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2,145,711

SOUNDING SIGNAL DEVICE

Filed April 19, 1934

2 Sheets-Sheet 1

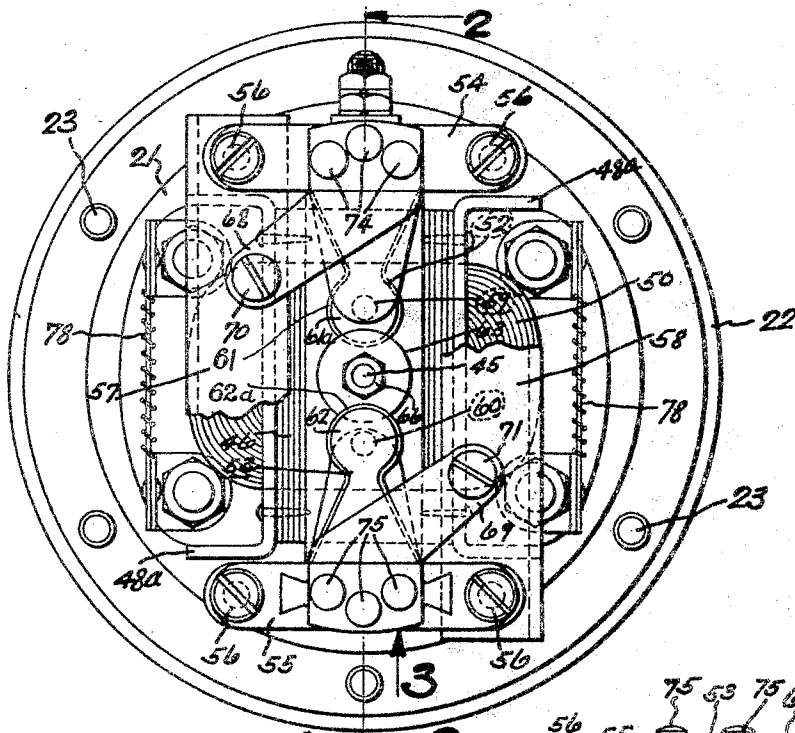


Fig. 1

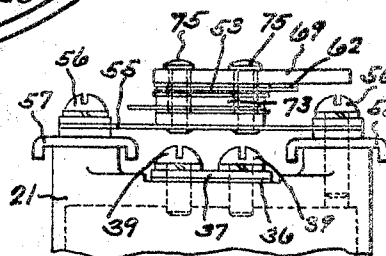


Fig. 3

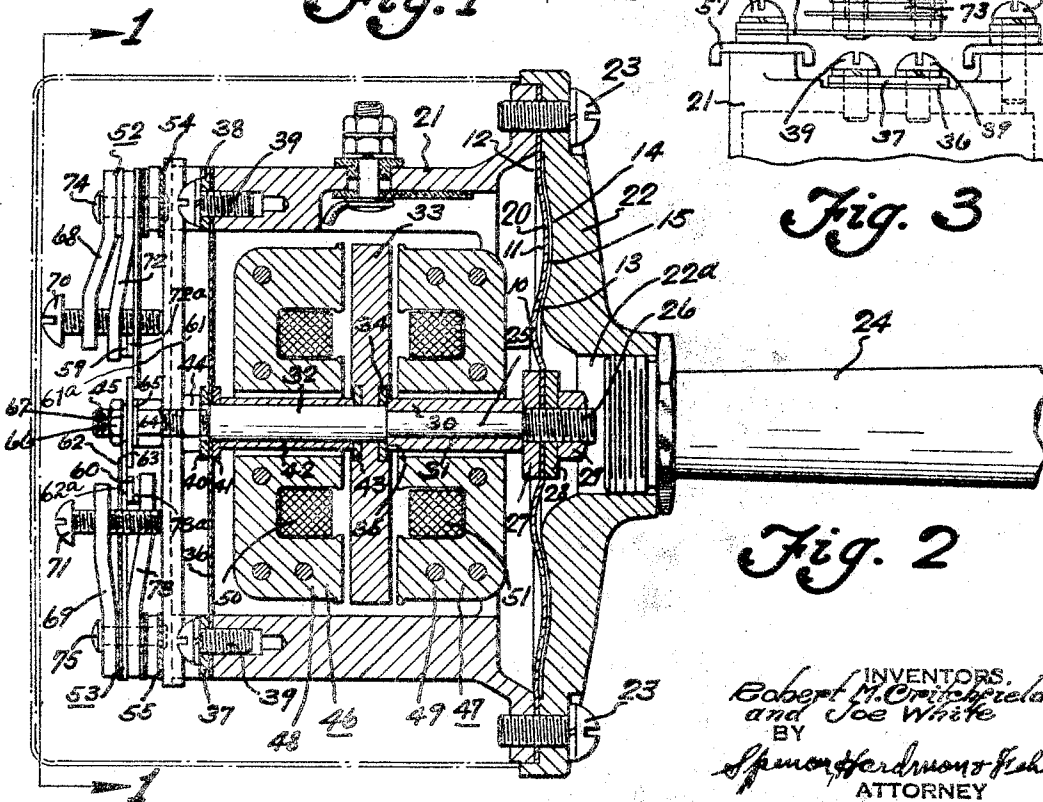


Fig. 2

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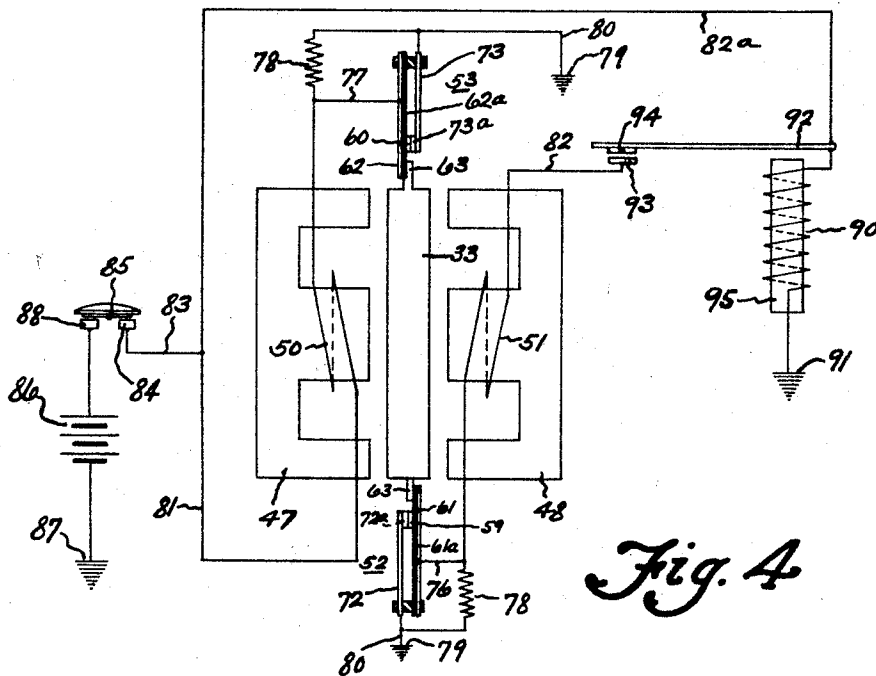
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2 Sheets-Sheet 2



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SOUNDING SIGNAL DEVICE

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6 Claims. (Cl. 172—126)

This invention relates to sound signal devices and especially to horns for automotive vehicles, wherein a diaphragm is electro-magnetically actuated to operate the horn. One of the objects of the present invention is to provide a sound signal of this type possessing an unusual amount of volume.

A further object is to simplify the construction as well as the means and mode of operation of sound signal devices, whereby they will not only be economical in construction, but will be more efficient in operation, capable of being easily and quickly operated and less likely to get out of repair.

A further object is to provide a sounding signal of the vibratory type, that is positively actuated on both the compression and retraction stroke, and not dependent for its operation on the inherent resiliency of component parts.

A still further object is to provide an air tone horn, of the push-pull type, whose impeller device will be positively actuated at high frequencies.

These and other objects are accomplished by constructing a sounding signal device of the air tone type in such manner that a compression chamber is formed by a trumpet supporting collar and a flexible impervious diaphragm, mounted in sealed relation at their peripheries. The compression chamber thus formed by the juxtaposed and similarly surfaced diaphragm and collar is of the sealed type except for the central opening through the collar leading into the projector. Framework cooperating with the collar periphery aids to clamp the diaphragm in sealed relation, and forms a support for the magnet motor construction. The magnet motor comprises a pair of field frames mounted on opposite sides of a movable armature, and that have their windings in communication with circuit breakers controlling the energization and deenergization of the same in alternation. The movable armature is fixedly connected to contact actuating means and the central portion of the diaphragm and thereby forms a movable air impeller.

The construction and arrangement of the parts and the electrical circuits within which they operate, are so designed that when the windings of the magnet motor are connected with the current source, that each winding of the magnet will be energized in alternate and rapid succession with respect to the other magnet winding so that the movable armature is caused to act upon the diaphragm positively driving it alternately to and from the cooperating collar surface. This to and fro movement of the diaphragm in relation to the juxtaposed collar, first squeezes out all of the air in the compression chamber located between the diaphragm and collar, and then follows with a final stopping of the air column through the projector at the toe thereof, and

on the retraction movement pulls the diaphragm away from the collar to enlarge the chamber and thereby draw air through the projector to fill the space. A construction of this type, and after this principle, results in a sounding signal device characteristically pure in sound product of a vibrating air column that is substantially free of vibrations caused by any mechanical noise. Also, the air impelling member is positively driven during both the compression stroke and the retraction stroke, since movement of the diaphragm or impeller is caused by the push-pull magnet motor, rather than any inherent resiliency of the diaphragm or the armature supporting spring.

With the above objects in view, the invention resides in these novel features of construction, combination and arrangement of parts, which will be hereinafter first fully described, and then be specifically pointed out in the appended claims reference being had to the accompanying drawings, illustrating a preferred and practical but obviously not the only embodiment of my invention.

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 an end view of a sound signal device embodying the present invention, with parts thereof broken away for clearness, the view being taken substantially on the line 1—1 of Fig. 2.

Fig. 2 is a vertical sectional view taken substantially on line 2—2 of Fig. 1, but showing parts of circuit breaker mechanism in elevations.

Fig. 3 is a fragmentary elevational view as indicated by arrow 3 of Fig. 1.

Fig. 4 is a circuit diagram of an electrical system for operating the signal device.

Like parts are indicated by the same reference character throughout the different views.

Referring to the drawings, numeral 20 indicates a diaphragm that is attached at its periphery between engaging faces of a casing 21 and a collar 22 by screws 23. The collar also supports a projector or trumpet 24, the collar having an aperture 22a centrally disposed and opening into the toe of the projector. The diaphragm and collar relation is one of specific characteristics, in that it is desired that the collar face opposing the diaphragm shall be very closely mating in surface contour therewith, and only slightly spaced therefrom. In practice the diaphragm 20 is concentrically corrugated as illustrated in the section of Fig. 2 at 10 and 11, which resolves the diaphragm into a structure of somewhat stiffened characteristics throughout its greater central portion, and it tends to localize the flexing portion in a region indicated at 12 just within the

clamped portion of the diaphragm. The opposing collar surface is corrugated with substantially the same contour of corrugations as indicated at 13 and 14, the corrugation or crest 13 being innermost and designated to merge smoothly into the bore of the aperture 22a. When the collar and diaphragm so characterized are assembled in their operative position, as illustrated in Fig. 2, then they will define a compression chamber 15 that is existent between and coextensive throughout the cooperating opposed surfaces of the diaphragm and collar, and the cross-sectional magnitude of this chamber will slowly and gradually increase from the peripheral attaching portion inwardly to the trumpet toe, or until the chamber opens into the collar aperture 22a. The diaphragm supports at its central portion one end of an axially movable armature rod 25 having a threaded portion 26 for the accommodation of clamping washers 27 and 28 and a nut 29 which securely clamps the rod and diaphragm in assembled relation against a spacing sleeve 30 surrounding a reduced portion 31 of the rod 25. Mounted upon an enlarged portion 32 of the rod 25 there is an armature 33 provided with a washer 34 for engagement with a shoulder 35 of sleeve 30. An armature guide spring 36 is secured at its extremities between members 37 and 38 and the casing 21 by screws 39. At its central portion the spring 36 is clamped between washers 40 and 41, bearing against a spacing sleeve 42 surrounding enlarged portion 32 of the rod 25 and the other end of the sleeve bearing against a washer 43 of the armature 33. A nut 44 tightened upon a threaded portion 45 of the rod 25 firmly clamps the armature guide spring 36 and the rod 25 in assembled relation.

Two electro-magnets 46 and 47 are located one on each side of the armature 33, and are composed of field frames 48 and 49 carrying field windings 50 and 51 respectively. Bracket or shelf members 48a and 49a attach the field frames to casing 21 in any desired manner. Appropriate electrical connections are made between the coils with a source of energy and with circuit breaker mechanisms 52 and 53. These mechanisms are carried by strips 54 and 55 respectively, both being secured by screws 56 through bridging members 57 and 58 and driven into the casing 21 of the horn.

The circuit breaker mechanisms include movable contacts 59 and 60 mounted upon resilient members 61 and 62 respectively, the free ends of which overlap an engaging member 63 mounted upon the threaded portion 45 of the armature rod. Insulators 61a and 62a overlap the members 61 and 62 and extend between them and the engaging member 63 so that the mechanisms may be properly insulated. The engaging member is held in fixed relation on the rod by adjustable clamping means comprising a nut 64 and washer 65 on one side and on the opposite side by a nut 66 and washer 67.

Rigid brackets 68 and 69 support adjusting screws 70 and 71 for adjusting engagement with bridging members 57 and 58. Fixed contact supporting members 72 and 73, are provided, and are rigidly secured to the brackets 68 and 69, and are consequently adjustable therewith. Stationary contacts 72a and 73a are mounted on the members for cooperation with the contacts 59 and 60. The whole breaker mechanism assembly is secured together by rivets 74 and 75, that fasten the assemblies to an intermediate part of the

strips 54 and 55, whereby a yielding support is provided.

Referring to Fig. 4, the electrical connections are made between the magnet windings 50 and 51 and their respective circuit breaker mechanisms by means of elements 76 and 77 communicating with leaf springs 61 and 62, whereupon optionally separable circuits are completed to ground through the contacts 59 and 72a and member 72 for the circuit breaker unit 52, and through the contacts 60 and 73a and member 73 for the circuit breaker unit 53. With respect to each unit, a resistance element 78 is joined to the conductors 76 and 77 and the members 72 and 73 from whence connection is made to ground at 79, through appropriate ground leads 80, the resistance being shunted around the separable contacts, and always in series between the respective magnet winding and its return or ground connection. The resistance unit 78 suppresses arcing at the contact points, since it provides a shunt path for the current upon opening the magnet circuit at the respective circuit breaker.

For connecting the sounding signal device into an appropriate electrical system, the opposite ends of the magnet windings 50 and 51 are provided with conductors 81 and 82, that eventually provide for electrical connection with a common conductor 83 joined to a contact 84 of an operating switch that provides a bridging member 85 for connecting the windings with a battery 86 grounded at 87 by bridging the contact 84 with the battery contact 88. The connection to one of the magnet windings, for instance that designated 50, is made as short and as direct as possible to the source, which is accomplished by a short lead 81.

For purposes of accomplishing assurance of starting of the horn, or for setting the same into oscillation, a lag device is inserted in the electrical circuit of the opposing electromagnet winding.

One form of such lag device is illustrated in Fig. 4, and comprises a relay winding 90 having a ground connection at 91, and is electrically connected with a resilient contact support 92 whose electrical connection is a source of current by a portion of the lead 82 designated at 82a. The lead 92 of the winding 51 is attached to a fixed contact 93 in opposed and separable relation with a movable contact 94 carried by the member 92. Immersed in the field of the winding 90 there is a core member 95 so disposed as to act upon the contact support 92.

With respect to the circuit diagram, when the signal device is at rest or is non-operative, the contributing parts will be substantially as illustrated, in which the horn button contacts will be open, both sets of circuit breaker contacts will be closed, and the separable contacts of the current lag device will be open. Upon closing of the horn button contacts, the current from the battery 86 will traverse both of the parallel branches, in one instance going directly thru the magnet winding and circuit breaker points to the return circuit connection, and in the other instance going thru the current lag device and thence to the return circuit connection. The open condition of these contacts of the current lag device, and their inherent resistance towards closing, will cause delayed conditions of operation in the magnet winding of that branch, by reason of which the electro-magnet winding directly connected with the current source will be energized and draw over the armature 33 before the op-

posing electro-magnet can in point of time be energized.

In theory, the same period of time of operation exists for the winding of the current lag device, as of the winding for the electro-magnet in the parallel branch, so that no magnetic influence is set up in the winding of the electro-magnet connected into the circuit of the lag device, until after the opposing electro-magnet has substantially completed its function. Operation of the directly connected electro-magnet, and drawing over of the armature, causes the separation of the contacts of the respective circuit-breaker mechanism, whereupon that electro-magnet will be deenergized. The other set of circuit breaker contacts remaining closed, and the current lag device having operatively closed the separable contacts of that device, the indirectly connected electro-magnetic winding will then be energized and operate to draw the armature in a reverse direction until it opens the circuit breaker contacts connected therewith. Once the armature of the device is set into operation it will continue so long as the horn button contacts are closed, the alternate energization of the opposed electro-magnets being taken care of entirely by the normally closed circuit breaker mechanism and the movable armature actuating the same.

From the foregoing description, taken in connection with the accompanying drawings, it is thought the construction, operation and advantage of the invention will be readily apparent to those skilled in the art to which the invention appertains.

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, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. An electrical system for a sounding signal, comprising in combination, a pair of opposed electro-magnets, an armature assembly having portions projecting through and beyond the magnets, normally closed circuit breakers each in circuit with an electro-magnet and disposed for engagement by a projecting portion of the armature assembly during opposite movement thereof, a current source, means connecting the source with the electro-magnets in parallel branches, and means delaying the action of one electro-magnet whereby the sounding signal may be set into operation by the other electro-magnet, said delaying means comprising a relay having a winding directly connected between the source and ground, and a cooperating armature for connecting one of the electromagnets directly with the source.

2. An electrical system for a sounding signal, comprising in combination, a pair of opposed electro-magnet, an interposed armature assembly, normally closed circuit breakers each in circuit with an electro-magnet and positioned to be opened on opposite movement of the armature assembly, a current source, means connecting the source with the electro-magnets in parallel branches for substantially simultaneous energization, and means connected into one of the parallel branches to increase its reluctance for delaying the effective action of the electro-magnet in that branch until after the other electro-magnet has been energized, the action of each electro-magnet opening the respective circuit breaker, whereby the other electro-magnet is energizable for operation.

3. An electrical system for a sounding signal, comprising in combination, a pair of opposed electro-magnets, normally closed circuit breakers each in circuit with an electro-magnet, means for opening each circuit breaker after energization of its respective electro-magnet, including an armature assembly disposed between the electro-magnets and engaging a part of each circuit breaker, a current source, means simultaneously connecting the source with both electro-magnets in parallel branches, and means increasing the reluctance of one branch for starting the electro-magnet of the other branch in advance of the operation of the electromagnet of the same branch comprising, a relay in one of the said branches for delaying the energization of the electro-magnet in that branch until the electro-magnet in the other branch has been energized.

4. An electrical system for a sounding signal, comprising in combination, a pair of opposed electro-magnets, an armature assembly responding to both magnets normally closed circuit breakers each in circuit with an electro-magnet and having a part actuable by the armature assembly, a current source, means connecting the source with the electro-magnets in parallel branches, a circuit breaker mechanism being in series with each electro-magnet, and having a pair of normally closed contacts, responsive to the operation of each electro-magnet for opening its respective circuit breaker, and means in circuit with one of the electro-magnets delaying its effective operation until the other electro-magnet has substantially completed its function, said delaying means comprising a device for increasing the magnetic resistance through the associated electromagnet.

5. An electrical system for a sounding signal, comprising in combination, a pair of opposed electro-magnets, an armature assembly responding to both electro-magnets, a circuit breaker mechanism in series with each electro-magnet, having a pair of normally closed contacts adapted to be opened upon reverse movement of the armature assembly, a current source, means connecting each circuit breaker with its respective electro-magnet into parallel branches, and the branches to the current source, and a starting device connected into one of the branches for delaying the action of the magnet in that branch until the magnet in the other branch has been operated, said starting device comprising a winding and an armature serially connected directly between the source and one of the electromagnets.

6. An electrical system for a sounding signal, comprising in combination, a pair of opposed electro-magnets, a current source, means connecting the source simultaneously with the electro-magnets in parallel branches, a circuit breaker mechanism in series with each electro-magnet, and having a pair of normally closed contacts, means including an armature assembly responding to the influence of both magnets for opening each pair of contacts upon actuation of the respective electro-magnet, and means traversed by current in one of the branches for delaying the effect of the magnet in that branch upon the armature until after the magnet in the other branch has actuated the armature.

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