

Jan. 3, 1939.

S. G. DOWN

2,142,184

DIAPHRAGM HORN

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Fig. 1

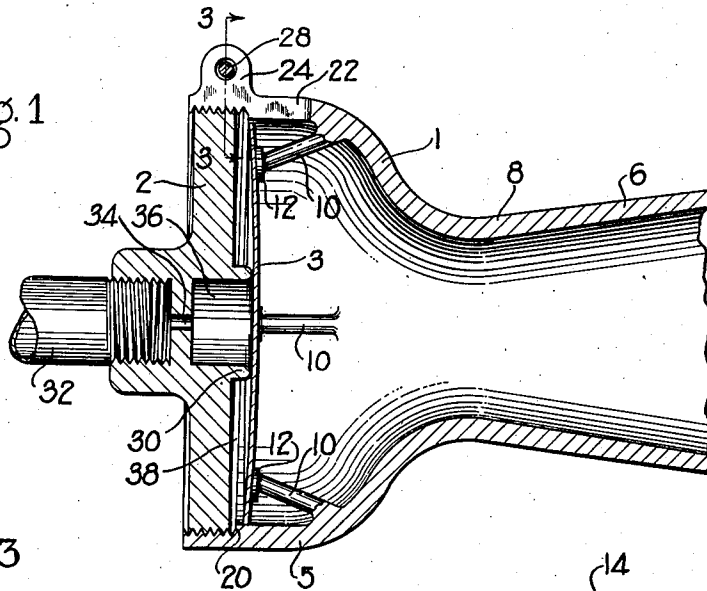


Fig. 3

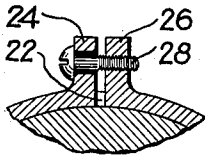


Fig. 2

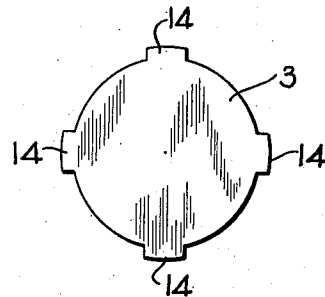
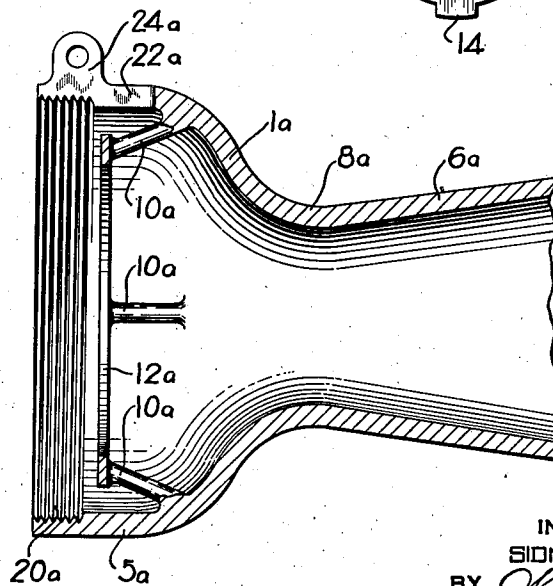


Fig. 4



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2,142,184

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2 Claims. (Cl. 116—142)

This invention relates to a sound producing device and more particularly to a device of the type employing a vibratory diaphragm.

It is the principal object of this invention to provide an improved sound producing device of the type referred to and which is operated by fluid under pressure.

A further object of the invention is to provide a sound producing device of the type referred to which incorporates means to adjustably vary the tone of the sound produced by the device.

Another object of the invention is to provide an improved sound producing device which is simple and rugged in construction and efficient in operation.

Other objects of the invention and features of novelty will be apparent from the following description taken in connection with the accompanying drawing in which

Fig. 1 is a fragmentary sectional view of a sound producing device embodying my invention,

Fig. 2 is an elevational view of the diaphragm employed in the device shown in Fig. 1,

Fig. 3 is a fragmentary sectional view taken substantially along the line 3—3 of Fig. 1, and

Fig. 4 is a sectional view of a portion of a sound producing device showing a modified form of construction which I may employ.

Referring to Fig. 1 of the drawing, the sound producing device therein illustrated comprises a casing section 1, a casing section 2, and a flexible diaphragm 3.

The casing section 1 comprises a substantially cylindrical portion 5 of relatively large diameter which is connected to a horn bell portion 6 through a portion of relatively small diameter indicated at 8. The casing section 1 has formed integral therewith inwardly extending prongs 10 which terminate in enlarged heads 12 having substantially flat faces which are adapted to engage a face of the diaphragm 3.

The diaphragm 3 is constructed of a suitable material, such as sheet metal, and is of slightly smaller diameter than the opening in the cylindrical portion 5 of the casing section 1. The shape of the diaphragm is clearly shown in Fig. 2 of the drawing where it will be seen that it has recesses cut in the margin thereof leaving projections 14 at points spaced apart circumferentially of the diaphragm.

The prongs 10 and the recesses in the margin of the diaphragm 3 are arranged so that when the diaphragm is in position in the cylindrical portion 5 of the casing section 1, the heads 12 of the prongs 10 engage the face of the diaphragm at

points located radially inwardly of the recesses in the margin of the diaphragm.

The casing section 1 has threads 20 cut in the inner face of the cylindrical portion 5, and it has a slot 22 cut therein, while there are ears 24 and 26 formed on the outer face of the casing section 1 on opposite sides of the slot 22. The ear 24 has an opening therein through which extends a screw 28 which extends into a threaded opening in the ear 26.

The casing section 2 comprises a substantially cylindrical member having threads cut in the periphery thereof which are adapted to cooperate with the threads 20 cut in the inner face of the cylindrical portion 5 of the casing section 1.

The casing section 2 has formed thereon a substantially annular seat rib 30 which projects from the face of the casing section 2 and is adapted to engage a face of the diaphragm 3 adjacent the center thereof.

The casing section 2 has secured in an opening therein a pipe 32 which leads from a suitable source of fluid under pressure, not shown, and which is connected through a choke or restricted portion 34 with the chamber 36 within the seat rib 30.

The casing section 2 is screwed into the threaded portion on the cylindrical portion 5 of the casing section 1 so that the seat rib 30 presses against one face of the diaphragm 3 and thereby presses the other face of the diaphragm against the heads 12 carried by the prongs 10, and so that the diaphragm 3 is deflected slightly, as is clearly shown in Fig. 1 of the drawing.

When the casing section 2 has been turned to the position to give the desired deflection of the diaphragm 3 it may be locked in this position by tightening the screw 28, which contracts the cylindrical portion 5 of the casing section 1 about the casing section 2 and thus rigidly clamps it in position.

When it is desired to operate the signal device, fluid under pressure is supplied to the pipe 32 by means, not shown, and it flows therefrom through the choke 34 to the chamber 36 within the seat rib 30. Fluid which is supplied to the chamber 36 is confined to this chamber at this time as the diaphragm 3 is firmly pressed against the seat rib 30, thereby cutting off communication between the chamber 36 and the area indicated at 38 outwardly of the seat rib 30.

On an increase in the pressure of the fluid in the chamber 36 to a predetermined value, the force exerted by this fluid on the diaphragm 3 is sufficient to overcome the force resulting from

the inherent resiliency of the material of which the diaphragm is constructed and tending to hold the diaphragm against the seat rib 30.

When the pressure of the fluid in the chamber 36 builds up to this value, the diaphragm 3 is forced away from the seat rib 30, thereby permitting the fluid under pressure within the chamber 36 to escape past the seat rib 30 to the area 38 outwardly of the seat rib. When the diaphragm 3 is moved away from the seat rib 30, the flow capacity of the passage opened thereby is substantially greater than the flow capacity of the choke 34 through which fluid under pressure is supplied from the pipe 32 to the chamber 36. Fluid under pressure, therefore, can escape from the chamber 36 at a more rapid rate than the rate at which fluid is supplied thereto, and, as a result, there is a rapid reduction in the pressure of the fluid in the chamber 36.

On this reduction in the pressure of the fluid in the chamber 36, the force exerted on the diaphragm 3 tending to hold it away from the seat rib 30 is correspondingly reduced, and the diaphragm 3 is returned, by the inherent resiliency of the material of which it is constructed, to a position in which it is in engagement with the seat rib 30. This cuts off the release of fluid under pressure from the chamber 36 within the seat rib, and as fluid under pressure is continuously supplied to the chamber 36 from the pipe 32 through the choke 34, the pressure of the fluid in this chamber builds up, and, because of the relatively small volume of the chamber 36, the pressure in this chamber very quickly increases to a value such that the force exerted by the fluid on the diaphragm 3 again exceeds the force tending to press the diaphragm 3 against the seat rib 30. The diaphragm 3, therefore, is again moved away from the seat rib 30 so as to again permit fluid under pressure to escape from the chamber 36 at a rate more rapid than the rate at which fluid is supplied thereto through the choke 34. The diaphragm 3 will thereupon again be returned into engagement with the seat rib 30 to cut off the release of fluid under pressure from the chamber 36 within the seat rib 30.

This process will continue as long as fluid under pressure is supplied to the device by way of the pipe 32, and the rapid vibrations of the diaphragm 3 results in the production of vibrations in the air column within the horn bell 6 which causes the device to emit an audible sound.

The fluid under pressure which escapes from the chamber 36 past the seat rib 30 to the area 38 outwardly of the seat rib 30 flows therefrom through the recesses cut in the margin of the diaphragm 3 to the opposite side of the diaphragm, and thence to the atmosphere through the horn bell 6.

This sound producing device incorporates means by which the tone of the sound produced by the device may be adjustably varied if desired. This is accomplished by loosening the screw 28 and then turning the casing section 2, which is threaded in the cylindrical portion 5 of the casing section 1. This causes the seat rib 30 carried by the casing section 2 to move relative to the heads 12 carried by the prongs 10 and this changes the degree of deflection of the diaphragm 3. This varies the force tending to press the diaphragm 3 against the seat rib 30 as the result of the inherent resiliency of the material of which the diaphragm is constructed, and this varies the pressure to which the fluid in the chamber 36 within the seat rib 30 must build up before the

force exerted by this fluid on the diaphragm 3 is sufficient to move the central portion of the diaphragm away from the seat rib 3. This results in a different rate of vibration of the diaphragm 3 and produces a change in the rate of vibration of the air column within the horn bell 6 which determines the tone of the sound produced by the device.

After the casing section 2 has been turned to the desired position it may be locked in this position by again tightening the screw 28 which contracts the cylindrical portion 5 of the casing section 1 about the casing section 2 and holds it in the adjusted position.

In Fig. 4 of the drawing I have illustrated a modified form of construction which I may employ. In the construction shown in this figure a casing section 1a, which is generally similar to the casing section 1 employed in the device shown in Fig. 1 is provided, and has a substantially cylindrical portion 5a which is joined to the horn bell section 6a by a portion of reduced diameter indicated at 8a.

This casing section has formed integral therewith inwardly extending prongs 10a within the cylindrical portion 5a and the ends of these prongs are joined by an annular portion, indicated at 12a, which is adapted to be engaged by a face of the diaphragm 3 at points on the diaphragm radially inwardly of the recesses which are cut in the margin of the diaphragm.

With this form of construction a casing section similar to that indicated by the reference numeral 2, and employed in the device shown in Fig. 1 is employed, and when it is screwed into the threads 20a on the interior of the cylindrical portion 5a, the seat rib 30 carried thereby presses against the diaphragm 3 forcing the diaphragm against the annular portion 12a and deflecting the central portion of the diaphragm.

The operation of this embodiment of the invention is similar to that shown in Fig. 1, and the fluid under pressure which escapes past the seat rib 30 on the casing section 2 flows around the diaphragm 3 and through a passage positioned outwardly of the annular portion 12a, and flows between the prongs 10a to the chamber on the face of the diaphragm, and thence to the horn bell portion 6a from which it escapes to the atmosphere.

It will be seen that this invention provides a sound producing device employing a vibratory diaphragm and incorporating means to adjustably vary the tone of the sound produced by the device. It will be seen also that this device is simple and rugged in construction and is efficient in operation.

While two embodiments of the improved sound producing device provided by this invention have been illustrated and described in detail, it should be understood that the invention is not limited to these details of construction and that numerous changes and modifications may be made without departing from the scope of the following claims.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a sound producing device, in combination, a member having a seat rib associated therewith, a member having a substantially annular portion adapted to engage a face of a diaphragm, said annular portion being of substantially larger diameter than the seat rib, a flexible diaphragm having one face engaged only by the

5 seat rib and having its other face engaged only
by said annular portion, means for supplying
fluid under pressure at a restricted rate to the
area within the seat rib, and a communication
extending around the periphery of the said dia-
phragm and located outwardly of said annular
portion through which fluid may flow from the
area outwardly of the seat rib at one face of the
diaphragm to the other face of the diaphragm.

10 2. In a sound producing device, in combina-
tion, a flexible diaphragm, a casing section hav-
ing a seat rib associated therewith and engaging
a face of the diaphragm substantially centrally

thereof, means engaging the other face of the
diaphragm at points arranged circumferentially
of the diaphragm and located radially outwardly
of the said seat rib and radially inwardly of the
margin of the diaphragm for pressing said dia-
phragm into engagement with said seat rib, the
portion of said diaphragm radially outwardly of
said means being free to flex about said means
as a fulcrum, and means for supplying fluid
under pressure at a restricted rate to the area
within said seat rib. 10

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