Jan. 15, 1957 A. BAILEY 2,777,251

SELF-OSCILLATING DOUBLE TONE WHISTLE

Filed June 29, 1954

FIG. 1

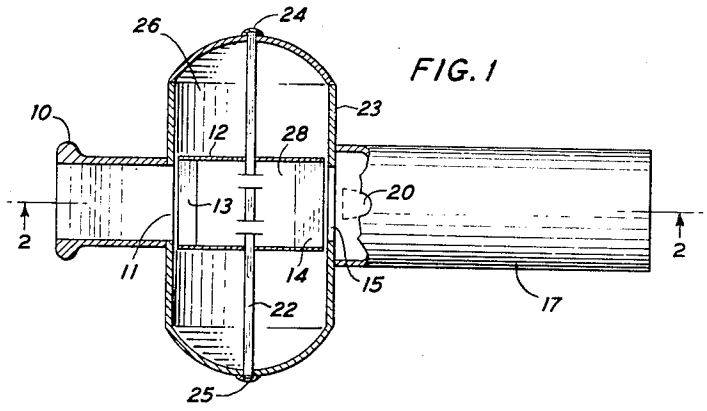


FIG. 2

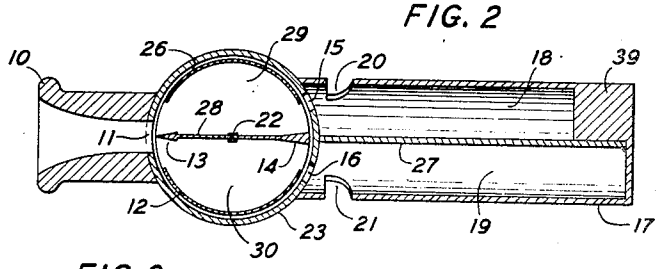


FIG. 3

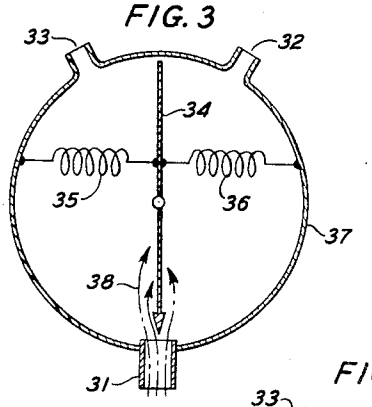


FIG. 4

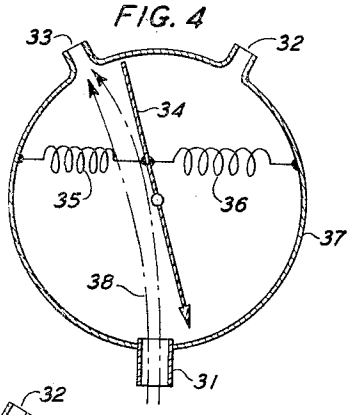
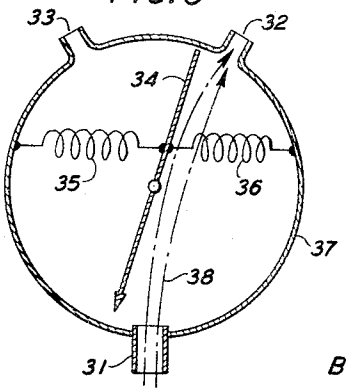


FIG. 5



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SELF-OSCILLATING DOUBLE TONE WHISTLE

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4 Claims. (Cl. 46—179)

This invention relates to fluid operated sound producing devices and more particularly to a self-oscillating double tone whistle.

Whistles of single or multitone types, actuated by air, steam, or other fluids are well known. Generally, in devices of the multitone type either all tones are emitted in unison or modulation occurs at a variable rate usually as a function of the actuating fluid pressure. Recently, however, a new international radio distress signal has been proposed which creates a need for an audible tone producing device which automatically emits two different tones in succession at a frequency of alternation which remains substantially fixed no matter what may be the applied fluid pressure.

Specifically, the warning signal adopted by the Comité Consultatif Internationale Des Radiocommunications, consists of a 1300 cycle tone sent for one-quarter second, followed by a 2200 cycle tone for one-quarter second, this alternation being repeated for a minimum period of six seconds. It is proposed further to provide receiving equipment which will automatically recognize this audible signal when transmitted on a radio voice frequency channel and which will thereupon actuate associated apparatus to initiate rescue operations. A whistle which is the ultimate in simplicity and reliability is one which is operable by ordinary lung power to produce the desired alternating signal. Thus, the only additional operation will be the turning on of the radio transmitter to the designated distress frequency.

It is therefore an object of this invention to provide a fluid pressure operated sound producing device for emitting two successive tones of different chosen frequencies at an automatic and fixed rate of alternation.

It is a further object to provide a sound producing device as above described which is actuatable by comparatively low fluid pressures such as produced by human lungs for the required minimum of six seconds.

In one specific embodiment of this invention a valve chamber is provided having a single inlet port and two outlet ports, each communicating with a sound producing chamber of a distinctive and differing frequency. Pivoted centrally in the valve chamber is a spring loaded vane arranged so as to have a central or "neutral" position in which the head of the vane bisects the inlet port and the tail rests midway between the two outlet ports.

The spring loaded vane constitutes an unstable system which deflects to one side or the other upon impingement of a fluid stream such as air, through the inlet port. This deflection, governed by the porting system, is sufficient to move the vane "head" completely to one side of the inlet port while the tail moves to a position just short of one outlet port, enabling communication through the inlet port and only one of the outlet ports. The vane springing system then acts to overcome the initial deflection of the vane and to restore it to the "neutral" position. However, inertia causes the vane to swing past this central position so that the air stream impinges on the opposite side of the vane and causes deflection in the

opposite direction enabling venting of the air stream through the other outlet port. This oscillatory motion of the vane with alternate venting of the fluid stream from the two outlet ports will continue so long as fluid pressure is applied at the inlet port. Each of the outlet ports may be arranged in communication with a separate sound producing chamber for producing a tone of a different frequency, or it may be found advantageous merely to vent one port to the atmosphere, thereby interrupting one tone at the frequency of the oscillating system.

Thus, in a device constructed in accordance with this invention the frequency of alternation of the dual tones is a function of the rotational inertia of the vane member and the stiffness of its spring system. For example, a two-tone whistle for giving the noted international signal would be tuned by adjusting the mass of the rotating parts and the stiffness of the restoring spring to have a resonant frequency of two cycles per second.

One feature of this invention resides in a self-oscillating valve for controlling the operation of associated sound producing devices.

Another feature is the simplicity, reliability, and ease of operation realizable in the device of this invention.

The invention and the above noted and other features thereof will be understood more clearly and fully from the following detailed description with reference to the accompanying drawing, in which:

Fig. 1 is a top elevational view partially in section of a two-tone whistle in accordance with this invention;

Fig. 2 is a side elevation in section of the whistle; and

Figs. 3, 4, and 5 depict in schematic form the operation of the automatic valve mechanism in accordance with this invention.

As seen in Figs. 1 and 2, wherein like reference numbers are used for identical parts, the two-tone whistle comprises a metallic housing which conveniently may be in three parts; an inlet or mouthpiece **10**, a valve housing **23**, and a pipe section **17**. The inlet **10** terminates in an inlet port **11** to the valve chamber **26**. As shown in Fig. 2, two outlet ports **15** and **16** connect the valve chamber **26** to each of two separate pipe sections **18** and **19** formed by the longitudinal dividing member **27**. Each of the pipes may be tuned to emit a tone of a desired frequency by suitable dimensioning of the lengths of the chambers **18** and **19**. This is depicted in Fig. 2 by the block **39** which serves to shorten the chamber **18**.

The valve chamber **26** contains a vane member **28** integral with the cylindrical housing **12** so as to form two passages **29** and **30**. This vane housing **12** is rotatably mounted within the valve housing by the flat spring member **22** which may be fashioned of a single strip secured to the vane as shown and fixed at each end to the outer housing **23** as by suitable locking means or brazing or welding at the points **24** and **25**. Alternative modes of securing the spring member may be employed, for example two separate strips may be welded to opposite sides of the vane. As installed in the unbiased or "neutral" position the head **13** of the vane member as nearly as possible will bisect the inlet port. As the vane **28** and its housing **12** are caused to rotate from the neutral position the spring member **22** acts as a restoring force to cause the vane to return to the neutral position. The amount of deflection is limited to that point at which the input air stream is cut off, which occurs when the housing **12** blocks the inlet port **11**. In a typical embodiment this cut-off of the inlet port should occur at that point of deflection when the tail **14** of the vane member **28** is aligned with either of the outlet ports **15** and **16**.

The action of the self-oscillating valve mechanism is depicted schematically in the series of figures numbered 3, 4, and 5. In each of the figures there is shown in

circular outline a housing 37 having one inlet port 31 and two outlet ports 32 and 33. In Fig. 3 the centrally pivoted vane member 34 is biased to the neutral position by the spring system represented here by the coil spring 35 and 36. When fluid pressure, for example air pressure exerted by lung power, is applied to the inlet port, the stream as represented by the arrowheaded flow lines 38 will at first divide, passing to each side of the vane. However, an unbalance is inherent in a spring biased system of this type and this unbalance, however slight, will cause a greater pressure on one side of the vane than upon the other. In Fig. 3 the unequalization is represented by the double flow line on one side of the vane and a single line on the other side. Hence, the vane will be deflected counterclockwise, to a position as shown in Fig. 4. Here, as indicated by the flow lines, the inlet port 31 is, in effect, connected only to the outlet port 33, thus admitting fluid pressure to the device connected thereto.

The springs 35 and 36, in combination with a reactive "kick" of the fluid stream leaving the outlet port 33, tend to restore the vane to the neutral position. By proper selection and tensioning of the springing system the vane is caused to swing slightly beyond the central or neutral position and the unbalanced pressure effect will then cause it to swing clockwise to the position indicated in Fig. 5. Here the inlet port 31 is connected only to the outlet orifice 32, thus admitting fluid pressure to the device connected therewith. It is apparent that by suitable determination of the rotational inertia of the vane member this oscillation is enabled to continue so long as pressure is applied through the inlet port 31.

Turning again to Figs. 1 and 2, it will be understood from the foregoing explanation that the application of fluid pressure to the inlet port 11 will cause the vane 28 and its housing 12 to oscillate so as to direct the fluid pressure into the outlet orifices 15 and 16 alternately at a rate dependent upon the constant of the spring system and the rotational inertia of the vane and substantially independent of the applied pressure. Thus, the whistle emits successively at a fixed rate each of the tones produced by the pipes 18 and 19 to which the outlet orifices 15 and 16 are connected.

Although specific embodiments of the invention have been shown and described, it will be understood that they are but illustrative and that various modifications may be made therein without departing from the spirit and scope of the invention. For example, it is apparent that the invention is not restricted to the application of lung pressure but that other fluids and pressure producing means, such as steam, may similarly be employed. It is also to be understood that the tone producing devices attached to each outlet orifice may take forms other than pipes, for example horns of the reed type may be used. Further, by merely venting one orifice to the air a very advantageous form of single tone whistle is produced. Such a single tone device offers, by virtue of the air vent, a reduced resistance to the operating pressure and is thereby considerably less difficult to sound than the conventional intermittent single tone whistle.

What is claimed is:

1. A device for producing sound of two different fixed frequencies alternately at regular predetermined intervals from a source of fluid pressure, comprising two fluid operable sound generators each having a different resonant frequency, and a fluid control valve interposed between said source and said generators for automatically directing fluid pressure alternately into each said generator, said valve comprising a casing having an inlet port from said pressure source and outlet ports to each said sound generator, a vane member pivoted centrally in said casing, and spring means restraining said vane member in its rotation.

2. A device for producing sound of two different fixed frequencies alternately at regular predetermined intervals comprising two fluid operated sound generators each having a different resonant frequency, a source of fluid pressure, and a fluid control valve interposed between said source and said generators for automatically directing fluid pressure alternately into each said generator, said valve comprising a cylindrical casing having an inlet port from said pressure source and outlet ports each said sound generator, an oscillating member pivoted centrally in said casing, said member comprising a cylindrical housing having diametrically opposed inlet and outlet orifices, a vane member bisecting said inlet and outlet orifices and sectioning said cylindrical housing into longitudinal halves, and spring means restraining said oscillating member in its rotation.

3. A device for producing sound of two different fixed frequencies alternately at regular predetermined intervals comprising two fluid operated sound generators each having a different resonant frequency, a source of fluid pressure, and a fluid control valve interposed between said source and said generators for automatically directing fluid alternately into each said generator, said valve comprising a cylindrical casing having an inlet port from said pressure source and outlet ports to each said sound generator, an oscillating member pivoted centrally in said casing, said member comprising a cylindrical housing having diametrically opposed inlet and outlet orifices, a vane member bisecting said inlet and outlet orifices and sectioning said cylindrical housing into longitudinal halves, and spring means restraining said oscillating member in its rotation, said ports and orifices being arranged so that said inlet port is blocked by said housing when said vane member is aligned with either of said outlet ports.

4. A fluid operable device for producing two sounds alternately at regular intervals comprising two fluid operated sound generators, and a fluid control valve connected to an inlet and to said generators for alternately directing fluid into each generator, said valve comprising a cylindrical casing having an inlet port and two outlet ports, oscillating means pivoted centrally in said casing and including a vane and spring restoring means, said oscillating means having a resonant frequency that governs the sound interval.

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