research project in the electrical engineering laboratories of the university. . . . The next few months will witness an assortment of interesting conferences on television and allied topics. On Saturday, April 14, the Cincinnati section of the IRE will hold its 5th annual meeting, which will feature papers by R. F. Guy of NBC, R. G. Clapp of Philco, Harold L. Brouse of Crosley, R. B. Dome of G. E., A. V. Loughren of Hazeltine and Jerry B. Minter of Measurements, who will cover ultrahighs and color television. On April 21, at the Copley-Plaza Hotel in Boston, the 5th annual New England Radio Engineering meeting will be held. On April 20-21 on the campus of the Southern Methodist University in Dallas, Texas, the Southwest IRE conference will be held, and on May 23, 24 and 25, at the Biltmore Hotel in Dayton, Ohio, there'll be a national conference on airborne electronics with talks on antennas and components which can be used in radar and airborne television. . . . A 4-page house organ describing klystrons, test sets for the *hf* band, etc., has been released by Burlingame Associates and its affiliate, Brujac Electronic Corp., 103 Lafayette St., N. Y. 13. . . . Robert C. Tait, president of Stromberg-Carlson Co., is now co-chairman of the joint electronics industry committee which was established to coordinate all industry mobilization activities. . . . The 7th annual Pacific Electronics Exhibit will be held at the Civic Auditorium, San Francisco, California, August 22-24. . . . L. W. Howard is now WCEMA representative for the radio industry coordinating committee and also for the Chicago Parts Show. The WCEMA executive staff is now headed by Paul F. Byrne, who is prexy; Noel Eldred, vice prexy; Arthur Davis, secretary, and Norman H. Moore, treasurer. . . . Dr. E. H. Schulz, chairman of the electrical engineering department at the Armour Research Foundation of Illinois Institute of Technology, has been named president of the National Electronics Conference for 1951, which will be held Oct. 22-24 at the Edgewater Beach Hotel in Chicago. . . . A third plant in Long Island City has been acquired by the Insuline Corp. of America. . . . The International Rectifier Corp. has added a second story to its plant at 6809 Victoria Ave., Los Angeles 43, Calif. . . . The National Electronic Manufacturing Corp. has moved to 4202 Vernon Blvd., Long Island City, N. Y. . . . Harold Engstrom, supervisory engineer of Sylvania Electric, was guest speaker at a recent N. Y. U. symposium and discussed *Preparation for the Work Simplification Program.* . . . Stanford University has announced that they are building two new electronics laboratories which will cost about $250,000. The labs will consist of a unit for applied research and a center for student electrical engineering activities. Construction of the latter has been made possible through a gift from Hewlett-Packard Co. Dean Frederick E. Terman of the School of Engineering will direct the activities in the new labs.

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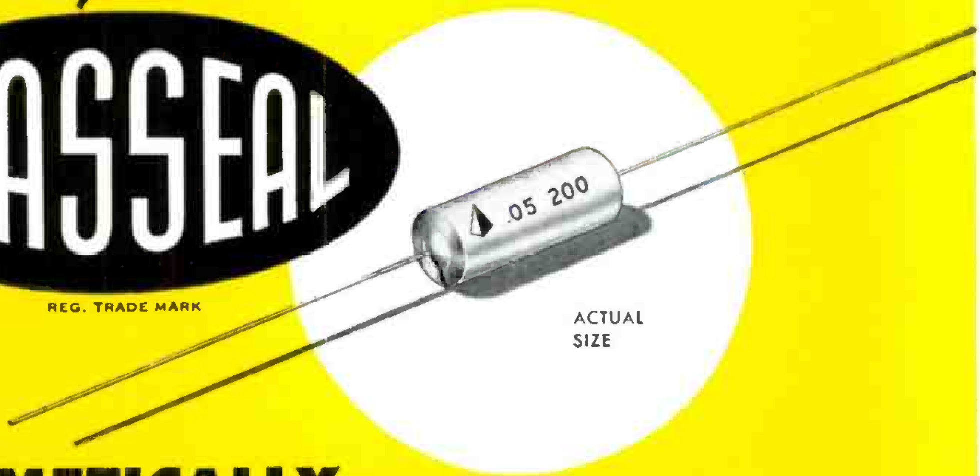

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