

Aug. 13, 1957

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ELECTRO-MAGNETIC DIAPHRAGM HORN
AND CIRCUIT BREAKER THEREFOR

2,803,004

Filed Nov. 22, 1955

2 Sheets-Sheet 1

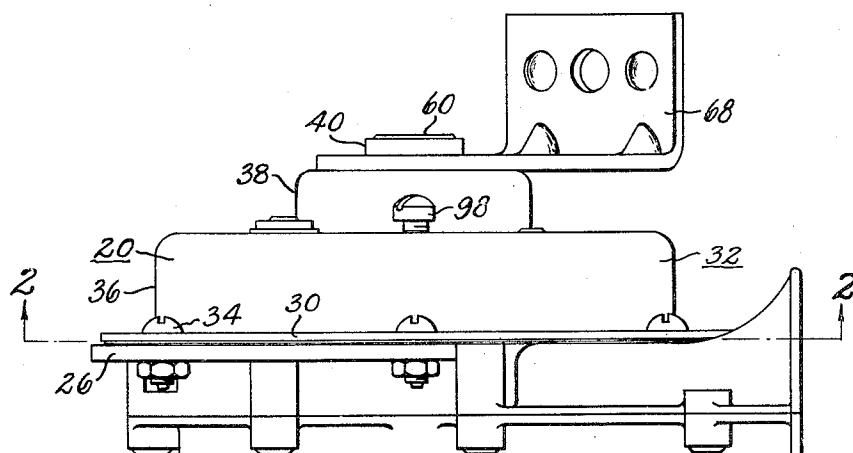


Fig. 1.

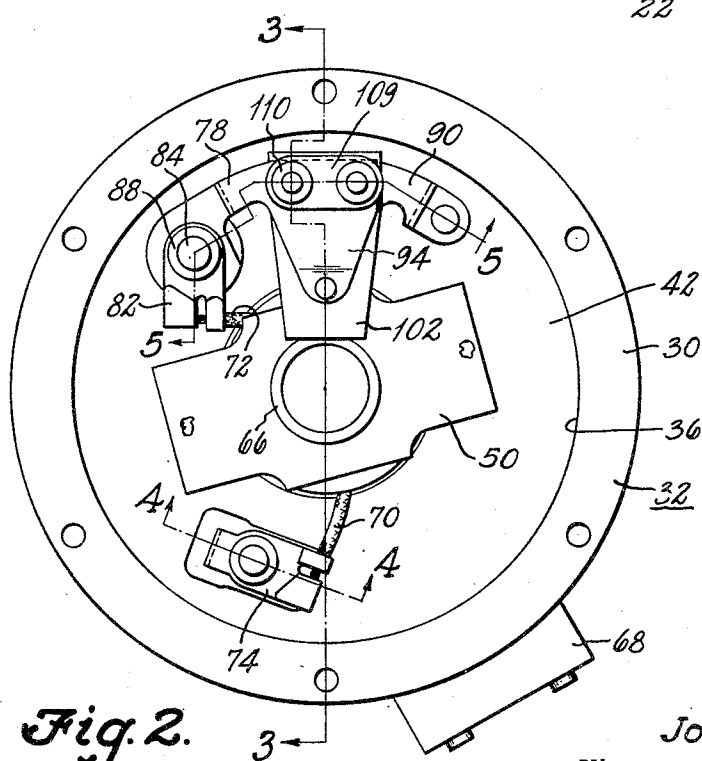


Fig. 2.

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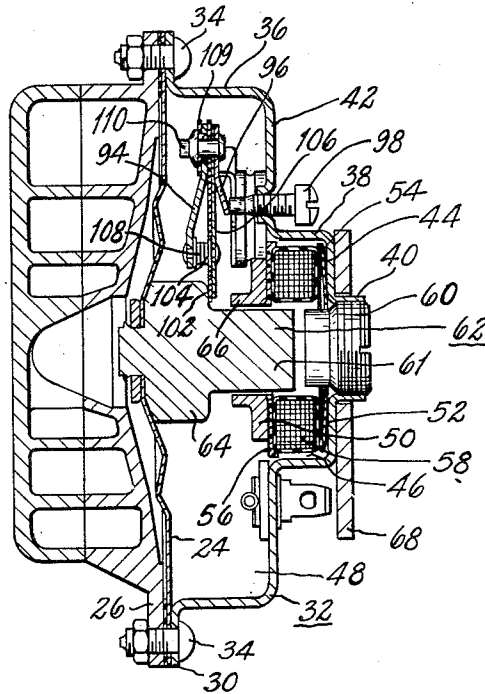


Fig. 3.



Fig. 4.

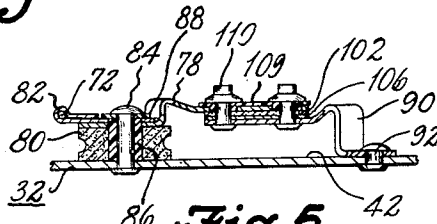


Fig. 5.

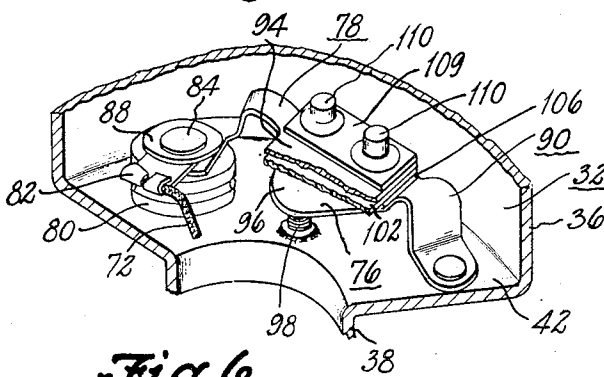


Fig. 6.

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2,803,004

ELECTRO-MAGNETIC DIAPHRAGM HORN AND CIRCUIT BREAKER THEREFOR

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Application November 22, 1955, Serial No. 548,348

6 Claims. (Cl. 340—388)

This invention relates to circuit controllers and is particularly concerned with a circuit breaker assembly for use in an electromagnetic vibrating horn.

In electromagnetic horns suitable for vehicle use, a resistance is frequently connected across breaker contacts to minimize the sparking of the contacts when the current is interrupted to the electromagnetic coil. Heretofore, this resistance and the breaker contacts assembly were located in different parts of the horn casing. This construction required that terminal leads be utilized to connect the breaker assembly with the resistance. This arrangement considerably increased the cost of manufacture of the horns and, frequently, contributed to the failure of operation of the horn when the horn was placed in service.

It is an object, therefore, of the present invention to reduce the cost of manufacture of a vehicle horn, to arrange the parts of a horn so they will be easy to inspect during assembly, and to provide a horn with a minimum of parts to thus increase the reliability when the horn is installed on a motor vehicle.

Another object of the present invention is to at least partially support the contact carrying portions of a circuit breaker contact assembly of a horn on a resistance which will minimize the sparking at the contacts when the contacts cause the current to the electromagnet of the horn to be varied.

A further object of the present invention is to mount one of the terminal leads of an electromagnet for a horn, a contact carrying arm, and a resistance on a single rivet to considerably reduce the number of lead wires and parts normally used in a horn.

A still further object of the present invention is to use a resistance disc in a vehicle horn as a support for at least a portion of the horn circuit breaker to minimize the number of parts in a horn and provide a means for reducing the inductive arcing at the breaker points when said points open to break a circuit to the electromagnet of the horn.

Another object of the present invention is to carry the breaker points of a horn on a bridge-like member that has one end secured to the horn base and the other end supported by an arc limiting resistance and to provide a means for adjusting the angularity of the bridge member to vary the opening and closing of the breaker contacts when the portion of the interrupter carrying the contacts is moved by the armature of the electromagnet.

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

In the drawings:

Figure 1 is a side elevational view of a horn embodying the present invention.

Figure 2 is a plan view showing the various parts of the horn along line 2—2 in Figure 1.

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Figure 3 is a cross-sectional view along line 3—3 in Figure 2.

Figure 4 is a cross-sectional view along line 4—4 in Figure 2.

Figure 5 is a cross-sectional view along line 5—5 in Figure 2.

Figure 6 is a view, in perspective, showing the circuit breaker assembly according to the present invention as installed in a vehicle horn.

In the drawings, the horn 20 has a sound projector 22 similar to that disclosed in Patent 2,677,875, which has been assigned to the assignee of the present invention. As in most horns of the type herein shown, the air column of the sound projector is vibrated at a predetermined frequency by a diaphragm 24 which is separated from a flange 26 on the projector 22 by a washer 28. The diaphragm 24 is secured between the flange 26 and a flange 30 on a base 32 by a plurality of bolts, or rivets, 34.

The base 32 is preferably formed of stamped metal to have three coaxially aligned, axially spaced bores of decreasing diameter which are defined by the annular walls: 36, 38 and 40. The wall 36 is connected with wall 38 by a flat wall 42 which is substantially parallel to and spaced from diaphragm 24. The walls 38 and 40 are interconnected by a flat wall 44 which is parallel to wall 42 and spaced from the diaphragm to provide a chamber 46 which is defined by walls 38 and 44 and which is interconnected with a chamber 48 as defined by walls 36 and 42. The walls 40, which form the smallest bore, are internally threaded for the purpose which will be later set forth.

Positioned within chamber 46 and held therein by a retainer 50 is a field coil assembly for the electromagnet portion of the horn 20. This field coil assembly includes a Belleville or wave washer 52 which is disposed between wall 44 and the remainder of the coil assembly to resiliently urge the components of the coil assembly, centered in chamber 46, against the retainer 50 which is formed as shown and is secured, as by welding, to the wall 42. The field coil assembly also includes a pair of insulating washers 54 and 56 which are located as shown in Figure 3 to insulate the field coil windings 58 from the wall 44 and retainer 50, both electrically and from shock wear, etc., respectively.

A pole piece 60 threadedly engages the threads in wall 40 to partly extended into chamber 48. This pole piece 60 is axially aligned with and spaced from the stem portion 61 of the armature 62 which is provided with a headed portion 64 and which is secured as by riveting to the diaphragm 24 so as to be carried thereby.

It is to be noted that the particular arrangement of the parts for the horn provides a very efficient electromagnetic motor. The separation of the air gap between the stem portion 61 and the pole piece 60 causes a high flux density through the center air gap.

The armature 62 is also provided with the enlarged headed portion 64. This headed portion 64 provides weight for the diaphragm 24 and is formed on stem 61 which is aligned with the opening in the retainer plate 50 through which the stem 61 extends. This collar 66 will cause a further concentration of flux between the armature and the coil winding assembly and, because of the size and arrangement of parts, will cause the flux to have a high axial component of force on the armature 62. The pole piece 60 is axially adjustable relative to the stem 61 of armature by means of the threads in walls 40 to vary the dimension of the air gap between the stem 61 and pole piece 60 to the proper operating range. After the proper adjustment of the horn tone is achieved, the pole piece is secured in the threaded bore in some suitable manner as by deforming a portion of the threads

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in the wall 40. The walls 40, also by being outwardly extending as shown, aid in the positioning of the mounting bracket 68 for the horn which is suitably secured to wall 44 as by welding.

The coil winding 58 has two terminal leads 70 and 72 which are preferably covered with an insulated sleeve, not specifically shown. The terminal lead 70 is connected through a terminal 74, which is insulated from the base 32 as shown in Figure 4, and thence to the vehicle battery through a conventional horn actuating circuit which is not shown.

The terminal lead 72 is connected to the circuit breaker assembly 76 most clearly shown in Figures 5 and 6. This circuit breaker assembly 76, which forms one of the principal features of the present invention, provides an arrangement whereby the number of terminal leads as normally included within a horn is considerably reduced and whereby the number of parts which are normally used in a horn interrupter are also minimized. This is accomplished by mounting an arm 78 of the circuit breaker assembly 76 on a resistance element or disc 80 and, by securing the resistance unit 80, the arm 78 and a terminal clip 82 for terminal lead 72 by means of a single rivet 84 to the wall 42 of base 32 so that the resistance element 80, which is in electrical contact with the base 32, acts as a support for the arm 78. For the purpose which will become herein apparent, it is required that current from arm 78 does not pass directly through the rivet 84 to the base 32. To accomplish the result, the rivet is insulated from the resistance unit 80 by a sleeve 86 and the washer 88.

The arm 78 together with the arm 90, forms a bridge which carries the remaining portions of the circuit breaker assembly 76. The arm 90 has one end suitably secured in electrical contact with the wall 42 as by a rivet 92. The arms 78 and 90 extend from their respective points of securement on wall 42 to form a portion of a laminated structure which will be hereinafter described.

The arms 78 and 90 are both curved to generally follow the contour of wall 36 and each have enlarged portions 94 and 96, respectively, formed as shown. The portion 96 on arm 90 extends to be contacted by the adjustment screw 98 which is threaded in an opening in wall 42. The screw 98 bears against the portion 96 which is bent toward wall 42 as in Figure 3. When screw 98 is inwardly turned, the angularity of the laminated structure relative to wall 42 will change and cause the free ends of insulated part 102 and the spring blade part 106, which carries movable contact 104, to move toward the headed portion 64 of armature 62. The stationary contact 108 is carried by the enlarged portion 94 of arm 78 and is engaged by the movable contact 104, as carried on part 106, when the armature 62 is moved to the left as shown in Figure 3.

The parts which are superimposed on each other to form the laminated structure include arm 90; part 106, which is formed of spring metal and in electrical contact with arm 90; part 102, which has its free end extending to be moved by the headed portion 64 of armature 62; the arm 78, which is insulated from part 106 and arm 90 by part 102, and a part 109 which is formed of insulating material to electrically insulate the heads and shanks of rivets 110 from arm 78, as shown in Figure 5. The rivets 110 are used to secure the laminated parts in assembled relation.

When the parts of the horn 20 are in the position shown in Figure 3, the current from the battery, not shown, will flow lead 70 through the coil winding 58 through lead 72 to terminal clip 82. When the contacts 104 and 108 are in engagement, as in Figure 3, the current from clip 82 will flow through arm 78, contacts 108 and 104, part 106, arm 90 to base 32 which may be grounded to the vehicle through bracket 68, if desired. The closing of contacts 104 and 108 will complete the circuit for the coil winding 58 and cause the armature 62 to

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move to the right from the position shown in Figure 3. When the armature 62 moves to the right, the headed portion 64 thereof will engage the insulated part 102 and cause the spring blade part 106 to move contact 104 from its engagement with contact 108 to break the circuit to arm 90. When the circuit through contacts 104 and 108 is broken, the arcing, which would otherwise occur between the opening contacts, as caused by the inductive currents as set up by the coil winding 58, will be minimized as the induced current in the coil winding 58 will pass through the resistance 80 to the grounded base 32. When the current from the battery to the coil winding 58 is interrupted by the opening of contacts 104 and 108, the magnetic attraction on the armature will be reduced and the diaphragm 24 will cause the armature to be moved to the left so that contacts 104 and 108 are closed to repeat the above described cycle of operation.

While the embodiments of the present invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In an electric horn having a diaphragm, an electromagnet assembly including an armature for vibrating said diaphragm, and a wall spaced from said diaphragm and carrying at least a portion of said electromagnetic assembly, a circuit breaker assembly for causing a pulsating current flow through said electromagnet assembly, said circuit breaker comprising; a disc-like resistance element in electrical contact with said wall, and a contact means having a first portion supported by and in electrical contact with said resistance element, a second portion supported by said wall and in electrical contact therewith and a portion disposed intermediate and carried by said other portions engaging said armature and adapted to be actuated thereby for alternately by-passing current through said resistance element and said second portion.

2. In an electric horn having a diaphragm, a base having a wall spaced from said diaphragm, and an electromagnet assembly having an armature carried by said diaphragm and a coil winding carried by said base, a circuit breaker assembly for causing a variation in current flow through the coil winding, comprising in combination; a resistance disc mounted on said wall in electrical contact therewith, a metal arm mounted on said wall, another metal arm insulated from said first mentioned arm and mounted on said resistance disc, a terminal lead from coil winding connected with said disc mounted arm, and a pair of contacts carried by said arms and adapted to be opened and closed by said diaphragm, one of said contacts being electrically connected with said wall mounted arm and the other contact being electrically connected with the arm mounted on said disc for causing current in said terminal lead to by-pass said resistance disc when said contacts are closed and to pass through said resistance when said contacts are open.

3. In an electric horn having a diaphragm and a flat wall spaced from said diaphragm, an annular recess in said wall, an electromagnet assembly for moving said diaphragm, said assembly having a movable armature carried by said diaphragm and a magnetic coil carried in the recess in said wall, a circuit breaker assembly for causing an intermittent current flow through said coil, said circuit breaker assembly comprising in combination, a disc-like resistance element mounted on said wall and a means electrically connected with a terminal lead from said coil and mounted on and supported by said element and having a pair of contacts arranged to be opened and closed by the movement of said armature for by-passing current through said resistance when said contacts open.

4. In an electric horn having a diaphragm; a wall spaced from said diaphragm, an electromagnet assembly for vibrating said diaphragm, said assembly having a movable armature carried by said diaphragm and an electromagnetic coil carried by said wall, a circuit breaker as-

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sembly arranged to be actuated by said diaphragm for causing an intermittent flow of current through said coil, said breaker assembly including; a disc-like resistance element carried by said wall and a pair of contacts at least partially supported by said element.

5. In an electric horn having a diaphragm; a wall spaced from said diaphragm, an electromagnet assembly for vibrating said diaphragm, said assembly having a movable armature carried by said diaphragm and an electromagnetic coil carried by said wall, a circuit breaker assembly adapted to be actuated by said diaphragm for causing an intermittent flow of current through said coil, said breaker assembly including; a disc-like resistance element carried by said wall and a laminated bridge assembly having one laminating part mounted on the resistance element and electrically connected with a terminal lead from said coil, a second laminating part mounted on said wall and a third laminating part means carried by said other parts, said third part means having one of a pair of separable contacts

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thereon and adapted to be moved by said armature for intermittently causing a portion of the current flowing through said coil to pass through said resistance element to said wall.

5 6. In an electromagnetic horn, an electromagnet having an electromagnetic coil and a movable armature, a diaphragm adapted to be vibrated by said armature, and a base having a wall spaced from said diaphragm, a circuit breaker assembly having a disc-like resistance element, a terminal connection from said coil and a contact carrying arm secured to said wall by a single rivet with the element in contact with said wall.

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