

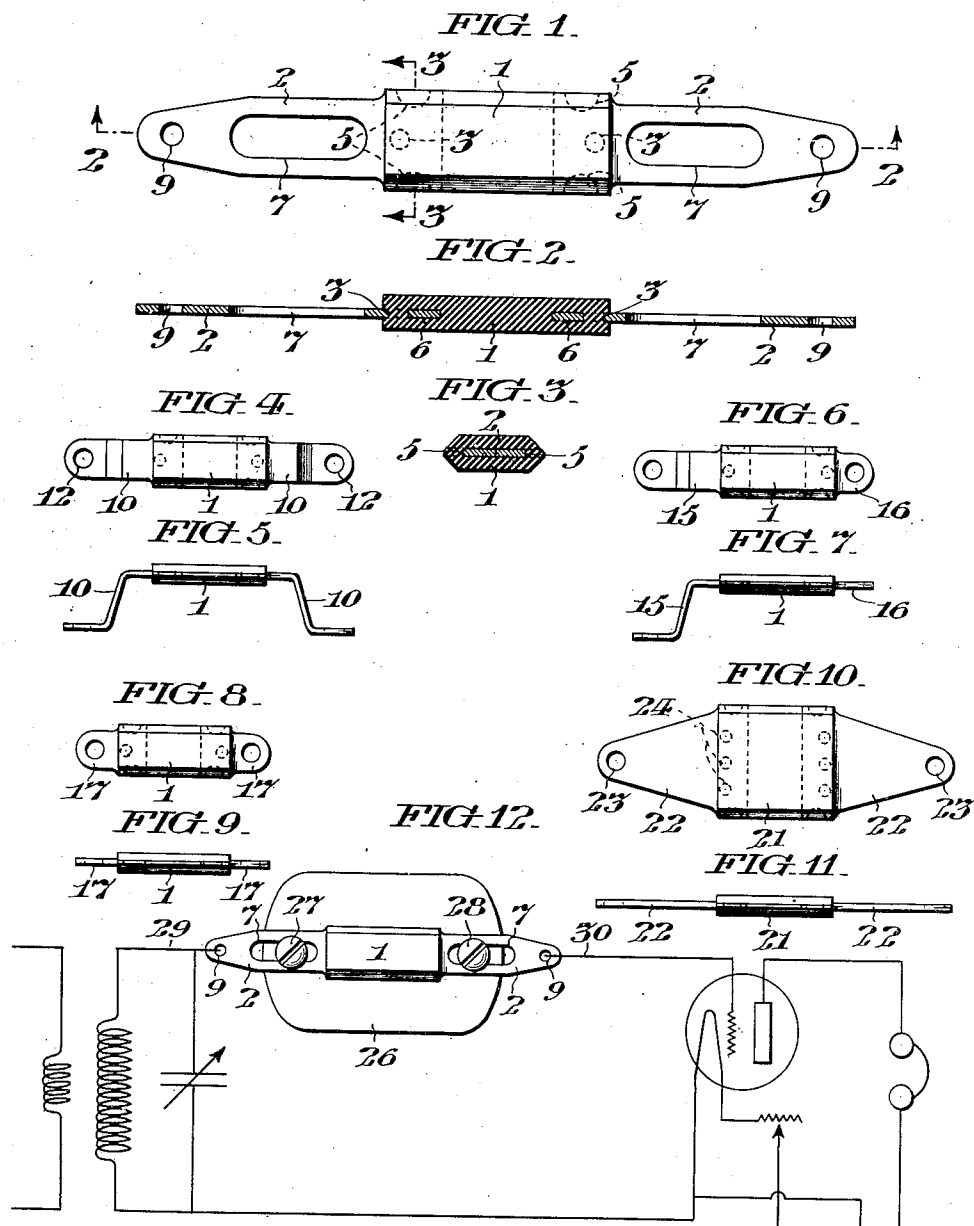
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T. A. SWARTZ ET AL
ELECTRICAL RESISTANCE UNIT

1,972,411

Filed Aug. 26, 1929

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 13

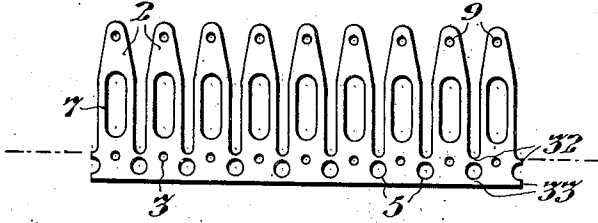


FIG. 14

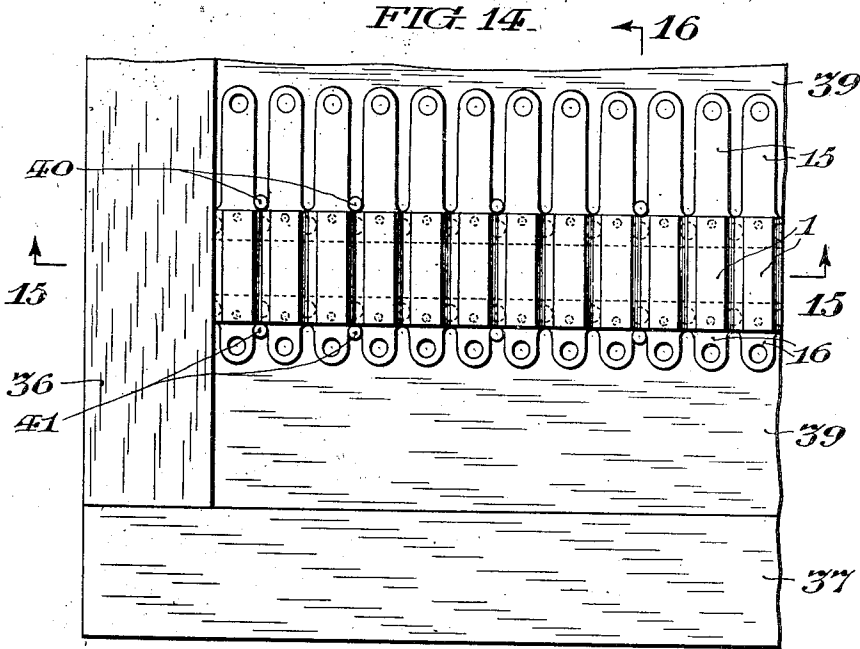


FIG. 15

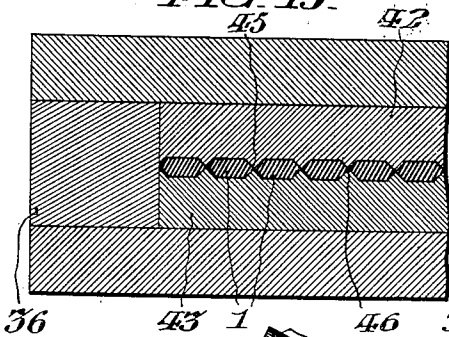


FIG. 16

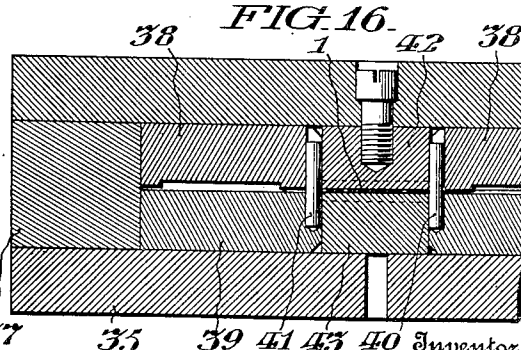
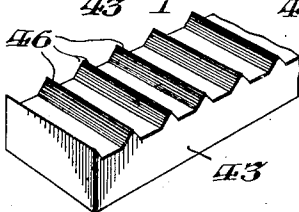


FIG. 17



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UNITED STATES PATENT OFFICE

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ELECTRICAL RESISTANCE UNIT

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Application August 26, 1929, Serial No. 388,359

5 Claims. (Cl. 201—63)

This invention relates particularly to the formation of electrical resistance units that are capable of replacement and is especially directed to their means of attachment and to the method of manufacture of said units.

The principal objects of this invention are to provide readily replaceable units which are particularly well adapted for use as grid leaks for radio detector circuits and which are capable of direct connection with the condenser and the grid circuits of such detector.

Other objects of this invention are to provide a device of the character set forth which is noiseless in operation, occupies a comparatively small amount of space and which is adaptable to varying distances between points of connection.

Further objects of this invention are to provide resistance units of the type contemplated that may be manufactured in gangs, thereby not only greatly facilitating the handling and shipping of said units, but considerably reducing their cost of manufacture.

This invention also comprehends the method by which such resistance units may be manufactured in gangs and includes novel means for embedding the terminals therein.

Specifically stated, the form of my invention as hereinafter set forth comprises resistance units which are produced in strip or gang formation and readily separated from such strip by bending back and forth along a restricted groove or furrow. The metallic terminals being in suitably perforated sheet strip form are placed in a mold and plastic resistance material subjected to pressure in said mold is caused to be embedded in the perforations provided therefor, said strip being perforated in the line of separation of the individual units so as to facilitate the breaking apart of said units from the gang thus formed.

This invention also includes all of the various novel features of construction and arrangement as hereinafter more definitely specified.

Units of relatively high resistance values, say from fifty thousand to ten million ohms, heretofore in use, while they may be satisfactory from an electrical standpoint, do not lend themselves readily to a permanently secure attachment in an electric circuit and occupy considerable space. The conventional form of grid leak, for instance, which is usually a resistance of the order of one to three million ohms, consists of a tubular form having conical ends, and in order to place this device in the electric circuit a special mounting device, usually in the form of a spring clip, must be provided, which occupies an amount of space

which is out of all proportion to its usefulness. Another disadvantage which arises from the use of such spring clips is that they frequently result in poor contacts, sometimes due to the loss of resiliency of the spring, which poor contacts in turn are the cause of objectionable foreign noises in the reproducer.

Therefore, it is found highly advantageous to provide a resistance unit in which the use of spring clip contact members is avoided and permanently connected lugs employed for making contact with the resistance, said lugs being so designed that the unit as a whole may be attached directly to and across a condenser by means of eyelets or screws, whereby not only is the space which is ordinarily occupied by the separate mountings conserved, but the cost of manufacturing, assembling and attaching such mountings is saved, and the objectionable noises caused by poor contacts completely eliminated.

In the accompanying drawings, Figure 1 is an enlarged plan view of one form of resistance unit embodying the essential features of the invention; Fig. 2 is a central vertical longitudinal sectional view of the resistance unit shown in Fig. 1, taken on the line 2—2 in said figure; Fig. 3 is a transverse vertical sectional view of said resistance unit taken on the line 3—3 in Fig. 1; Fig. 4 is a plan view illustrating a modified form of resistance unit, the contact members of said unit being capable of being bent for terminal adaptation; Fig. 5 is a side elevational view of the unit shown in Fig. 4; Fig. 6 is a plan view of another modification of resistance unit; Fig. 7 is a side elevational view of the unit shown in Fig. 6; Fig. 8 is a plan view of another modification of resistance unit; Fig. 9 is a side elevational view of the unit shown in Fig. 8; Fig. 10 is a plan view of still another form of resistance unit; Fig. 11 is a side elevational view of the unit shown in Fig. 10; Fig. 12 is a diagrammatic view of a radio detector circuit, showing the improved resistance unit of the form illustrated in Fig. 1 assembled therein; Fig. 13 is a plan view illustrating a sheet metal strip of connected contact members such as is embodied in the unit shown in Fig. 1 adapted to be molded into the gang resistance elements; Fig. 14 is a fragmentary plan view of the base flask or lower section and coping of the mold showing the resistance units of the type illustrated in Fig. 6, therein molded in gang formation; Fig. 15 is a fragmentary transverse vertical sectional view of the assembled mold taken transversely through said units on the line 15—15 in Fig. 14; Fig. 16 is a frag-

mentary transverse vertical sectional view of the assembled mold taken longitudinally of the units therein on their line of separation as indicated by the line 16—16 in Fig. 14; and Fig. 17 is a perspective view of a fragment of the lower former bar of the mold.

In said figures the unit, in the preferred form shown in Figs. 1, 2 and 3, comprises a resistance element 1 which is usually made of a moldable material, and a pair of duplicate contact lugs 2 made of sheet metal, preferably whitened copper, one end margin of each of which lugs is provided with punched-out apertures as at 3 and 5 and is molded or pressed into intimate contact with the resistance element at the opposite ends of said element as indicated at 6.

In this form of the invention the lugs are each provided with an elongated slot 7 which may be of such length that, in combination with the over-all length, the unit is capable of attachment to most of the common types of grid condensers. In other words, by virtue of the slots 7 the unit is adaptable to any center-to-center distance between points of attachment provided in most of the condensers commonly used.

Each of the lugs 2 may be tapered toward its free end and provided with the perforation 9 to afford a convenient means for attachment of wires for completing the electric circuit to and through the unit. When the wires are to be soldered to the lugs, it is particularly desirable that the lugs be of tinned copper, whereby the time element in soldering as well as the heat required is materially reduced, which is an essential consideration if the resistance element is of such a character that it might be injured by excessive heat.

In Figs. 4 to 11 inclusive, the resistance units are shown provided with lugs of varying forms and lengths. For instance, as illustrated in Figs. 4 and 5, the element 1 has the lugs 10 which are elongated and bent into the form shown and are provided with perforations 12 for the reception of the attaching members as well as the circuit connecting wires. The device in this form is readily adaptable by bending to variations in center-to-center distances between fixed points of attachment.

As shown in Figs. 6 and 7, the resistance element 1 is provided with a combination of long and short lugs, the longer lug 15 being capable of flexing or bending to adapt it to different distances between points of support, while the shorter lug 16 may be attached at a different level.

As shown in Figs. 8 and 9, the resistance element 1 is provided with short lugs 17 which may be used when adjustability for mounting purposes is not required. Units of this type may be made of specific dimensions for special locations in the assembly, and when there is no necessity that the resistance element be raised to provide clearance when mounted.

In Figs. 10 and 11, the resistance element 21 is flat in cross section like all of those above described, but is wider, and is provided with correspondingly wider lugs 22 tapered towards their free ends and provided with perforations 23 for the reception of the attaching screws and wires and perforations 24 for anchorage in the element. The purpose of this type is to provide a unit of lower resistance value, the wide lugs and flat form also providing greater surface area, which is useful in dissipating heat generated when heavy currents are passed through the unit.

In Fig. 12 is illustrated one form of applica-

tion of the devices above described. In this figure is shown a simple and well known type of radio detector circuit, on the condenser 26 of which the grid leak shown in Fig. 1 is mounted and is attached to the condenser contacts by means of screws 27 and 28, the assembly being connected in circuit by wires 29 and 30 attached to the lugs 2 through the perforations 9, and preferably soldered thereto.

In any of the forms described the device is readily adaptable for use in the grid circuits of any of the well known radio receiving apparatus now on the market, by virtue of the construction of which device the contacts to the resistance medium serve also as the mounting for the unit, which not only results in a great saving in space but provides a contact for the unit which is permanent and reliable.

The new resistance unit hereinbefore described has made possible a unique and economical method of manufacture. Under this method the lugs are punched from sheet metal, preferably copper tinned on both sides, the punching being done in such manner that the lugs remain connected together in strip form as shown in Fig. 13; in other words, the lugs are produced in a series, the strip which unites the lugs being punched out to afford the apertures 3 and 5, so that the individual adjacent lugs are connected only by narrow webs 32 and 33 of metal left between them, whereby the units may be readily separated by bending and causing fracture of said webs. The strip may be of any desired length and therefore may contain as many lugs as there are units to be molded. Applicant has found that thirty units can be conveniently handled at a single operation.

The portion of the strip of lugs above the dot-and-dash line in Fig. 13 is held in that part of the mold which may be termed the insert or lug holder, while that portion of the strip below line, extends into the hollow portion of the mold in which the resistance material is molded. This material is thus molded into intimate contact with all that portion of the strip below said dot-and-dash line and not only embraces the inner margin of said strip but is forced through the perforations 3 and 5 so that the material on one side of the strip is united to that on the other side, as best shown in Fig. 1, thus securely locking the strip in the molded material to form an integral structure.

The mold, as illustrated in Figs. 14, 15, 16 and 17, is preferably made of hardened steel and comprises the bottom plate 35, the side and end pieces 36 and 37 respectively, which may be best attached to the bottom plate 35, the filler or holding blocks 38 and 39 between which the lug portion of the lug strips, as shown in Figs. 14 and 15, may be inserted, the position of said lug strips being determined by the stop pins 40 and 41.

Said mold is so constructed as to produce a multiple impression, being provided with the forming blocks 42 and 43 respectively having wedge-shaped dividing ridges 45 and 46 which register in opposed relation so that when the two halves of the mold are brought together under pressure the moldable material is formed into individual units which may either be taken from the mold with the lugs of the units still connected by a thin web, which may be readily broken, or the mold may be so constructed as to sever the said webs and deliver the units already separated. It has been found in practice that

best results are obtained by forcing the forming blocks together in the press to partially cut through the webs 32 and 33, thereby facilitating the separation of the units.

5 For convenience of illustration, the form of electrical resistance unit shown in Fig. 6 has been chosen for illustration in the mold as shown in Fig. 14, the margin of the sheet metal strip of lugs 15 being embedded in the upper ends of the elements 1 and the margin of the sheet metal strip of lugs 16 being embedded in the lower ends of said elements.

15 This invention is advantageous in that by means of the method of production and distribution as above described substantial economies are effected as compared with the methods heretofore employed, wherein each individual lug or insert had to be picked up and loaded into the mold.

20 It is desired that this invention be not limited to the precise details of construction and arrangement as herein set forth, as it is obvious that various modifications may be made therein without departing from the essential features of this invention as defined in the appended claims.

25 Having thus described our invention, we claim:

1. As an article of manufacture, a gang of resistance units comprising spaced sheet metal strips each including a plurality of individual terminal members joined in unitary relation by reduced web portions in the strip, said reduced web portions providing a restricted junction whereby the members may be separated from one another at such junctions, and a mass of solid resistance material embracing and joining said strips, said mass having indentations aligned and cooperating with said reduced web portions whereby said units may be separated from one another along the lines of said indentations and webs.

40 2. A sheet metal terminal strip comprising a plurality of individual terminal units connected in unitary relation for embedding in a plasticiz-

able material and affording a plurality of spaced projecting connection lugs along one edge and a plurality of apertures adjacent the other edge, said apertures being located in the web portions connecting said lugs and in alignment with the gaps between said connection lugs whereby to assist in the separation of one of said lugs and its associated parts at a web portion from an adjacent lug and its parts, each of said apertures also serving to receive the plasticizable material whereby to hold the lug in position when embedded.

3. As an article of manufacture, a gang of resistance units comprising relatively spaced sheet metal strips each including a plurality of individual terminal members joined in unitary relation by restricted regions in said strips, and a mass of a solidified plastic resistance material embracing a margin of each of said strips and integrally joining them together so that the terminal members of the respective strips are oppositely directed.

4. As an article of manufacture, a pair of metal strips disposed in relatively parallel relation each having a plurality of terminal projections respectively extending in opposite directions and separated by a perforated web, and a slab of solidified plastic electric resistance material moulded about the relatively opposed margins of said strips and integrally uniting them together.

5. As an article of manufacture, a pair of metal strips disposed in relatively parallel relation each having a plurality of terminal projections respectively extending in opposite directions and affording reduced intermediate web portions, and a slab of solidified plastic electric resistance material moulded about the relatively opposed margins of said strips and integrally uniting them together, said slab being provided with a plurality of transverse slits disposed between said projections, and at the regions of said reduced web portions.

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