July 10, 1951 J. M. AUFIERO 2,560,323

ELECTRIC SOUND HORN

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Fig. 2

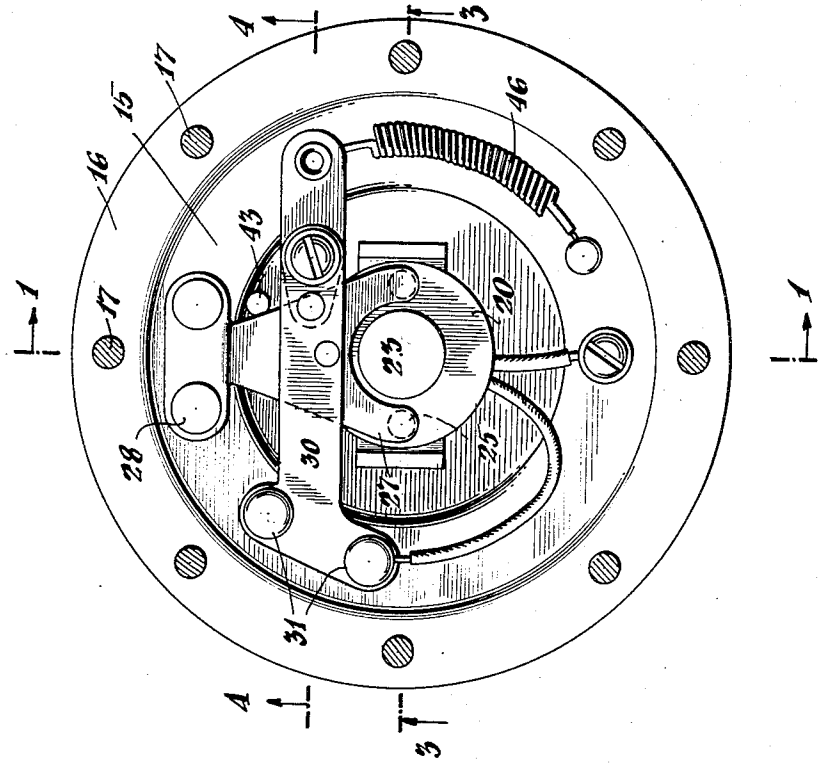
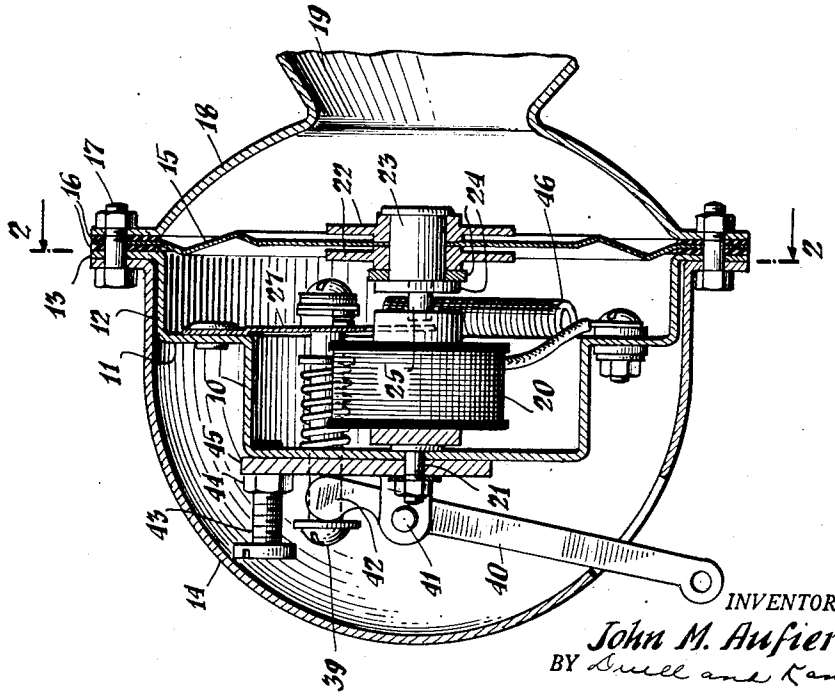


Fig. 1



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Fig. 6

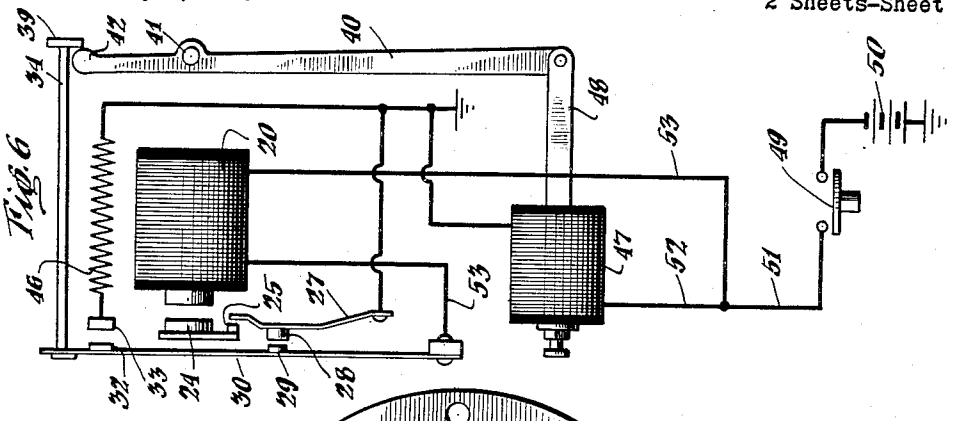


Fig. 5

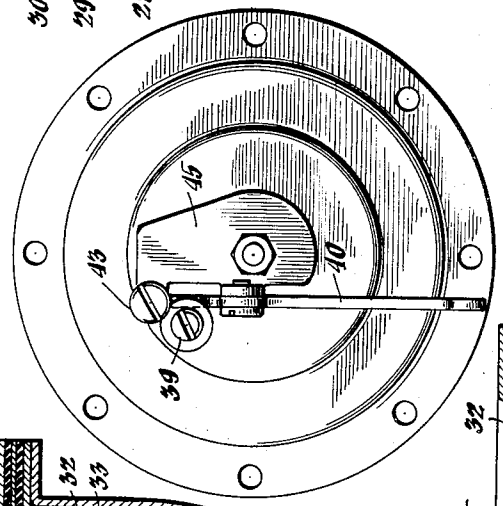


Fig. 3

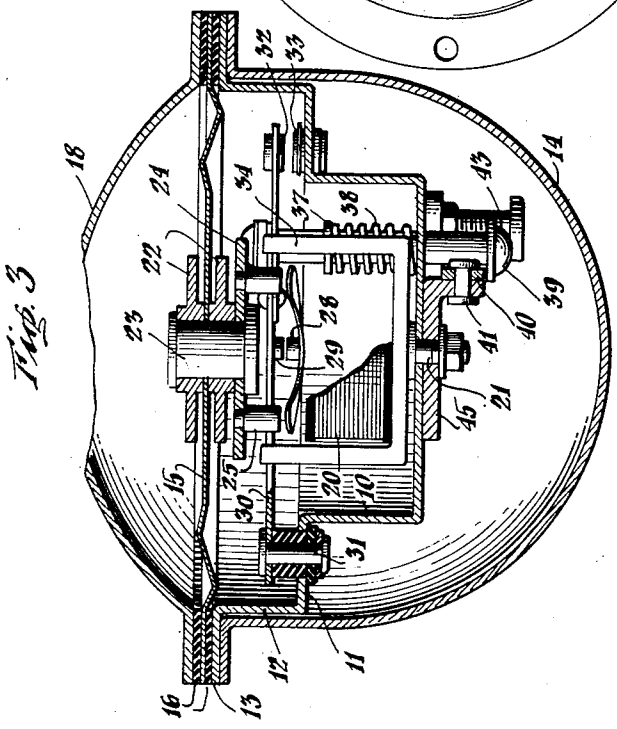
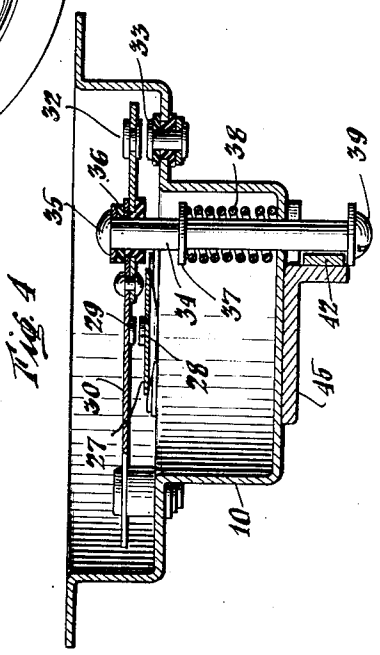


Fig. 4



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2,560,323

ELECTRIC SOUND HORN

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Application July 9, 1949, Serial No. 103,930

5 Claims. (Cl. 177—7)

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This invention relates to a structurally and functionally improved horn and especially a horn of the type used as a warning signal for motor vehicles.

It is an object of the invention to furnish a device of this type which will present an improved structure over that disclosed in prior United States patent rights such as: Patent Numbers 1,829,494 of October 27, 1931, 2,420,807 of May 20, 1947.

A further object is that of furnishing a horn which may be readily operated to produce warning signals of desired character and the current consumption of which will not be excessive.

Still another object is that of furnishing a unit of this type which will embody a relatively simple and economical design capable of being produced by quantity production methods and having a long effective life.

With these and other objects in mind reference is had to the attached sheet of drawings illustrating practical embodiments of the invention and in which:

Fig. 1 is a sectional side view of a horn taken along the lines 1—1 and in the direction of the arrows as indicated in Fig. 2;

Fig. 2 is a sectional view taken along the lines 2—2 and in the direction of the arrows as indicated in Fig. 1;

Figs. 3 and 4 are transverse sectional views taken along the lines 3—3 and 4—4 and in the direction of the arrows as indicated in Fig. 2;

Fig. 5 is a face view of the rear of the horn; and

Fig. 6 is a diagrammatic view of the wiring circuit which may be embodied in an alternative form of the assembly.

Primarily referring to Figs. 1 to 4, the numeral 10 indicates the base portion of a housing which is preferably continued in the form of an outwardly extending flange 11, a forwardly extending flange portion 12 and an outwardly projecting terminal or mounting flange 13. A protective casing 14 enclosing the rear of this housing may be provided and the casing 14 may also terminate in an outwardly extending flange portion of a diameter substantially equal to the flange portion 13. A diaphragm 15 is utilized which also has a diameter preferably equal to that of the flange 13. This diaphragm may embody any desired construction. Preferably, however, it is formed of thin relatively flexible material and has a desired number of concentrically spaced surfaces extending at

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angles with respect to each other and throughout its forward rear faces.

Disposed beyond the foremost ring or gasket 16 is a housing portion 18 which may be continued in the form of a trumpet 19 of any desired configuration. A flange of the housing 18 is again preferably equal in diameter to the flange 13 and the edge zones of all of the flange portions 13, 14, 15 and 18 as well as the bodies of the gaskets 16 are formed with perforations capable of being registered with each other. Through these openings bolt assemblies or other securing elements 17 are disposed. Accordingly, the several parts will be held against displacement with respect to each other.

Mounted upon the base and within the cup-shaped portion 10 is a solenoid 20. It may be secured in position by a threaded stem and nut assembly 21. Carried by the diaphragm 15 in line with the solenoid are disc elements 22 disposed one adjacent each of the diaphragm faces. A stem 23 in the nature of a rivet or other suitable fastening unit extends through a central perforation in the diaphragm 15 and mounts an armature strip 24. The latter carries adjacent its opposite ends inwardly extending pins or legs 25. As is apparent the stem 23 will secure all of the several parts of the assembly against displacement with respect to each other and the body of the diaphragm. Also, with parts of this assembly constructed of suitable materials the several parts may function as an armature.

A spring element 27 is interposed between the latter assembly and the solenoid. It is anchored and grounded adjacent its outer end. Conveniently as shown it is Y-shaped adjacent its inner end to provide arms extending one to each side of the center of the solenoid; the spacing of these arms being such that they preferably register with the pins or legs 25. A contact 28 is carried by spring 27 at a point preferably adjacent the point of juncture of its arms. This contact is aligned with a second contact 29 which is carried by a spring arm 30. The latter as shown may be formed of a pair of over-lapped sections. In any event, its inner end is mounted at 31 on the outwardly extending flange portion 11 and as shown is insulated therefrom.

Adjacent its outer or free end the strip 30 carries a contact 32. This contact is aligned with a contact 33 preferably mounted by and insulated from the flange portion 11. The characteristics of strip assembly 30 are such that the latter is normally flexed to a point where contacts 32 and 33 are materially separated from

each other. Also, contacts 28 and 29 are normally maintained in a separated condition although the spacing of the latter is substantially less than that of contacts 32 and 33. Accordingly, it is apparent that if strip 30 is swung in the direction of the solenoid, contacts 28 and 29 will initially engage and only thereafter will contacts 32 and 33 engage.

Now with the view to swinging or shifting the strip assembly in this manner it is preferred that in line with the point of over-lap of the two strip portions forming this assembly, an opening be provided. Through this opening the body of a bolt 34 or other suitable coupling member is extended. If a bolt is employed, then the inner end of the latter is headed as at 35 so that a retraction of the bolt will assure a downward swinging of the outer or free end of the strip assembly 30. The bolt is insulated from this assembly as indicated at 36. It may also carry a collar or washer 37 which is fixed against movement with respect to its body. A spring 38 is interposed between this collar and the base of cup portion 10. Therefore, the bolt is normally maintained in a position under which the normal spacing of the contacts as aforedescribed prevails.

To secure a rearward movement of the bolt 34 or its equivalent a lever 40 may be pivotly supported on the outer face of base portion 10 and as indicated at 41. The inner arm of this lever may terminate in an engaging portion 42 underlying the head 39 of the bolt. It is therefore, apparent that when the outer end of lever 40 is shifted to the right as viewed in Fig. 1 bolt 34 will be retracted against the action of spring 38. The range of movement of the inner arm of lever 40 may be controlled by employing a headed bolt 43 which will overlie the head 39 of bolt 34. A lock nut 44 preferably restrains bolt 43 from accidental movement and may underlie the head 39. This bolt is conveniently supported by having a screw threaded engagement with an opening formed in a strap 45 and may have a similar engagement with an aligned opening forming a part of base portion 10. Strap 45 is secured against movement by, for example, the anchoring element 21.

Now referring to Fig. 6, it will be seen that the several elements have been somewhat diagrammatically illustrated therein. In addition, there has been shown in this view the resistor 46 which has also been illustrated in elevation in Figs. 1 and 2. This resistor is connected to contact 33 at one of its ends and has its opposite end grounded. In so far as the upper portion of Fig. 6 is concerned, it shows a preferred manner of wiring the several parts as described in the preceding figures. It additionally shows a dash pot type solenoid 47 which has its armature connected by link 48 or otherwise to the outer end of lever 40. Moverover, there is illustrated in this figure a circuit breaker 49 preferably of the button type and a source of electrical current 50. The lead 51 has interposed in a circuit breaker 49. Leads 52 and 53 are connected to lead 51. Lead 52 has in series with it the windings of solenoid 47 and is thence continued to a ground. Lead 53 has in series with it the windings of solenoid 20. It continues thence to the inner end of assembly 30 with which it is connected. Therefore, current may flow from it through contacts 29 and 28 as well as contacts 32 and 33. In the case of the apparatus shown in Figs. 1 to 5, merely lead 53 is energized by a source such as 50. In other words, solenoid 47, link 48 and the horn button or circuit closer 49 are eliminated.

Now considering the operation of the apparatus as shown in Figs. 1 to 5, it will be assumed that the parts are electrically connected as aforedescribed. If, now, the outer end of lever 40 is moved in a counterclockwise direction, as viewed in Fig. 1, then, bolt 34 will be retracted. With such retraction, contacts 28 and 29 will be engaged. Therefore, current will flow through the winding of the solenoid assembly. This will energize the latter and serve to attract the armature assembly, including the bar 24. With such attraction, the diaphragm 15 will be flexed. In its inward movement, the arms or pins 25 will engage the adjacent arms of spring strip 27. Therefore, the latter will be shifted inwardly. This will separate contacts 28 and 29. The aforedescribed cycle will be repeated at acoustical frequencies such that the diaphragm 15 will be vibrated to produce a warning signal. As the lever 40 continues its movement, bolt 34 or the equivalent connecting number will shift the strip or spring assembly 30 inwardly to a greater extent. With such shifting, and due to engagement of the contacts 28 and 29, spring 27 will be shifted inwardly. Therefore, the point of engagement of the armature and spring 27 will be varied. Accordingly, the zone and amplitude of vibration of diaphragm 15 will be varied. It follows that the horn instead of simply producing a single substantially constant tone will throughout the zone of shifting of lever 40 produce a tone of varying pitch which may also vary somewhat in volume. The sound thus generated might, in certain respects, be likened to the roar of a bull. As the lever 40 is shifted to its extreme position, contacts 32 and 33 will engage. Of course, they may be spaced in a manner such that they will engage in advance of such final position of the lever. In any event, under those circumstances, current will flow in a series-parallel path in the manner aforedescribed and also through the resistor 46. The ohmage of the latter being properly proportioned to the ohmage of the solenoid 20. It follows that a continuing operation will occur. If contacts 32 and 33 engage before completion of swinging movement of the lever 40 in a counter-clockwise direction as in Fig. 1, then such further shifting of that lever as is possible will again result in a variation in the produced tone. If the lever is not shifted after engagement of these latter contacts then the tone will remain substantially constant.

The lever 40 will ordinarily be shifted by manual force which is directly applied either through a cable, a system of levers, or in any other desired manner. However, as shown in the overall illustration in Fig. 6 merely the closing of the switch or horn button 49 will provide for a proper operation of the horn free from any other manual effort. More particularly, when switch 49 is closed, then current will flow through lead 53 to produce the results which were initially described in the preceding paragraph. In other words, current will flow from contact 29 after having passed through solenoid 20 and thence through contact 28 to ground; the diaphragm being accordingly vibrated at acoustical frequencies. Simultaneously with the flow of current through lead 53, current will flow through lead 52. This will energize solenoid 47 to shift lever 40. Due to the relatively slow action of the armature of the solenoid because of the dash pot or equivalent structure, the lever 40 will be shifted at one speed or another

according to the setting of the parts. In any event, no effort additional to that involved in the closing of switch 49 will be necessary to assure an operation of the mechanism in the manner previously described.

Thus, among others, the several objects of the invention as specifically aforenoted are achieved. Obviously, numerous changes in construction and rearrangement of the parts might be resorted to without departing from the spirit of the invention as defined by the claims.

I claim:

1. An electrically actuated horn having an intermittently energizable solenoid attracting a diaphragm carrying armature including in combination a reciprocable movable strip electrically connected to one terminal of said solenoid, a first contact engageable with said reciprocable strip to energize said solenoid, a member supporting said first contact mounted between said solenoid and armature so as to be vibrated by said armature and vary the position of engagement between said first contact and said reciprocable strip, a second contact engageable with said reciprocable strip to energize said solenoid at a more extreme position of reciprocation of said strip than said engagement between said first contact and said strip, a resistance connected between said first and said second contacts so that said solenoid is energized by engagement between said second contact and said reciprocable strip through said resistance and means for reciprocating said reciprocable strip.

2. In a horn having an intermittently energizable solenoid attracting a diaphragm carrying armature and a spring flexed by said armature upon attraction by said solenoid, the combination of a first contact on said spring, a movable arm disposed adjacent and transverse to said spring and electrically connected to one terminal of said solenoid, one end of said arm immovable, one end of said arm movable in a direction toward and away from said spring, a reciprocable member cooperable and movable with the movable end of said movable arm, mechanical means cooperable with said reciprocable member to variably operate said member in the direction of the movement of said arm, a second contact on said arm out of contact with said first contact in the de-energized state of said solenoid and engageable with said first contact to energize said solenoid, said reciprocation of said movable arm being variable to vary the position of engagement between said first and second contacts along the direction of the movement of said movable arm whereby actuation of said mechanical means causes reciprocation of said reciprocable member and said movable arm to bring about a variation in the engagement between said first and second contacts and the flexure of said spring by said armature with a consequent variation in the sound produced by said diaphragm.

3. In a horn having an intermittently energizable solenoid attracting a diaphragm carrying armature and a member engaged by said armature upon attraction by said solenoid the combination of a first contact on said member electrically connected in the solenoid energization circuit, a first reciprocable means adjacent said member electrically connected in said solenoid energization circuit and movable in a direction toward and away from said member, a second means variably operable in the direction of reciprocation of said first means, said second means being cooperable and movable with said first reciprocable means, a second contact attached to said first reciprocable means and out of contact with said first contact in the de-energized state of said solenoid, said first reciprocable means and said second contact being movable to engage said second contact with said first contact to energize said solenoid, said reciprocation of said reciprocable means being variable to vary the position of engagement between said first and second contacts along the direction of the movement of said first reciprocable means whereby actuation of said second means causes reciprocation of said first reciprocable means to bring about a variation in the engagement between said first and second contacts and the movement of said member by said armature with a consequent variation in the sound produced by said diaphragm.

4. In a horn having an intermittently energizable solenoid attracting a diaphragm carrying armature the combination of a spring flexed by said armature upon attraction by said solenoid, a first contact on said spring movable therewith and connected in the solenoid energization circuit, a reciprocable arm independent of and disposed adjacent to said spring and electrically connected to one terminal of said solenoid, one end of said reciprocable arm immovable, the other end of said reciprocable arm being freely movable in a direction toward and away from said spring, reciprocable means cooperable with said free end of said reciprocable arm to variably reciprocate said reciprocable arm toward and away from said spring, a second contact on said reciprocable arm out of engagement with said first contact in the de-energized state of said solenoid and engageable with said first contact to energize said solenoid, said operation of said reciprocable means being variable to vary the position of engagement between said first and second contacts along the direction of the reciprocation of said reciprocable arm whereby actuation of said reciprocable means causes reciprocation of said reciprocable arm to bring about a variation in the engagement between said first and second contacts and the flexure of said spring by said armature with a consequent variation in the sound produced by said diaphragm.

5. In a horn having an intermittently energizable solenoid attracting a diaphragm carrying armature the combination of a spring interposed between said armature and solenoid, a free end of said interposed spring extending transversely halfway across said armature and anchored at the opposite end so as to be flexed by movement of said armature toward said solenoid, a first contact positioned on said spring substantially equidistant between said anchored end and said free end and electrically connected to one terminal of said solenoid, a movable arm disposed adjacent to said spring and electrically connected to one terminal of said solenoid, a fixed end of said movable arm, a freely movable end of said movable arm reciprocable in a direction toward and away from said spring, a reciprocable member cooperable and movable with the movable end of said movable arm, means cooperable with said reciprocable member to variably operate said member in the direction of the reciprocation of said movable arm, a second contact on said arm out of contact with said first contact in the de-energized state of said solenoid and engageable with said first contact to energize said solenoid, said reciprocation of said movable arm being variable to vary the position of engagement between said first and second contacts along the direction

of the reciprocation of said movable arm whereby actuation of said means causes reciprocation of said reciprocable member and said movable arm to bring about a variation in the engagement between said first and second contacts and the flexure of said spring by said armature with a consequent variation in the sound produced by said diaphragm.

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