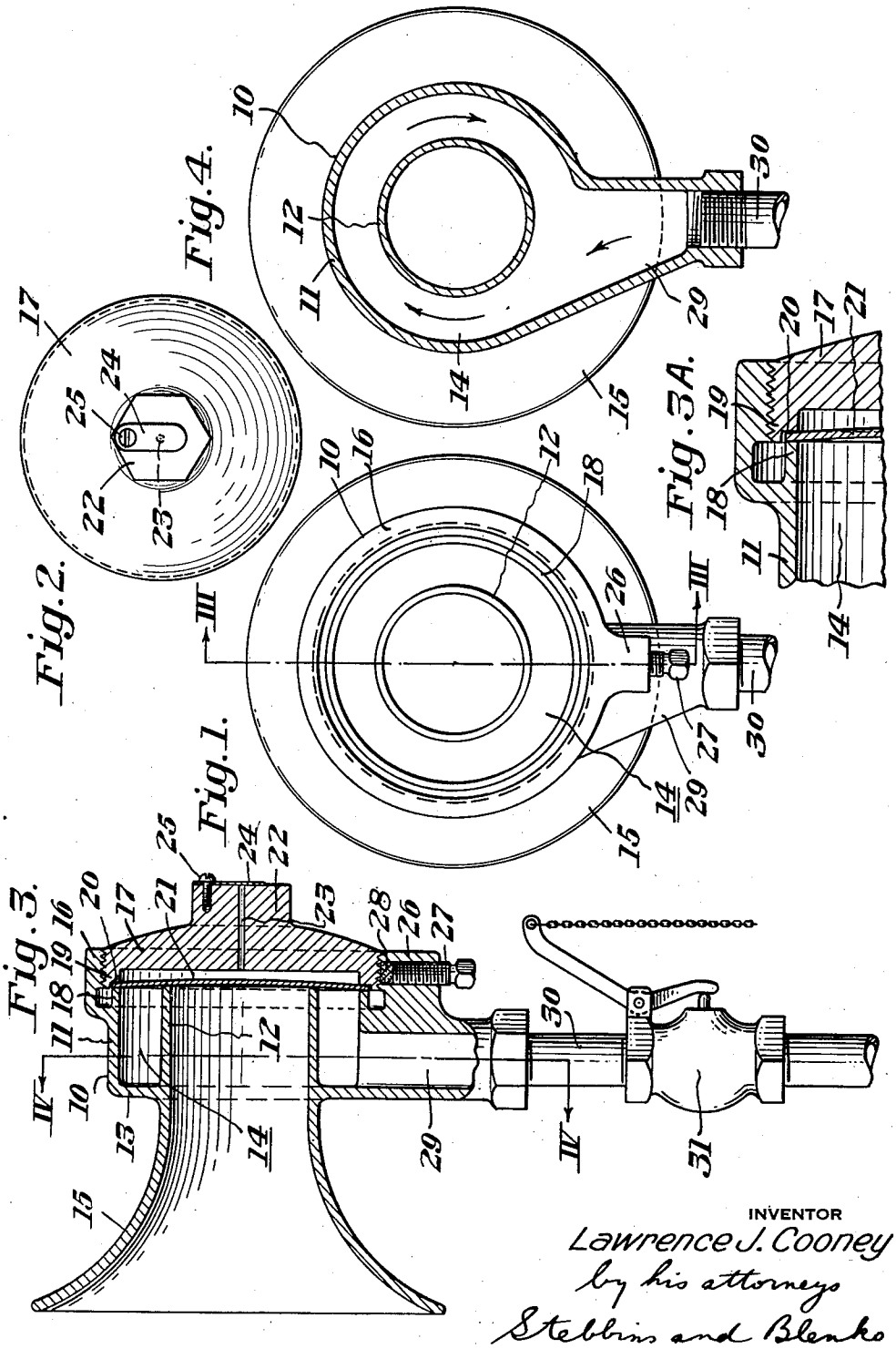
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SOUND EMITTING DEVICE

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SOUND-EMITTING DEVICE

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8 Claims. (Cl. 116—142)

This invention relates to a sound-emitting device and, in particular, to a device having a diaphragm supported for vibration and adapted to be actuated by fluid under pressure. Specifically my device is of the general type disclosed in Patent 870,074 but is an improvement thereon.

Various types of sound-emitting devices operated by fluid pressure have been known heretofore, including that shown in the aforementioned patent, but experience with various types of such devices has revealed certain objections thereto. It is the object of the present invention to improve generally on diaphragm-type sound-emitting devices operated by fluid pressure, and particularly to provide a device which starts substantially immediately on the admission of fluid thereto and operates at high efficiency so as to produce sound of great intensity with the expenditure of but little energy.

In a preferred embodiment, the invention comprises an annular chamber open at one end, with a cover for holding a diaphragm over the open end, the cover having a vent therein, an inlet to the chamber for fluid under pressure, and a flaring bell extending forwardly from the chamber and serving as an outlet for the sound produced. The details of construction and further novel features and advantages of the invention will be pointed out in the course of the following complete description and explanation which refer to the accompanying drawing illustrating the preferred embodiment. In the drawing—

Figure 1 is a rear elevation of the device with the cover removed;

Figure 2 is an elevation of the cover;

Figure 3 is a sectional view taken along the plane of line III—III of Figure 2 showing the cover in place on the body of the device;

Figure 3A shows a portion of Figure 3 to enlarged scale; and

Figure 4 is a transverse section along the plane of line IV—IV of Figure 3.

Referring now in detail to the drawing, the device comprises a substantially cylindrical body 10 including radially spaced, substantially cylindrical outer and inner walls 11 and 12. The body is open at one end. A connecting wall 13 extends between the walls 11 and 12 at the other end. The walls 11, 12 and 13 thus form an annular chamber 14 open at one end. A flaring bell 15 extends from the closed end of the body 10 and has a minimum diameter at least as great as that of the inner wall 12. The bell flares to a maximum diameter at its outer end about twice the axial length thereof, measured from wall 13. The structure thus far described may also be conceived of as comprising the flaring bell 15, the small end 12 of which is substantially cylindrical and has a substantially cylindrical outer wall 11 spaced radially therefrom and joined thereto by the connecting wall 13.

The outer wall 11 has an enlarged portion 16 threaded interiorly to receive a cover 17 adapted to be screwed into the open end of the body. Interiorly of the enlarged portion 16, the outer wall 11 is provided with a seat 18. The free end of the inner wall 12, i. e., the end remote from the wall 13, projects slightly beyond the seat 18 and lies in a plane parallel to that defined by the seat. The cover 17 has a peripheral shoulder 19 having a step 20 on the outer edge thereof. A vibratile diaphragm 21 is disposed in the step 20. When the cover 17 is screwed home, the shoulder 19 clamps the edge of the diaphragm 21 against the seat 18. Portions of the diaphragm spaced inwardly from the edge bear on the end of the wall 12. The diaphragm is thereby dished slightly by reason of the fact that the wall 12 projects slightly beyond the seat 18. For convenience in applying and removing the cover 17, it is provided with a boss 22 of hexagon or other non-circular shape adapted to be engaged by a wrench or other suitable tool.

The cover 17 is provided with a vent 23 in the form of a pinhole or capillary passage which may conveniently be drilled centrally through the cover 17 and boss 22. The vent is normally closed by a displaceable closure in the form of a flexible piece of thin metal 24 which I term a reed, secured to the boss 22 by a screw 25.

A boss 26 is formed on the body 10 and is drilled radially and tapped to receive a set screw 27. A fiber plug 28 disposed in the screw hole ahead of the screw is adapted to be forced thereby against the threaded periphery of the cover 17 to secure it against unscrewing as the result of the vibration of the diaphragm 21.

A fluid inlet 29 is formed on the body 10 and extends laterally therefrom. As shown in Figures 1 and 4, the inlet wall at one side is substantially tangential to the outer wall 11 of the body 10. At the other side, the inlet wall is substantially normal to the outer wall 11. By this construction, fluid delivered into the inlet is caused to circle around the annular chamber 14 in a clock-wise direction as indicated by the arrows in Figure 4. The outer end of the inlet 29 is enlarged and of hexagon or other suitable shape for the application of a wrench and is tapped to receive a pipe connection 30 from a suitable source of fluid under pressure. A control valve 31 of any suitable type is placed in the pipe connection as shown in Figure 3.

The device may be operated from any convenient source of fluid under pressure and emits sound of great intensity, viz., 109 decibels, when

operated by fluid under relatively low pressure, i. e., 15 pounds per square inch in the chamber 14. As previously stated, fluid under pressure admitted to the inlet 29 tends to circle the chamber 14. It is also effective, of course, to vibrate the diaphragm 21, thereby intermittently providing a slight clearance between it and the free end of the wall 12. When the fluid is first admitted to the chamber 14, the reed 24 is displaced by the pressure of the fluid, thereby providing an open vent and insuring substantially immediate starting of the vibration of the diaphragm. As soon as the diaphragm starts vibrating which, as previously indicated, is substantially immediately on the admission of fluid under pressure, the pressure of the fluid in the vent 23 decreases and the reed 24 returns to the illustrated position, thereby preventing a continuous loss of air through the vent which would lower the efficiency of the device.

The invention is characterized by numerous advantages over devices of the same general type such as have been known heretofore. In the first place, the vent in the cover causes the device to operate positively and to start immediately, whenever fluid under the necessary pressure is supplied to the chamber 14. This makes the device suitable for giving code signals including blasts of different lengths. The device is substantially non-directional, furthermore, despite the provision of the bell 15. The tangential disposition of the inlet whereby fluid entering the chamber 14 receives a circumferential velocity component is a further aid to immediate starting of vibration of the diaphragm and also improves the efficiency from the standpoint of the intensity of sound emitted and the volume of fluid consumed.

The fact that the minimum diameter of the bell 15 is at least as great as that of the wall 12 provides an unbroken outlet for vibrations and gives a better tone to the sound emitted than a contracted outlet such as that shown in Patent 870,074. The radial arrangement of the set screw 27 and the provision of the fiber block 28 permits the screw-on cover 17 to be securely locked against loosening under the vibrations of the diaphragm without imparting any initial distortion or local deformation to the diaphragm.

When operating, the device emits a penetrating sound which is audible over great distances, thereby rendering the device particularly useful as a warning signal for general application. The device is simple in construction and relatively inexpensive to manufacture and since there is only one moving part, i. e., the diaphragm, there is practically no maintenance involved.

Although I have illustrated and described a preferred embodiment of the invention, it will be recognized that changes in the construction and arrangement disclosed may be made without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. A sound-emitting device adapted to be operated by fluid under pressure, comprising a cylindrical body including radially spaced inner and outer substantially cylindrical walls, a connecting wall between the inner and outer walls at one end thereof, said inner wall being open to the exterior of the body at both ends and the space between said walls being open to the exterior of the body at the end opposite said connecting wall, a seating shoulder extending around the inside of the open end of the outer wall, said inner wall terminating in a free end adjacent the plane determined by said shoulder, a diaphragm having its edge in engagement with said shoulder and also having portions spaced inwardly of the edge in engagement with the free end of said inner wall, and a cover removably disposed in and overlying the open end of the body and serving to clamp the edge of the diaphragm against said seat, said outer wall having a fluid inlet formed thereon and extending laterally thereof, one side of said inlet being tangential to the outer wall of the body, and said cover having a vent passage therethrough.

2. A sound-emitting device adapted to be operated by fluid pressure comprising an annular chamber including spaced, coaxial, substantially cylindrical walls open at one end, a connecting wall closing the space between the walls at the other end, a cover removably secured to the open end of the body, a diaphragm seated in the body at said open end and secured in place by said cover, the inner wall terminating at such a point adjacent the open end of the body as to engage the diaphragm when secured in place by said cover, a fluid inlet formed on the outer wall of said body, one side of said inlet being tangential to said outer wall thereof, and a vent passage in said cover.

3. The apparatus defined by claim 2 characterized by a flaring bell extending outwardly from said connecting wall, the minimum diameter of said bell being at least as great as the diameter of said inner cylindrical wall, said bell flaring at its end to a diameter about twice the axial length thereof measured from said connecting wall.

4. The apparatus defined by claim 2 characterized by a flaring bell extending outwardly from said connecting wall, the minimum diameter of said bell being the same as the diameter of said inner cylindrical wall.

5. The apparatus defined by claim 2 characterized by a closure for said vent adapted to be displaced temporarily on the admission of fluid to said body.

6. The apparatus defined by claim 2 characterized by a flexible reed secured to the exterior of said cover, overlying said vent, and adapted to be displaced temporarily on the admission of fluid to said body.

7. A sound-emitting device adapted to be operated by fluid pressure comprising a flaring bell the small end of which is substantially cylindrical, a substantially cylindrical outer wall spaced radially from said end, a connecting wall between the bell and outer wall defining therewith an annular chamber open at one end, a cover removably disposed in the open end of outer wall, a diaphragm held in the end of the outer wall by said cover and bearing on said small end of the bell, a fluid inlet formed on said outer wall, one side of said inlet being tangential to said outer wall a vent passage in said cover, and a yieldable closure for said passage.

8. A sound-emitting device comprising coaxial inner and outer cylindrical walls, a connecting wall therebetween at one end, a diaphragm overlying the end of the inner wall opposite that at which the connecting wall is located, a cover clamping the edge of the diaphragm against the end of the outer wall, and a fluid inlet merging into the space between said inner and outer walls, said inlet being tangent to the outer wall on one side and substantially normal to the outer wall on the other.

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