Jan. 25, 1955 J. WHITE ET AL 2,700,761

ELECTROMAGNETIC HORN

Filed Feb. 5, 1952 2 Sheets-Sheet 1

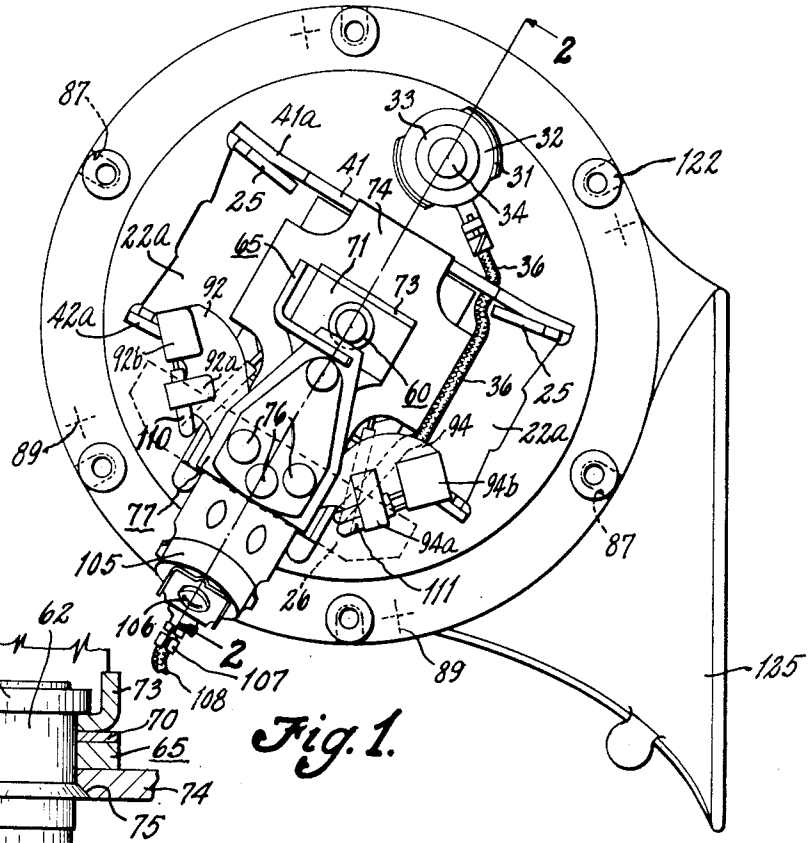


Fig. 1.

Fig. 4

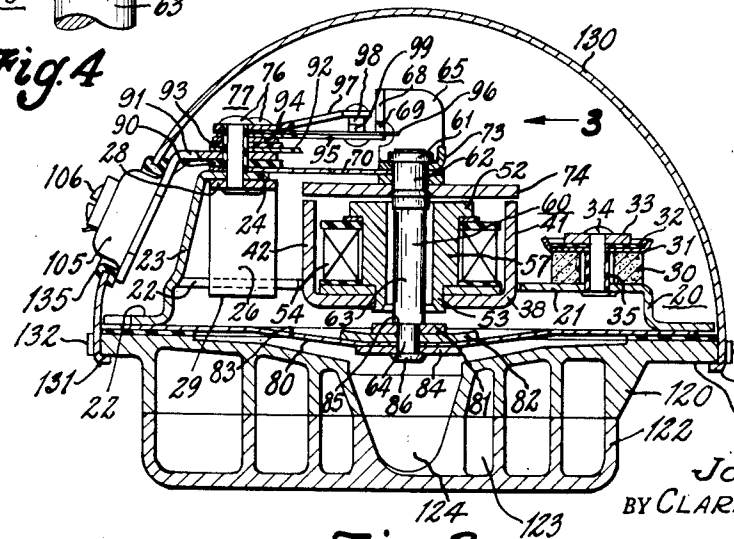


Fig. 2.

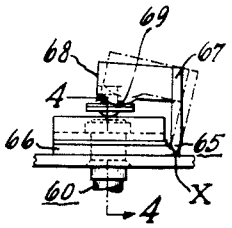


Fig. 3.

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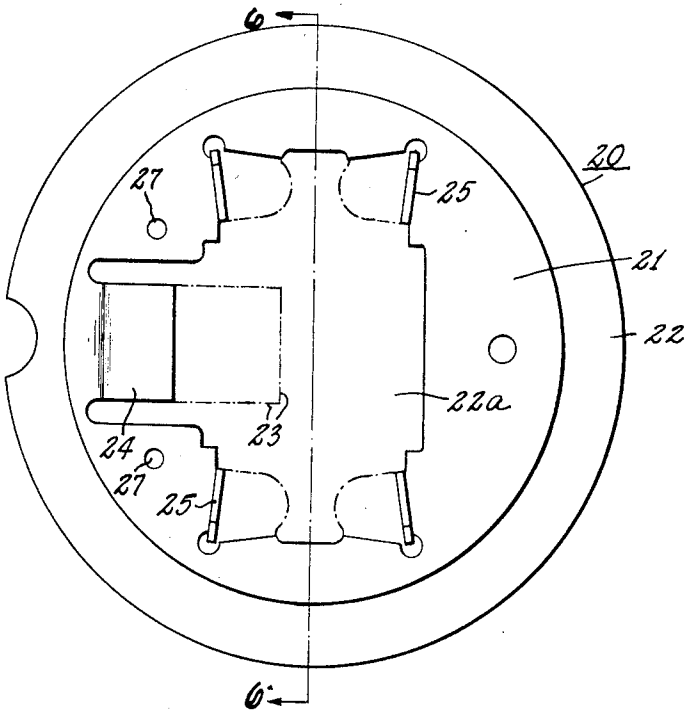


Fig. 5.

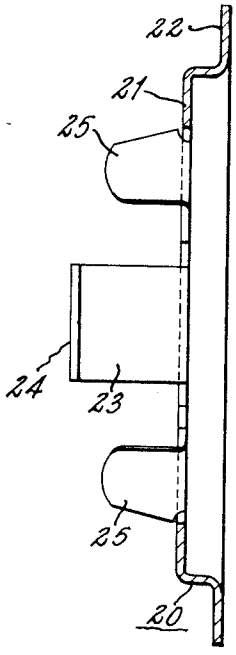


Fig. 6.

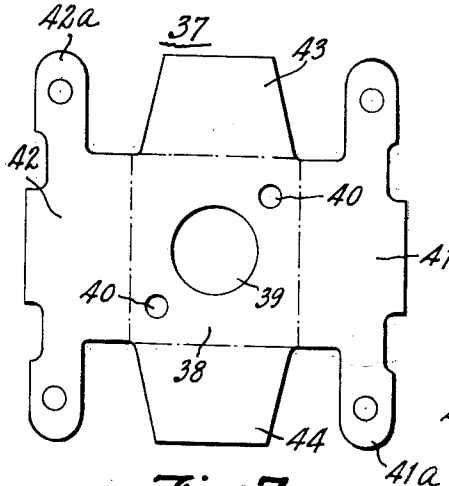


Fig. 7.

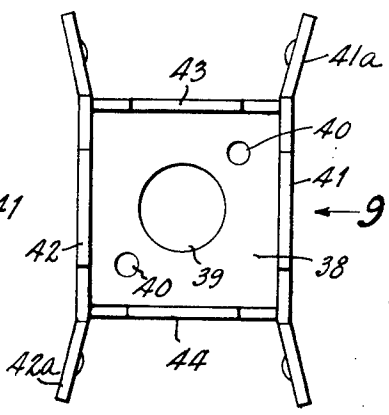


Fig. 8.

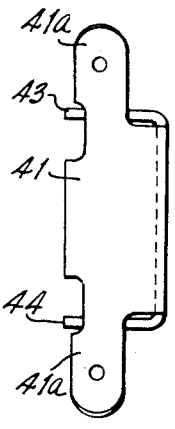


Fig. 9.

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2,700,761

ELECTROMAGNETIC HORN

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9 Claims. (Cl. 340—388)

This invention relates to improvements in sound signals or horns having a diaphragm actuated by an electromagnet energized by an intermittent current.

It has heretofore been customary to provide a sound signal switch a core made from E-shaped laminations held together by rivets which require a drilling operation and a disc grinding operation; to provide an armature stud or rod which is made on a screw machine which has three sizes of threads which require nuts; to provide a base made of relatively thick steel; and to provide a circuit breaker by which current through the magnet is interrupted periodically, the circuit breaker being actuated by one of the nuts vibrating with the diaphragm.

The main object of this invention is to provide a sound signal or horn of the magnetically actuated diaphragm type, that is light, durable and economical in construction; that may be readily assembled and adjusted by a bendable part and that, at the same time has fine tone qualities.

In carrying out the above objects, we have by refinements in design, construction and arrangement of the various elements provided a less expensive magnetic circuit by the use of a box-like frame with four pole faces made from punch press operations and a center core sleeve made on a header; by the use of an armature stud made on a header which eliminates all threads; and by using a new method of adjusting the horn current by the bending of sheet metal rather than adjustment by a nut and a lock nut together with suitable and convenient means for supporting the circuit breaker on the frame or base of the horn. With the new design and refinements the thickness of the steel used for the base and the supporting means for the circuit breaker in previous construction of the same type is reduced thirty-three percent.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Fig. 1 is a plan view of a horn embodying the improvement of the present invention.

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is a detail view of the armature and bracket shown in Fig. 2 and looking in the direction of arrow 3.

Fig. 4 is an enlarged sectional view of armature assembly taken on line 4—4 of Fig. 3.

Fig. 5 is a plan view of the horn base.

Fig. 6 is a sectional view of base taken on line 6—6 of Fig. 5.

Fig. 7 is a blank form in which a field frame is formed.

Fig. 8 is a plan view of the frame.

Fig. 9 is a view of frame looking in direction of arrow 9 of Fig. 8.

The signaling device comprising the present invention and as shown in the drawings, comprises a frame or base member 20 made from comparatively thin metal pressed to the desired form. The base is formed to provide a central cup-shaped section having a bottom wall 21. The cup-section has an outwardly extending flange 22, said bottom wall 21 is formed with an opening 22a having an inwardly extending arm 23 indicated in dot and dash lines. This arm 23 is bent angularly relative to the bottom wall to provide a platform or shelf 24 spaced from and parallel to the bottom wall 21. The

bottom wall 21 is also formed with spaced portions bent angularly relative to the bottom wall for providing attachment lugs 25. A U-shaped bracket 26 of relatively thin sheet metal is attached to the bottom wall 21 and to the platform 24 by projection welding. For this purpose the bottom wall 21 is provided with spherical bosses or projections 27. The platform 24 is also provided with spherical bosses, not shown. The legs of the bracket 26 extend through the opening 22a of bottom wall 21. The legs have side portions 29 which abut against the underside of section 21 while the yoke or shelf 28 abuts the upper face of the platform 24. By this arrangement a rigid support, having three sides is provided for mounting a circuit breaker assembly to be described.

A resistor assembly is attached to the base bottom wall 21. This assembly includes a disc resistor 30, a terminal clip 31, an insulating washer 32, a metal washer 33, a rivet 34 received by a hole in the base, and a conducting sleeve 35 surrounding the rivet 34. After these parts or elements are assembled to the base as shown in Fig. 2, the upper end of the rivet 34 is upset. The underside of the resistor 30 is grounded on the bottom wall 21 while the upper side of the resistor is electrically connected with the terminal clip 31 which is electrically connected with an insulated wire 36.

The opening 22a in the bottom wall 21 receives an electromagnet assembly including a box-like container formed from a blank 37 of relative thin sheet metal shown in Fig. 7. This blank 37 has a rectangular base portion 38 provided with an opening 39 and two apertures 40. The blank is bent along the dot-and-dash lines to provide the rectangular base 38 shown in Fig. 7, and to form opposite side walls 41 and 42 and end walls or flanges 43 and 44 see Fig. 8. The edges of the side and end walls are coined by a punch press or machined to provide smooth pole faces arranged in the same plane. The side walls 41 and 42 have oppositely disposed integral ears or extensions 41a and 42a, respectively engageable with and attachable to respective lugs 25 for securing the container to the bottom wall 21.

Referring to Fig. 2 a cold headed hollow core or sleeve is attached to the base 38. The sleeve 57 has an enlarged flange or head 52 at one end while the opposite end portion of the sleeve is reduced at 53 which is received by the opening 39 of the base 38 and riveted over the underside of the base 38. A coil 54 surrounds the core sleeve and is disposed between the head 52 and the base 38. The coil is built up of coiled wire in the well-known manner, and is suitably insulated from the core sleeve 51. The ends of the coil pass through the openings 40.

The armature assembly shown in Figs. 2, 3 and 4 comprises a novel design of rod or stud 60 cold formed by a header. The rod 60 is provided at one end with an enlarged flange portion or head 61, a first reduced portion 62, a second reduced portion 63 and a third reduced portion 64. The portion 62 receives a bracket 65 having a base 66 provided with a bendable arm 67. The arm 67 is bent at an angle to the plane of the base as shown in Fig. 3. The arm 67 is cut to provide an extension 68 which is bent at substantially right angles to the plane of the arm 67 and toward the base 65. The extension 68 is formed in this instance with a spherical cam portion 69, the purpose of which will be described hereinafter. The portion 62 also receives a leaf spring 70, a plate 71, having a stop flange 73 and an armature 74.

When these parts 65, 70, 71 and 74 are assembled on the reduced portion 62 it is circularly staked into tapered recess 75 in the armature 74 as clearly shown in Fig. 4. The staked portion is flush with the flat underside of the armature 74. The leaf spring 70 is provided with three holes which register with three holes in the end 24 and three holes in the platform of the bracket 26. These holes receive rivets 76 by which the leaf spring 70 and other parts of a circuit breaker assembly 77 are attached to the platform.

Before the electromagnet assembly is secured to the base 21, the armature assembly is attached with a diaphragm assembly 80. This is accomplished by passing

the rod 60 through the sleeve core 51 with the reduced portion 64 of the rod 60 receiving a plain metal washer 81, a slightly dished metal washer 82, a metal diaphragm 83, and a plain metal washer 84. These parts are clamped against a shoulder 85 by upsetting the reduced portion 64, as at 86, against the washer 84.

After the diaphragm assembly is attached to the armature assembly, the diaphragm is aligned with the frame or base 20 in such a way that notches 87 provided by the diaphragm will register with holes provided in a flange 22 of the frame 20. Then the diaphragm is attached to the frame flange permanently by spot welding at a plurality of places designated by crosses 89 in dotted lines shown in Fig. 1.

The circuit breaker assembly 77 is then attached to the bracket 26. This is accomplished by placing a loose stack or assembly of parts, which includes the leaf spring 70 adjacent and in contact with the shelf of the bracket 26. This stack includes the leaf spring 70, an insulating washer or spacer 90, a terminal 91, a connector plate 92, an insulating spacer 93, a connector plate 94, a leaf spring 95, an insulating plate 96, a bracket 97 supporting a contact 98 normally engaged by a contact 99 attached to leaf spring 95 and projecting through a hole provided in the plate 96. Three rivets 76 secure the stack of parts to the yoke 26. The tubes extend from the spring 70 to the upper face of the bracket 97. The lower end of the rivets, as viewed in Fig. 2 are upset against the yoke of bracket 26 in order to secure the stack of parts to the end of arm 23. The heads of the rivets contact the bracket 97 so that contact 98 is connected to ground through bracket 97, rivets 76 and arm 23 of frame 20 which is grounded by its mounting upon the frame of the vehicle which a ground strap connects with a terminal of a storage battery.

The terminal 91, which is electrically connected with the plate 92 has its free end bent downwardly, and said end is provided with a cup-shaped member 105. The cup member receives a screw 106 for attaching a clip 107 to one end of a wire 108.

After the circuit breaker assembly is attached to the bracket the various leads 110 and 111 of the coil 54 and lead 36 of the resistor are attached with the terminal plates 92 and 94. As shown in Fig. 1 the terminal 92 is provided with V-shaped tangs 92*a* and 92*b* and terminal 94 is provided with tangs 94*a* and 94*b*. The insulation of coil lead wire 110 is placed within the folds of tangs 92*a* and the bare end of wire 110 is placed in a fold of tang 92*b*. The insulation of coil lead 111 and the insulations of resistor lead 36 are placed in the tangs 94*a* and the bared ends of these leads are placed within the folds of tangs 94*b*. Since terminal plate engages leaf spring contact is connected to coil lead 111 and lead of resistor which is grounded. Therefore normally closed contacts short circuit the resistor when contact 92 separates from contact, the resistor becomes effective to reduce arcing at the contacts.

After the circuit breaker assembly is attached to the bracket the arms 41*a* and 42*a* of the horn magnet are welded to the lugs 25. Before the welding operation, the armature and the pole faces of the electromagnet are located a definite distance apart. A metal shim not shown, of predetermined thickness is placed between the armature and the pole faces of the box-like frame and electric current is caused to pass through the coil thereby causing the core sleeve to move toward the armature and bear firmly against the shim to provide the correct air gap. While the coil is energized the ears 41*a* and 42*a* are welded to the lugs 25 by virtue of the spherical portions carried by the ears which melt to unite the ears with respective lugs 25.

After the welding operation, the arm 67 is bent along the point *x* Fig. 3 causing the cam portion 69 of arm to adjust the amount of separation of the contact 99 from contact 98. This adjustment is made for the purpose of obtaining a certain current flow through the coil before contact separation, thereby determining the amount of electrical energy produced by the electromagnet and consequently the volume of the sound of the horn. For this purpose the cam portion is adjusted so that normally there is a predetermined clearance, for example .010" between it and the nonconducting plate.

The frame is secured to a projector assembly. In this instance the projector assembly includes an upper shell 120 and a lower shell 121 which are secured together by rivets 122, integral with the upper shell. These shells provide a spiral sound passage or column 123 which starts at the diaphragm chamber 124 and ends with the shell or trumpet end 125. The projector assembly together with a gasket 127 are attached to the base flange by rivets.

A back shell 130 is mounted in the base 20 to protect the vibrating parts. The shell 130 has tangs 131 which fit in notches 132 of flange 133 provided by the upper shell and bent over. The shell 130 is provided with an opening lined with a rubber-like grommet 135 through which projects the cupped part 105 of terminal 91.

In operation, it is apparent that the attraction of the armature by the magnet will cause the cam surface which contacts the insulating strip to move the leaf spring 95 with it to separate contact 99 from contact 98. The leaf spring 70 is easily flexed and offers little resistance to the movement of the armature 74. When the contacts 99, 98 separate, the spring 70, assisted by the diaphragm, will carry the armature 74 and the bracket 65 to a position to permit closing of the contacts.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A composite supporting device consisting of a base and a container attached to the base, said base being a sheet metal, cup-shaped member having an outwardly extending annular flange; a core and a coil attached to the container; an opening formed in the bottom wall of the member for receiving the container; a portion of said bottom being bent angularly relative to said bottom wall to form a platform spaced from and parallel with said bottom wall; spaced portions of said bottom wall, bent angularly relative to said bottom wall for providing attachment lugs for the container which is made of sheet metal comprising a base for supporting the core and coil; said base having a pair of spaced integral end walls and a pair of spaced integral side walls with edges of all walls being machined so that all of the edges of said walls are in the same plane, said side walls having oppositely disposed integral ears engageable with and attachable to respective lugs for securing the container to the base; a diaphragm secured to the annular flange; a rod passing through the core attached to the diaphragm; an armature attached to the rod; and a circuit breaker assembly attached to the platform.

2. In combination with a support having spaced integral upstanding lugs; a sheet metal frame having a rectangular base provided with an opening and having a plurality of integrally formed upstanding flanges defining a box-like structure, the edges of said flanges being coined and arranged in the same plane, two of said flanges in opposite relation having oppositely disposed extensions engageable with and attachable to the lugs for securing the frame to the support; a hollow core having a reduced portion at one end received by the opening; a collar associated with core; a coil surrounding the core and disposed between the collar and the base; and means including portions of the reduced portion of the core for securing the core to the base.

3. A composite supporting device for sounding signals consisting of a base and a container attached to said base, said base being a sheet metal, cup-shaped element having an outwardly extending annular flange. an opening formed in the bottom wall of said cup-shaped element for receiving the container, a portion of said bottom wall being bent angularly relative to said wall to form a platform spaced from and parallel with said wall; a separate stiffening bracket having portions rigidly attached to said platform and to the bottom wall of the base; spaced portions of said bottom wall bent angularly relative to said wall for providing attachment lugs for the container which is made of sheet metal and consists of a rectangular base on two opposite sides of which integral angular walls are provided the edges of which are in the same plane, the two other opposite sides of the container being integral angular walls the outer edges of which are in parallel and in the same plane as the first mentioned angular wall edges, said two other opposite walls having oppositely disposed integral ears engageable with and attachable to the said spaced angular portions of the base for securing the container to the base.

4. A composite supporting device for use in electrical devices consisting of a base and a container attached to

said base, said base being a relatively thin sheet metal cup-shaped element having an outwardly extending annular flange; an opening formed in the bottom wall of the cup-shaped element for receiving the container, portions of said bottom wall being bent angularly relative to said bottom wall for providing attachment lugs for the container which is made of sheet metal and consists of a rectangular base on two sides of which integral angular portions are provided the edges of which are in a like plane, the two other opposite sides of the container being integral angular walls the outer edges of which are parallel with and in the same plane as the first mentioned angular portions, said two opposite sides having oppositely disposed integral ears engageable with and attached to the said spaced angular portions of the base for securing the container to the base.

5. In a sound signal the combination of a base and a bracket attached to the base, said base being of sheet metal; an opening formed in the base for receiving the bracket, a portion of said base being bent angularly relative to said base to form a platform spaced from and parallel with one side of said base for providing a support for the bracket which is made of sheet metal and bent into U-shape with the yoke of the bracket rigidly attached to the platform, said arms of said bracket having side extensions engaging the opposite side of the base and rigidly secured to the base.

6. In a sound signal the combination comprising a base, said base being a sheet metal, cup-shaped member having an outwardly extending annular flange; an opening formed in the bottom wall of the cup-shaped member for receiving a container; lugs carried by the bottom wall; an electromagnet attached to the lugs, said electromagnet including a box-like frame made of sheet metal, said frame comprising a rectangular base having a pair of angular spaced end walls and a pair of angular spaced side walls the outer edges of which are in the same plane, one pair of said walls having oppositely disposed ears engageable with and attachable to the lugs for securing the frame to the base; a core and a winding; and means including portions of the core for securing the core to the base of the frame.

7. An electromagnet for an electrical device comprising, a container made of sheet metal, said container comprising a rectangular base having a central opening, four integral upstanding longitudinal flanges on the periphery

of the base, said edges of the flanges being machined to form smooth faces in the same plane; two of said flanges having oppositely disposed integral ears capable of being attached to portions of a support for securing the container to said support; a cold headed hollow core having an integral collar at one end and a reduced portion at the other end received by the opening in the base; a coil surrounding the core and disposed between the collar and base; and means including portions of the reduced portion of the core for securing the core to the base.

8. In combination with a support carrying spaced upstanding projections; a sheet metal frame having a base; a plurality of flanges carried by the base, the free edges of the flanges having surfaces arranged in the same plane, certain of said flanges having extensions engageable with and attachable to the projections for securing the frame to the support; a hollow core supported by said frame and having a collar at one end and having the other end associated with the base of the frame; a coil surrounding and carried by the core and disposed between the collar and the base; and means for securing the core to the base of the frame.

9. An electromagnet for an electrical device comprising in combination, a container comprising a rectangular base having a central aperture and four upstanding longitudinal flanges arranged around the periphery of the base, said flanges having faces in the same plane, two of said flanges including oppositely disposed ears thereon adapted to be attached to portions of the base for securing the container to the base, a core having an immovably disposed collar at one end thereof and a reduced diameter portion at the other end adapted to be received in an opening in said base, a coil surrounding the core and disposed between the collar and the base, and means including portions of the core adjacent the reduced diameter portion thereof for securing the core to the base.

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