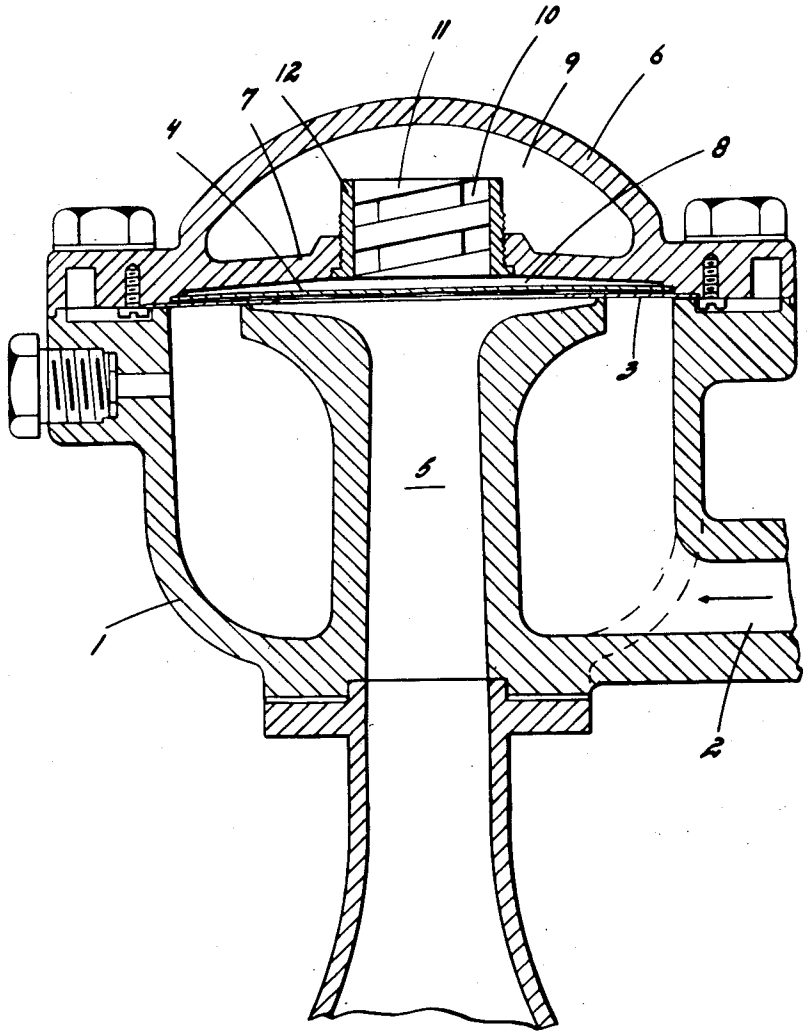
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ARRANGEMENTS IN SIGNAL APPARATUSES OPERATED BY A PRESSURE MEDIUM

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INVENTOR

JOHN G. M. BRODEN

BY Wenderoth, Lind & Ponack

Attys.

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ARRANGEMENTS IN SIGNAL APPARATUSES OPERATED BY A PRESSURE MEDIUM

John Gustaf Mauritz Brodén, Malmo, Sweden, assignor to Kockums Mekaniska Verkstads Aktiebolag, Malmo, Sweden, a corporation of Sweden

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The present invention relates to signal apparatuses operated by a pressure medium and being of the type in which the pressure medium acts on an oscillating member in the form of a diaphragm or the like forming a partition between a sound radiating member, preferably a funnel, and a chamber divided into two compartments by an interior wall, said compartments being in limited communication with each other and containing a medium, e. g. air, which is caused by the actuation of the oscillating movement of the oscillating member to flow alternatingly in one and the other direction between the two compartments through the limited communication between them. Signal apparatuses of this type are shown and described in Swedish patent specification No. 105,749 where the chamber with the holed interior wall serves as a damping member with the purpose of limiting the amplitude of the oscillating member actuated by the pressure medium, due to the hole in the interior wall offering resistance to the flow of the medium enclosed in the chamber alternatingly in one direction and the other between the two compartments of the chamber.

The main object of the present invention is to achieve, in addition to or instead of a damping effect limiting the amplitude of the oscillating member an effect of another kind, namely a suppression of a tendency otherwise appearing in the oscillating member, to oscillate, at least sometimes, otherwise than exclusively with a frequency corresponding to the basic note of the funnel, namely instead or in addition with a frequency corresponding to a harmonic of the basic note. Through the invention the willingness of the signal apparatus to emit sound as soon as the pressure medium serving for its operation is admitted to the apparatus is increased, i. e. the starting reliability of the apparatus is improved. At the same time the effectiveness of the signal apparatus is also increased.

The characteristic feature of the signal apparatus according to the invention through which the technical effects described above are achieved reside in the limited communication between the two compartments of the chamber being effected by a duct dimensioned in such a way with respect to its cross-sectional area and length that the oscillation energy of the medium flowing alternatingly in one direction and the other in that duct will reach a magnitude which is comparable to the magnitude of the oscillation energy of the oscillating member consisting of a diaphragm or the like.

Hereinafter it is assumed that the medium in the chamber is air. When the limited communication between the two compartments of the chamber consists of a hole provided in the interior wall between the two compartments of the chamber and being of small length (corresponding only to the thickness of the interior wall), as is the case in Swedish patent specification 105,749, the air volume in the duct formed by that hole becomes very small. Consequently, the kinetic energy of that air volume during its flow alternatingly in one direction and the other becomes small, i. e. it becomes unimportant with respect

to the kinetic energy of the oscillating member and in consequence thereof practically without influence on the oscillation characteristic of the diaphragm. On that characteristic a favourable influence is however exerted when the duct effecting the communication between the two compartments of the chamber is dimensioned in accordance with the invention, so that the kinetic energy of the air volume in the duct is no longer unimportant with respect to the oscillation energy of the oscillating member.

The oscillation energy of the diaphragm amounts to half the product of the mass of the diaphragm and the square of the velocity of the diaphragm when it passes its neutral position during its oscillation, and a factor that can usually be estimated at 0.2 for diaphragms fixedly secured at their margins and to 0.3 for diaphragms loosely disposed at their margins. The oscillation energy of the air volume in the duct between the two compartments of the chamber is equal to the kinetic energy of that air volume when during its flow alternatingly in one direction or the other it reaches its highest flow velocity. This kinetic energy is equal to half the product of the square of the said flow velocity and the mass of the air volume, which in turn is dependent on the volume of the duct which is equal to the product of the cross-sectional area and the length of the duct. This makes it easy to understand the possibility of determining the cross-sectional area and the length of the duct through calculations in each particular case in such a way that they fulfil the conditions of the invention. This does not exclude the possibility of adjusting the damping effect of the communication duct between the two compartments of the chamber, within reasonable limits, as the damping effect is dependent on the flow resistance in the duct, which can be varied at a given volume of the duct by variation of the ratio between the cross-sectional area and length of the duct.

For the better understanding of the invention a preferred embodiment thereof as applied to an arrangement in signal apparatuses operated by a medium will now be described by way of example with reference to the accompanying drawing which shows an axial section through the signal apparatus.

On the drawing:

1 designates the housing of the signal apparatus which is provided with an inlet 2 for the pressure medium consisting e. g. of compressed air or steam and serving to operate the apparatus. In the housing 1 there is disposed a diaphragm device made e. g. in accordance with Swedish patent specification No. 120,246 and consisting of a diaphragm ring 3 and a diaphragm disk 4 and forming a partition between a sound radiating member in the form of a funnel 5 and a chamber 6. The latter is divided by means of an interior wall 7 into a smaller compartment 8 bordering on the diaphragm disk 4, and a large compartment 9. These two compartments 8 and 9 are in communication with each other through a duct 10 fulfilling the conditions of the invention. According to the shown embodiment 10 this duct is formed by a helically extending groove in the circumference of a cylindrical insert body 11 which is inserted into a pipe length 12 secured in a central opening in the interior wall 7 and projecting somewhat into the compartment 9. The duct 10 could also be formed by a pipe or the like but not very well exclusively by a hole provided in the interior wall 7 and being of a length corresponding to the thickness of the interior wall 7, since in such a case the latter would have to be made unproportionally large in order that the duct should obtain the required length.

It may be added that the dimensions of the duct 10 and the volumes of the chamber compartments 8 and 9 on both sides of the intermediate wall 7 should be adjusted

in such a way that this system has a certain frequency of its own, which should not be equal to but deviate from the frequency of the funnel 5 itself.

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

1. An acoustic signal apparatus comprising a housing having an inlet for a pressure medium for the operation of the apparatus and an axial outlet for the pressure medium to a sound radiator, a diaphragm disposed for oscillating movement in said housing for controlling the flow of said pressure medium through said outlet to said sound radiator, said diaphragm being exposed on one side to said pressure medium and on the other side to a confined medium, said housing having a chamber for said confined medium and an interior wall facing said other side of said diaphragm and dividing said chamber into two compartments and an axial tubular projection on said interior wall forming between said compartments a connecting passage having a cross sectional area that is small in relation to the area of said diaphragm exposed to said confined medium, and of a length extending part way into said chamber having the confined medium beyond said interior wall.

2. In an acoustic signal apparatus the combination comprising a housing having an inlet for a pressure medium

for the operation of the apparatus and an outlet for the pressure medium to a sound radiator, an oscillating member comprising a diaphragm disposed in said housing for controlling the flow of the pressure medium through said outlet to said sound radiator and exposed on one side to said pressure medium and on the other side to a confined medium, said housing having a chamber for said confined medium and means comprising an interior wall dividing said chamber into a first compartment bordering said diaphragm, a second compartment, and a passage establishing a limited communication between said first and second compartments, whereby said diaphragm, when oscillating, forces the medium confined in said chamber to flow alternately in opposite directions in said passage between said compartments, said interior wall having an opening, a pipe length secured in said opening in said interior wall, and an insert body fitted into said pipe length provided with a helically extending groove forming said passage.

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