

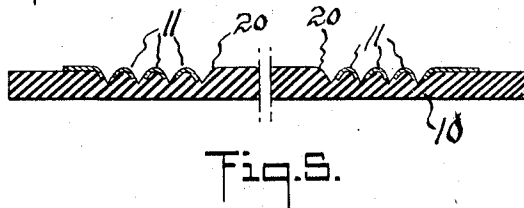
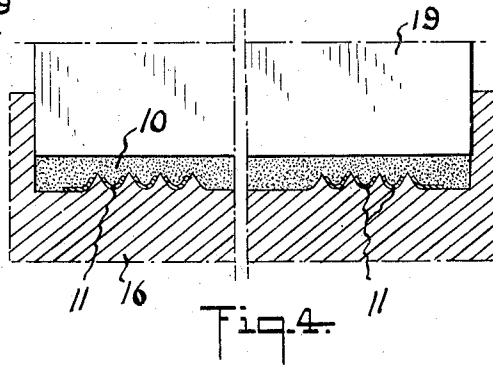
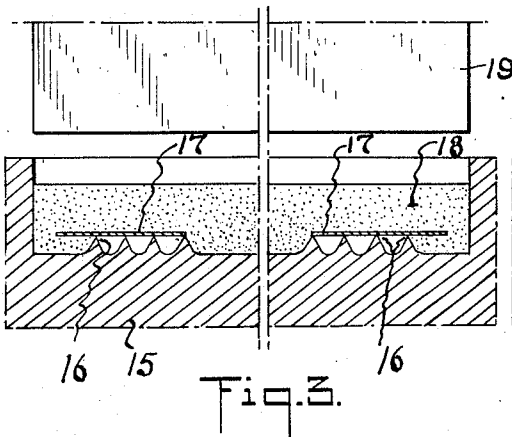
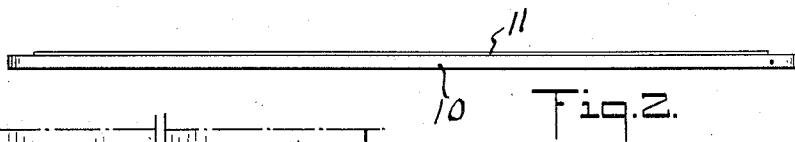
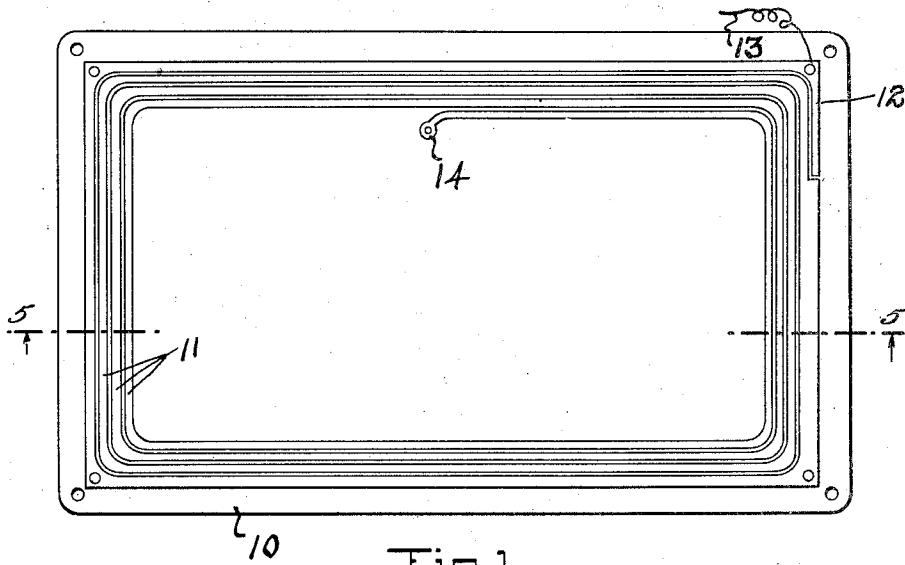
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A. W. FRANKLIN

2,431,393

METHOD OF FORMING METAL AND ATTACHING IT TO A SUPPORT

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INVENTOR
ALBERT W. FRANKLIN

BY *Darby & Darby*
ATTORNEYS

UNITED STATES PATENT OFFICE

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METHOD OF FORMING METAL AND ATTACHING IT TO A SUPPORT

Albert W. Franklin, New York, N. Y., assignor of one-half to Jacob Poster, Brightwaters, N. Y.

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1 Claim. (Cl. 18—59)

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This invention involves a novel method of simultaneously forming metal bodies and attaching them to a support, thereby providing a unitary structure.

This invention relates with respect to the finished product to my copending application Serial No. 584,523, filed March 24, 1945, now Patent No. 2,401,472, granted June 4, 1946.

The broad object of this invention is to provide a method whereby a metal body of predetermined shape is simultaneously formed from a suitably shaped piece of metal with the formation of a support therefor and the permanent attachment of the two parts.

A more specific object of this invention is to mold a support for a radio antenna from a suitable molding material conjointly with the formation of the antenna from a plain sheet of conductive material.

A more specific object of the invention is to provide a method wherein a support which may later form a part such as the back of a radio receiving instrument, is simultaneously molded to form with the formation of a loop antenna from a suitably shaped piece of conducting material.

Other and more detailed objects of the invention will be apparent from the following description of the embodiment thereof illustrated in the attached drawing.

This invention resides in the steps and series of steps all as hereinafter disclosed and claimed. In the accompanying drawings,

Figure 1 is a plan view of the structural unit produced by the method of this invention;

Figure 2 is an edge elevational view thereof;

Figures 3 and 4 diagrammatically illustrate successive steps in the process of forming the unit; and

Figure 5 is a cross-sectional view taken on the line 5—5 of Figure 1.

The finished product of this invention is in all major respects the same as the product disclosed in my above mentioned copending application and illustrated herein in Figures 1 and 2. It comprises a support 10 of suitable insulating material and suitable configuration depending upon its ultimate use. For example, in the event the antenna unit of this invention is to form part of a radio receiver, the support 10 may well be shaped to provide as illustrated, a removable back for the cabinet of such a receiver. Adhering to one face of the support 10, preferably the inner face, is the loop antenna comprising as illustrated a series of concentric conducting strips 11 likewise of suitable geometrical form and, as illus-

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trated, preferably, but not necessarily, concentric with the shape of the support. The outermost of outer terminal end 12 is provided with a suitable connecting pigtail or other circuit connector 13. The pigtail 13 as illustrated may represent the terminal end of the connection from the antenna input terminal of a radio receiver. The innermost terminal end 14 of the loop antenna provides the other point of connection in the event that the antenna is used as a true loop. The antenna is permanently attached in the broader aspect of this invention to the support 10 in any suitable way, but with regard to the specific embodiment herein illustrated it is attached to the support coincidentally with its formation, and as a result of the operation of forming it and the support.

Referring now to Figures 3 and 4, the structure of Figures 1 and 2 is prepared as follows. A mold 20 and die 15 of any suitable metal for the purpose, such as steel, is formed into a cup-like structure having a plain bottom in which are formed a series of concentric sharp edged ribs 16. The configuration of these ribs can well be imagined by noting that they will lie in the spaces between the convolutions 11 of the finished antenna, as will appear later. A sheet of suitable conducting material such as a thin sheet of copper 17 rectangular in outline in this case, is laid in the mold so that it rests on the cutting edges of the grooves 16 properly centered in the mold. A suitable molding material 18 is filled into the mold to the proper depth, being sure that the space under the overhanging outer edges of the metal sheet 17 are filled in. Any suitable moldable material of insulating characteristics is suitable for this purpose and may be either in powder or liquid form. Likewise, any such material which may be molded by the application of pressure alone or by heat and pressure such as the thermo-plastic and thermo-setting molding materials of various forms well known in the molding art, could be used. For example, various well known natural and synthetic resins could be employed, as for example "Bakelite," molding powder.

The mold 15 thus prepared is placed in a suitable form of pressure generating equipment such as a molding press so that the ram 19 may be forced down into the mold, as illustrated in Figure 4, under the proper pressure depending upon the material to be molded, so as to mold, fuse, weld, or otherwise compact the molding material 18 into a self-sustaining sheet 10 of the proper thickness. As a result of the pressure resulting from the molding of the material the metal

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sheet 17 will be cut along the line of the sharpened edges of the grooves 16 and forced down to the bases of these grooves, as clearly illustrated in Figure 4, to form the convolutions 11 of the antenna. It will be seen that as a result of this pressure the sheet is not only cut but the metal convolutions or strips resulting from the cutting action are forced to assume the shape of the grooves. The molding material and the resulting convolutions 11 are therefore molded or compacted into a jointly adherent unit from which the resulting antenna may not be easily detached.

The final structure appears in cross-section as shown in Figure 5. At this point it may be noted that the sheet of conducting material 17 may consist of an open rectangle of metal, that is a sheet with its center cut out leaving a surrounding band of metal of such width that the necessary number of convolutions 11 can be cut therefrom. It is, of course, apparent that a continuous sheet of metal could be placed in the mold, in which event the center thereof would be cut out by the innermost cutting edge of the die and mold, so that it would be separated from the antenna proper and be molded in adhering relation to the support 10, so that its peripheral edges would curve around the curve defining edges 20 of the center portion of the support. Thus when a continuous sheet of metal 17 is used the center of the support 10 would likewise be covered with a metal panel which would be adherent thereto, and which could be left in place or stripped from the support as conditions dictate. However, from the angle of economy and probably from that of electrical characteristics of the loop antenna, it is preferable to use a sheet of metal from which the center has been previously cut out, as in the case of the structure illustrated in the drawings and described above.

From the above description and upon careful consideration of the nature of the structure produced, it will be seen that in the case of a loop antenna, the only dielectric between the adjacent turns or convolutions of the antenna is air. It is believed that this antenna is the first practical antenna of this type in which there is substantially no dielectric between adjacent convolutions other than air. As those skilled in the art will appreciate, in all prior art antennas of this type there is some insulating material other than air between at least some adjacent portions of the convolutions and in many cases between substantially all of the adjacent convolutions. It is, of course, well understood that it is desirable from the viewpoint of electrical characteristics of the antenna to use air as a dielectric between the turns as much as possible. The resulting structure of this invention reaches the ideal in having no dielectric between adjacent turns other than air.

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Having now carefully described the nature and characteristics of the invention, it will be apparent upon consideration that the method herein disclosed is by no means limited to the production of radio antennas. It will be seen that, for example, a disc commutator can equally well be made by this method in which a circular ring of metal would be cut into any number of desired radial segments and attached to a supporting disc therefor simultaneously with its formation. Likewise, many other forms of unitary metal and supporting structures can be made as, for example, fancy grills for articles of furniture, name plates, decorative designs and the like. By way of example, a radio cabinet could be simultaneously molded and have formed attached thereto a decorative metallic facing of any suitable configuration.

From the above description it will be apparent that there is herein disclosed a novel method of simultaneously forming an antenna and a support therefor, both of which are bonded together for use. It is likewise clear that the resulting support for the antenna can be formed of such shape as to provide the removable back for the cabinet of the receiver with which the antenna is to be used. From a consideration of the above disclosure it will be clear to those skilled in the art that the method herein disclosed is capable of some variations, and I do not, therefore, desire to be strictly limited to the illustrative embodiment of the invention herein disclosed.

What is claimed is:

The method of forming a structural unit comprising an insulating support and a metallic body of predetermined design comprising the steps of placing a sheet of metal in a mold having a cutting edge defining said predetermined design, placing a quantity of moldable material in said mold and applying pressure to the contents of said mold to simultaneously shape the moldable material into the configuration of the cavity of the mold and cut the metal sheet at said cutting edges, whereby a molded body is formed having the metal design attached thereto.

ALBERT W. FRANKLIN.

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