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W. C. CRIMMINS

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HORN

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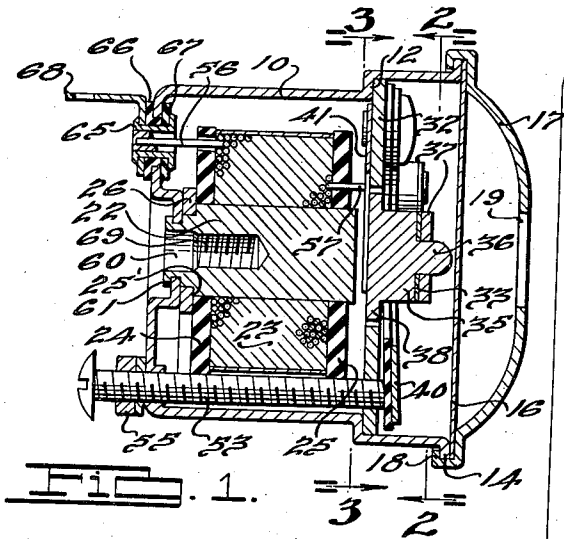
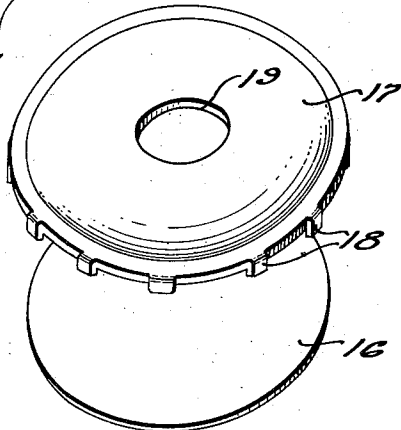
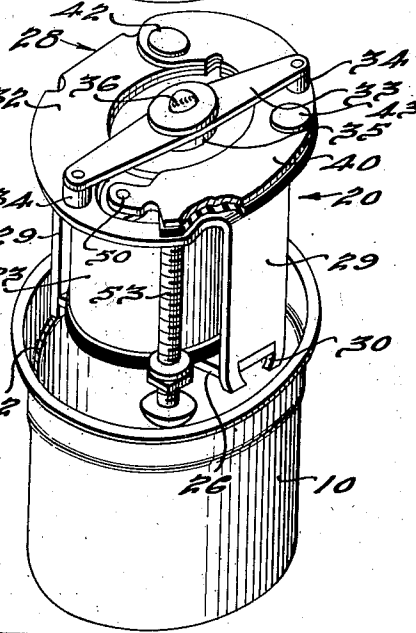


FIG. 1.



UNITED STATES PATENT OFFICE

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HORN

William C. Crimmins, Marion, Ind., assignor to
Delta Electric Company, Marion, Ind., a corporation of Indiana

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2 Claims. (Cl. 177-7)

The present invention relates to an electro-magnetic horn and is an improvement upon the electro-magnetic horn disclosed in Lee M. Wiley Patent No. 2,193,544 of March 21, 1940.

The principal object of the present invention is to provide a horn of the type mentioned which will operate with maximum efficiency and therefore a minimum electric current consumption in order that the horn may be adapted for use on bicycles or in like installations wherein the source of current is a dry cell or cells having relatively small capacity and therefore a short life.

In the above-mentioned prior co-pending Wiley application is disclosed a horn construction wherein the electro-magnetic flux created by the electro-magnet is closely confined and directed by the horn casing which is so shaped that it closely surrounds the electro-magnet winding. In the Wiley construction a novel arrangement of circuit interrupter mechanism within the annular surface surrounding the vibratable armature is disclosed, which location and arrangement makes possible the use of a small compact unit and therefore decreases the reluctance of the magnetic circuit.

It is a more particular object of the present invention to further increase the permeability of the flux circuit and therefore the efficiency of the horn by providing an iron path for the outside flux directly to the armature through the annular space surrounding the same.

A further object of the invention is to provide a novel combination of circuit interrupter mechanism and a means for conducting the outside flux to the armature.

Another object of the invention is to provide a simple compact horn unit having a substantially closed iron path for the electro-magnetic flux.

Other objects and advantages of the invention will become apparent from the following specification, accompanying drawing and the appended claims.

In the drawing:

Fig. 1 is a central longitudinal section through the complete horn unit;

Fig. 2 is a section taken looking in the direction of the arrows along the line 2-2 of Fig. 1;

Fig. 3 is a section looking in the direction of the arrows along the line 3-3 of Fig. 1;

Fig. 4 is an exploded perspective view of the assembly; and

Fig. 5 is a side elevation of the electro-magnetic vibratory unit of the horn.

Referring particularly to Figs. 1 and 4 of the drawing, the horn unit of the present invention

comprises a cup-shaped casing 10 having an internal shoulder 12 adjacent its outer end and an outwardly turned flange 14 at its outer edge. The casing is adapted to be closed by flexible sheet metal diaphragm 16 which is secured in position against the outer surface of the flange 14 by means of a cover 17 having a plurality of tongues 18 at its outer edge bent around the periphery of the diaphragm 16 and the flange 14 of the cup shaped casing. The cover 17 is provided with a central opening 19 through which the sound generated by the diaphragm 16 is emitted.

Mounted within the casing 10 is a unitary electro-magnetic vibratory mechanism indicated generally at 20 in Fig. 4. This mechanism, as best shown in Figs. 1 and 4, comprises a cylindrical iron core piece 22 upon which an electric winding 23 is provided between a pair of insulating disks 24 and 25 which are pressed upon the core piece. The inner end of the core piece is reduced to provide a shoulder 25' against which is seated a transverse bar 26 having a central aperture to receive the inner reduced end of the core piece. The transverse bar, likewise, has a pressed fit upon the core. A yoke, indicated generally at 28, is provided with a pair of legs 29, the lower ends of which are notched at 30 to receive reduced extremities of the transverse bar 26; and the projections on the legs 29 on opposite sides of the notch are bent inwardly, as best shown in Fig. 4, to permanently secure the yoke to the transverse bar 26. The central portion 32 of yoke 28 is in the form of an annular plate which is generally of the same diameter as the larger internal diameter of the casing 10 and which is adapted to seat against the shoulder 12 of the casing when the unit is assembled.

A flexible leaf spring 33 is mounted at its ends upon a pair of pins 34 carried by the central annular plate 32 of the yoke 28 and the leaf spring 33 carries at its mid-point an armature 35 having a projection 36 which is normally slightly spaced from the diaphragm 16, but which is adapted to strike the diaphragm and vibrate the same when the armature is oscillated by the electro-magnet. The projection 36 of the armature extends through a suitable opening in the leaf spring 33 and is held in assembled relation with respect to the spring by means of an annular member 37 which is pressed upon the projection 36. The parts are so proportioned that the annular plate 32 is positioned in the same plane as an outwardly directed flange 38 on the inner end of the armature 35 and the diameter of the

flange 33 is only slightly less than the diameter of the central opening in plate 32.

As a result of the arrangement just described, the external flux created by the electro-magnet is conducted through the casing 10 as well as the legs 29 of the yoke to the plate 32 and thence directly to the armature through the small gap between the armature and the sides of the central opening in the plate 32. From the armature the flux then passes directly to the core of the electro-magnet across the short space or gap between the core and the armature. It is apparent that by this arrangement a substantially closed iron path for the electro-magnetic flux is provided in as much as the casing, the yoke 28 and the core 22 are formed of soft steel which has an exceedingly high permeability.

A novel arrangement of interrupter mechanism is provided upon the central plate 32 of the yoke 28. This interrupter mechanism comprises a pair of arcuately shaped resilient fingers 40 and 41. The resilient contact fingers are each secured to opposite sides of the plate by means of the same two rivets, 42 and 43, which extend through both fingers adjacent one end of each and through the plate 32. The outer finger 40 is insulated from the plate 32 by means of a sheet of insulating material 45 of substantially the same formation as the finger 40, and by means of suitable washers 46 under the heads of the rivets 42 and 43. No insulation is provided between the finger 41 and the plate 32. Looking down on the top of the unit as viewed in Fig. 2, the flexible finger 40 projects clockwise from the rivets 42 and 43 while the finger 41 projects counter-clockwise from the same two rivets until the extremities of the fingers 40 and 41 overlap each other at the point indicated generally at 47 in Fig. 2. At this point the plate 32 is cut away at 48 and the outer finger 40 is deflected inwardly, as best shown at 49 in Fig. 5, and is provided with a contact point 50 adapted to engage a similar contact point 51 on the extremity of the finger 41. The flexible fingers 40 and 41 are so designed that they are normally urged into contact with each other by their own resiliency, but the finger 40 is so much stiffer than the finger 41 that the position of the finger 40 determines the location of the point of contact between the two fingers. The free extremity of finger 41 is provided with an inward projection 52, shown best in Fig. 3, which extends into the path of movement of the flange 38 of armature 35 with the result that upon attraction of the armature toward the core of the electro-magnet, it will engage the projection 52 on finger 41 and cause a separation of the contact points 50 and 51.

The electric circuit for the electro-magnetic unit extends from the lead-in wire 56 through the electro-magnetic winding 23 to wire 57 which extends outwardly through a suitable notch 58, formed in the periphery of the central opening in plate 32, into overlying relation with respect to the finger 40, to which it is soldered at 59. The current flows through the finger 40, the contacts 50 and 51 and finger 41 to the plate 32, which is grounded, thus energizing the coil 23 as long as the contacts 50 and 51 are in engagement with each other.

Means are provided for adjusting the position of the finger 40 and therefore the position of the point of engagement of the contacts 50 and 51, which means comprises an elongated screw 53 which is threaded through the closed end of the casing 10 and projects freely through a suitable

opening 54 in plate 32 into engagement with the inner side of insulating layer 45 between the finger 40 and plate 32. By threading the screw 53 inwardly or outwardly and locking it in adjusted position by means of a lock-nut 55, the horn can be tuned.

When the electro-magnetic vibratory unit 20 is positioned within the casing 10, a reduced projection on the inner end of the core 22 projects through a suitable opening in the end wall of the casing 10. The reduced extension on the core 22 is counter-sunk at 60 and the walls of the counter-sunk opening are flanged or spun over the edges of the opening in the end wall of the casing 10, as shown at 61, to secure the unit 20 to the casing. The parts are so proportioned that when the unit 20 is secured within the casing in the manner described, the periphery of plate 32 will seat tightly against the shoulder 12 of the casing while the projections on the opposite sides of the slot 30 at the inner ends of yoke legs 29 will just clear the bottom of the casing. Preferably the projection 36 on armature 35 will be slightly spaced from the diaphragm 16 when the armature is in its normal position shown in the drawing, but if desired, the projection 36 may just contact the diaphragm. This is advantageous in that it insures that the diaphragm will be vibrated by striking blows from the armature, but will vibrate independently of and out of contact with the armature intermediate the blows.

The lead-in wire 56 projects through a hollow rivet 65 which is mounted in a suitable opening in the end wall of the casing and is insulated from the casing by means of a pair of insulating washers 66 and 67. A terminal member 68 may be provided for attachment to the electric circuit. A suitable tapped hole 69 is provided in the inner end of the core 22 for mounting purposes.

In operation, when the coil circuit is closed by any suitable switch associated with the lead-in terminal 68, the armature 35 will be attracted toward the core 22. After a predetermined movement toward the core, the armature will engage the projection 52 on finger 41, deflect that finger inwardly and thereby interrupt the coil circuit. Upon interruption of the coil circuit and consequent cessation of the electro-magnetic pull on the armature, the latter will be snapped outwardly by the leaf spring 33 and will strike the diaphragm 16 a relatively sharp blow. During the outward movement of the armature under the influence of the spring 33, the electro-magnetic coil circuit will again be completed through contacts 50 and 51 and as the armature bounds off the diaphragm, it will be attracted towards the core 22, thus repeating the cycle. By properly adjusting the location of the projection 52 by means of the adjusting screw 53, the point to which the electro-magnetic coil circuit is broken may be varied until the horn is tuned to its most effective operating condition.

It is apparent that there is provided in accordance with the present invention an exceedingly compact and efficient horn in which the utmost volume of sound can be produced by the minimum current consumption. Large numbers of horns of the type herein disclosed have operated with great success even though as actually constructed and used they were one-half the size shown in the accompanying drawing. While only one form of the invention is shown and described herein, it is apparent that others are available within the

spirit of the invention and within the scope of the appended claims.

What is claimed is:

1. In a horn construction, a cup shaped cylindrical casing containing and closely confining an electro-magnet having a stationary core positioned on the axis of the cup-shaped casing, said casing having an annular outwardly turned flange adjacent the open end thereof, a flexible diaphragm seated against said flange and closing the cup-shaped casing, a stationary plate positioned in a transverse plane located between the core and diaphragm and having a central opening, an armature for operating the diaphragm positioned for movement within the plate opening and adjacent the end of the core piece, said plate serving to conduct the external flux of the electro-magnet to the armature, and a circuit interrupter for said electro-magnet comprising an adjustable contact member secured to said plate, and extending arcuately around said plate opening, an arcuate flexible contact finger secured to the inner side of said plate and having a portion overlapping and normally in electrical contact with said adjustable contact member, and interengageable means on said finger and armature for causing the armature as it moves toward said core to

deflect said finger and separate said contacting portions of the member and finger to thereby break the electro-magnet circuit.

2. In a horn construction, an electro-magnet having an electric winding, a cup shaped cylindrical casing containing and closely confining said electro-magnet, an armature resiliently supported adjacent one end of the electro-magnet, a supporting member having a portion positioned in approximately the same plane as said armature extending transversely to the axis of the cup shaped casing and having a central opening adapted to receive said armature, and a pair of arcuately shaped flexible fingers secured on opposite sides of said plate and extending from their points of attachment to the plate in opposite directions more than 180° around said plate opening, said fingers having overlapping free extremities normally tending to make electrical contact with each other, means for causing a separation of said fingers as the armature moves toward the core, one terminal of said electro-magnet winding being electrically connected to one of said fingers, and means for connecting the other terminal of said electro-magnet winding and the other finger to a source of electric current.

WILLIAM C. CRIMMINS.