G. C. DEAN.

MECHANICAL HORN.

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1,105,324.

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Fig. 1.

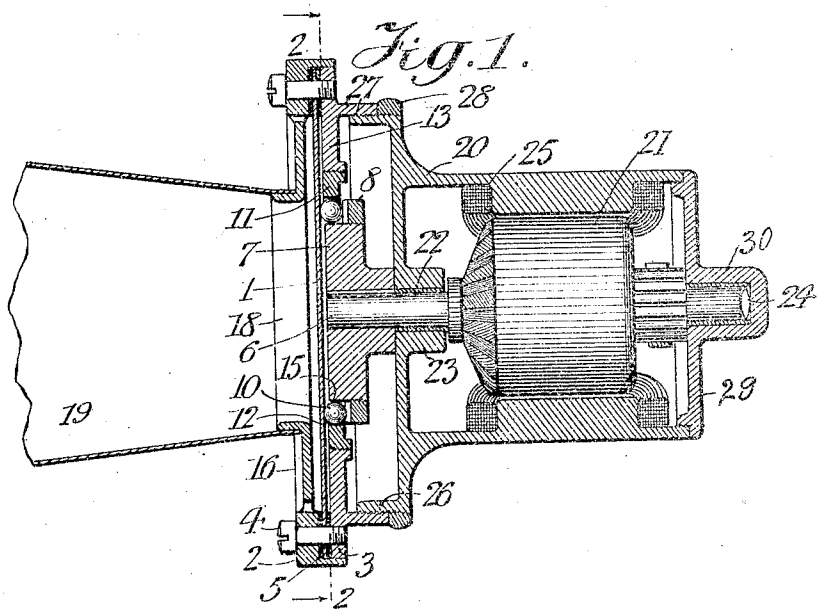
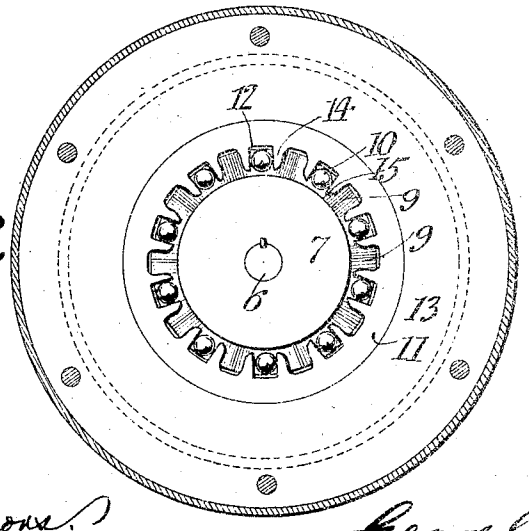


Fig. 3.



Fig. 2.



WITNESSES:

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MECHANICAL HORN.

1,105,324. Specification of Letters Patent. Patented July 28, 1914.

Original application filed July 10, 1911, Serial No. 637,678. Divided and this application filed February 10, 1913. Serial No. 747,336.

To all whom it may concern:

Be it known that I, GEORGE COOPER DEAN, a citizen of the United States, and resident of Bronxville, Westchester county, New York, have invented certain new and useful Improvements in Mechanical Horns, of which the following is a specification.

This invention relates to signal or alarm devices, of that type in which there is employed a diaphragm or other vibratory sound producing member and means for setting up vibration of the required frequency and amplitude. In such signals the diaphragm is usually actuated by means of a rotary member, which is driven by power means, usually in the form of an electric motor. Suitable connections or instrumentalities are employed which are capable of converting the rotary movement of the driver into reciprocatory movement of the diaphragm. The diaphragm being elastic, vibration may be set up and maintained by repeatedly displacing it in either direction from normal, since such displacement will put it under elastic stress causing it to return to or past normal position upon cessation of the displacing effort. Or the diaphragm may be displaced in both directions. In some cases the driving shaft or rotary member is provided with one or more eccentric portions or projections, constituting a cam or series of cams, the path of which is intercepted by a projection carried by the diaphragm. In other cases a separate thrust connection or a freely vibrated part has been interposed between the cam and the diaphragm.

This application is a division of my prior application, Serial No. 637,678, filed July 10th, 1911, and the invention herein claimed resides solely in the construction and arrangement of the parts for driving a rotary member and in the means for supporting said parts and facilitating adjustment in respect to the diaphragm.

The novel features of construction hereinafter described and by means of which the diaphragm is caused to vibrate upon the rotation of the rotary member form no portion of the present invention and are not claimed herein, the same being claimed in a co-pending application.

It will be apparent from the following detailed description that any suitable means may be employed for vibrating the diaphragm upon the rotation of the motor shaft in place of the mechanism herein disclosed without necessitating any change in the construction, mounting and adjustment of the motor which involve the novel features hereinafter claimed.

In the present invention I so mount the motor that it may be bodily rotated about an axis preferably normal to the diaphragm to secure the proper adjustment of the rotor in respect to the diaphragm. By employing a threaded connection between the motor casing or shell and a portion of the diaphragm casing a very delicate adjustment is secured by a relative rotation of the parts. This adjustment of the motor may be utilized to vary the operative relationship of the rotor to the diaphragm although supplemental adjusting means may also be employed if desired. The motor casing or shell preferably has spaced end walls including bearings for the armature shaft. One of these walls is preferably substantially parallel to the diaphragm and spaced only a short distance therefrom so as to form, with the diaphragm supporting member and the diaphragm, a substantially air tight chamber in the rear of the diaphragm and in which the air may be compressed and expanded during the vibration of the diaphragm. The adjustment of the motor toward and from the diaphragm also serves to adjust this end wall toward and from the diaphragm and vary the volume of the air chamber in the rear of the diaphragm.

In the accompanying drawings illustrating one embodiment of my invention, Figure 1 is a vertical longitudinal section through a warning or signaling device, the horn being partly broken away; Fig. 2 is a section on the line 2—2 of Fig. 1, and Fig. 3 is a semi-diagrammatic view, showing the relation between the particular cam, diaphragm, balls, and their guide member illustrated in Figs. 1 and 2.

In the horn illustrated I employ a diaphragm 1, held between clamps 2 and 3 forming marginal portions of the two sections 13 and 16 going to make up the diaphragm supporting and inclosing casing. The clamping portions are held together by

suitable screws 4, and gaskets 5 of cork or other suitable material engage with the opposite sides of the diaphragm at the clamped portion. The front casing section 16 is formed with a sound escape opening 18 from which extends a suitable projector or resonator 19. The diaphragm is caused to vibrate by means of a rotor or head 7 hereinafter referred to more in detail and mounted upon a shaft 6 preferably disposed normal to the diaphragm and in the particular form illustrated it is in alinement with the axis of the diaphragm and resonator. This shaft is preferably the shaft of an electric motor and the main features of my present invention reside in the construction of this motor, and the method of mounting and adjusting the same in respect to the diaphragm. The motor includes a substantially cylindrical metal case or motor shell 20 concentric with the axis and having cores for the field coils 25 integral therewith and projecting inwardly toward the armature 21. The motor casing has an end wall 22 preferably integral therewith and disposed substantially parallel to the diaphragm and so positioned as to be normally spaced a short distance from the diaphragm as hereinafter more particularly pointed out. This end wall has a bearing 23 for the armature shaft 6, said bearing being disposed between the armature and the rotor or head 7. At the opposite end of the motor case is a removable end wall or cap 29 which preferably has an outwardly projecting boss thereon into which one end of the armature shaft projects so as to constitute a bearing for the latter and within this boss 30 may be any suitable thrust bearing 24.

For securing the motor in position and facilitating its adjustment, I preferably provide the rear casing section 13, which is of annular or ring form, with a rearwardly extending cylindrical flange 27. The motor casing is mounted to telescope with the flange 27 and is provided with a part 26 closely fitting within said flange. The part 27 is interiorly threaded and the part 26 is exteriorly threaded, so that the motor is secured in place by a relative rotation of the motor casing, and the section or ring 13 and the rotation of the motor in one direction advances it and its head or rotor toward the diaphragm. When the motor has been rotated to a sufficient extent to firmly support it and a sufficient extent to bring the rotor head into proper operative position in respect to the diaphragm, it may be locked against further rotation and held rigidly in place by a lock nut 28 threaded on the motor casing part 26 and abutting against the end of the horn casing part 27. It will be noted that by means of this simple supporting mechanism the motor may be readily and quickly removed from the remainder of the horn whenever desired and when in place may be rigidly held against movement. The proper positioning of the motor may be secured with great delicacy due to the comparatively large diameter of the threaded portion and the low pitch of the threads. I may rely upon this adjustment as the only one for securing the proper positioning of the rotor, in respect to the diaphragm, or auxiliary adjusting mechanism may be employed for varying the position of the cam with respect to the diaphragm and independently of a movement of the motor case as will be hereinafter particularly pointed out.

For effecting the vibration of the diaphragm by the rotation of the head 7 any suitable means may be employed and the particular means illustrated is not claimed herein, although forming the subject-matter of a separate and copending application. In this specific construction the head 7 is provided with a face cam 8 encircling the same and adjustable in respect to the body of the rotor and between the face cam and the diaphragm is a series of balls 10 disposed in pockets or guide openings 12 in a guide member 11 forming a part of or carried by an inwardly extending flange portion of the rear casing member 13. The guide member 11 is stationary and the cam 8 is rotated by the rotation of the head 7 and shaft 6. The cam 8 is illustrated as being formed separately from the head 7 and secured thereto by screw threads or otherwise; and the holder or guide member 11 is illustrated as a ring screw or otherwise adjustably secured to the stationary ring or annular diaphragm supporting member 13. I have shown the member 11 provided with internally-projecting fingers 14 which form therebetween the openings 12, which being uninclosed at their inner sides, are opposite a peripheral surface 15 on the head. The spacing is such that the balls may contact with this peripheral surface without escaping from the openings 12, and in this way be constantly agitated by the rotor. The surface 15 may be regarded as a peripheral shoulder on the head, and the cam member as a radially projecting flange in the rear of this shoulder and behind the retaining member 11.

In operation the parts 6, 7 are rotated at high speed, so that the cam member 8 is carried around behind the balls to force the latter repeatedly toward and against the diaphragm. The latter is preferably entirely plane and imperforate inside its virtual periphery—that is, the inner circle of its clamped portion, and the balls are caused to deliver perfectly normal thrusts distributed simultaneously about and distant from its axis. In this way even a large diaphragm may be vibrated in a unitary manner, and without any lateral component of thrust, so that the diaphragm is placed under the least

possible strain and the similarity of successive sound waves is not impaired. Since the amplitude of vibration at the regions of thrust is materially less than the complete amplitude of vibration at the center of the diaphragm, balls may be employed with advantage, even though of small diameter, since the extent of their reciprocatory movement is slight. For this reason their guide openings 12 may be of the simplest formation, without the necessity of providing them with means for holding the balls against escape at either end, the presence of the cam and the diaphragm being sufficient to insure the retention of the balls.

The cam 8 may be adjusted toward and from the diaphragm, either by adjusting the head 7 as has been previously described, or by screwing the cam forward or backward on the head or by both, one for coarse and the other for fine adjustment. The retaining member 11 may be adjusted between the cam and the diaphragm, by screwing it forward or backward on the support 13. The pitch of the screw threads may be low, so that very fine adjustments may be secured.

As previously stated I make no claim herein for the specific means for vibrating the diaphragm upon the rotation of the armature shaft as any other means might be employed in the combination claimed in place of that shown, and that shown is claimed in a co-pending application.

What I do claim and desire to secure by Letters-Patent is:—

1. In a horn, an electric motor having an inclosing cup-shaped shell threaded externally at one end, a removable cap across the open end of the shell and provided with a bearing for the motor shaft, an internally threaded ring screwed upon the threaded end of the shell, an amplifier secured to the ring, a diaphragm in a plane substantially at right angles to the motor shaft having its marginal edges secured between the amplifier and the ring and means on the motor shaft for vibrating said diaphragm.

2. In a horn, an electric motor having a cup-shaped shell of magnetizable material, the base of the shell being threaded externally, an internally threaded ring screwed upon the base of the shell whereby the shell may be adjusted endwise in the ring, means for locking the shell in its adjusted position, a cap across the open end of the shell and provided with a bearing for the motor shaft, a diaphragm secured to the ring and extending across the adjacent end of the shaft, and means on the motor shaft for vibrating the diaphragm.

3. In a horn, a rotary electric motor driving a suitable shaft and having an inclosing shell, carrying field coils, and bearings for the motor shaft, a supporting member, a diaphragm carried thereby and located substantially at right angles to said motor shaft, and means carried by said motor shaft for effecting vibration of said diaphragm, said shell and said diaphragm-supporting member being relatively rotatable to adjust said last mentioned means in respect to the diaphragm.

4. In a horn, a rotary electric motor having an inclosing shell provided with an open end, and carrying the field coils, a removable member extending across one end and provided with a bearing for the motor shaft, a diaphragm in a plane substantially at right angles to said motor shaft, an annular diaphragm supporting member adjustable lengthwise of and upon said shell and means carried by said motor shaft for effecting vibration of said diaphragm, said means being adjustable toward and from said diaphragm upon the relative rotation of said motor shell and said diaphragm supporting member.

5. In a horn, a diaphragm, an annular internally threaded member supporting the same, an electric motor provided with an inclosing cylindrical shell having an axis at an angle to said diaphragm having exterior threaded engagement with the threaded portion of said member, and a rotor driven by said motor and adjustable toward and from said diaphragm upon the rotation of said motor shell in respect to said member.

6. A horn or signaling device having a diaphragm, a diaphragm supporting member and a rotary electric motor supported by said member with its shaft substantially normal to said diaphragm, and a rotor driven by the shaft of said motor, said motor and said diaphragm supporting member having threaded engagement whereby the rotation of one with respect to the other adjusts said rotor toward and from said diaphragm.

7. A horn or signaling device having a casing member presenting a threaded portion, a diaphragm clamped to said casing member adjacent the periphery of the latter and an electric motor including an armature and a casing having a cylindrical threaded wall and transverse wall, said transverse wall being spaced from and substantially parallel to said diaphragm and serving as a bearing for one end of the armature shaft, a rotor on said armature shaft between said transverse wall and said diaphragm for vibrating the latter, the threaded engagement of said shell and said casing serving to adjust the position of said rotor in respect to said diaphragm.

8. A horn or signaling device having a diaphragm, an annular member supporting the same, a rotary electric motor arranged with its shaft substantially normal to said diaphragm and provided with a casing, a rotor mounted on the motor shaft in operative relation to said diaphragm, and means ad-

justably connecting said casing with the peripheral portion of the diaphragm supporting member, whereby relative adjustment of said diaphragm and rotor toward and from each other is attainable by a relative rotation of said motor casing and said diaphragm supporting member.

Signed at New York city in the county of New York and State of New York this 8th day of February A. D. 1913.

GEORGE C. DEAN.

Witnesses:

CLAIR W. FAIRBANKS,

FLORENCE LEVIEN.