Oct. 4, 1966 V. FRESOLONE, SR 3,276,420

EXHAUST WHISTLE

Filed Sept. 21, 1964

2 Sheets-Sheet 1

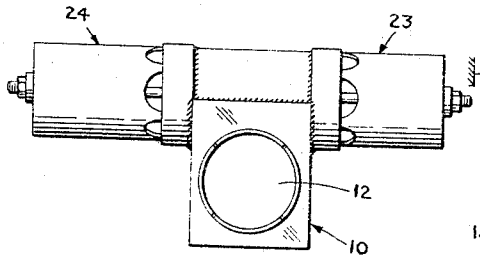


FIG. 1

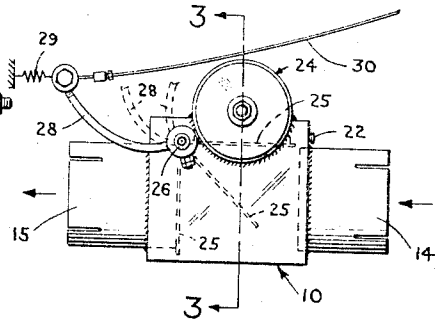


FIG. 2

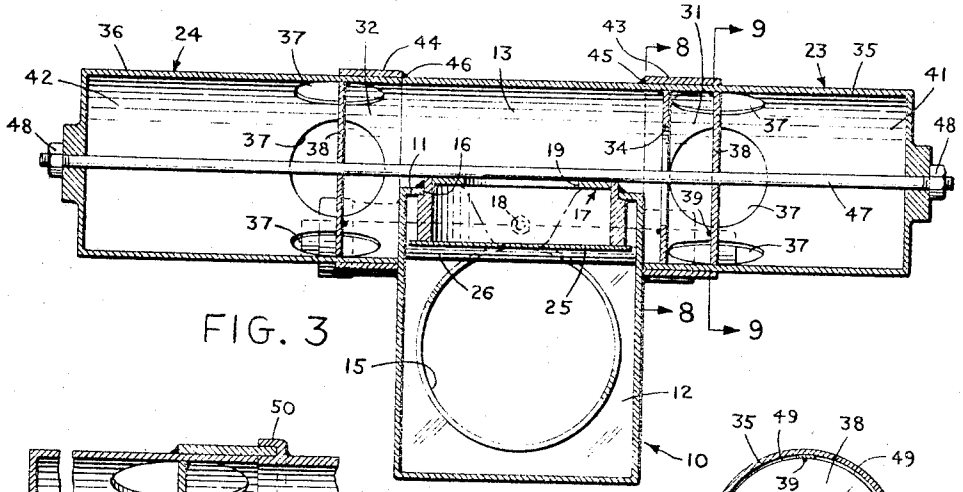


FIG. 3

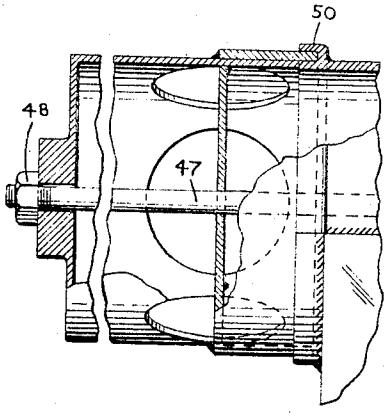


FIG. 10

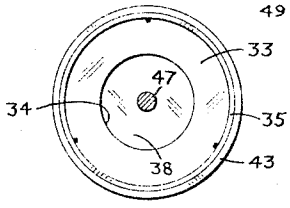


FIG. 8

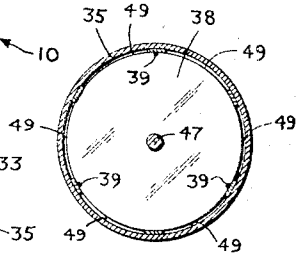


FIG. 9

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EXHAUST WHISTLE

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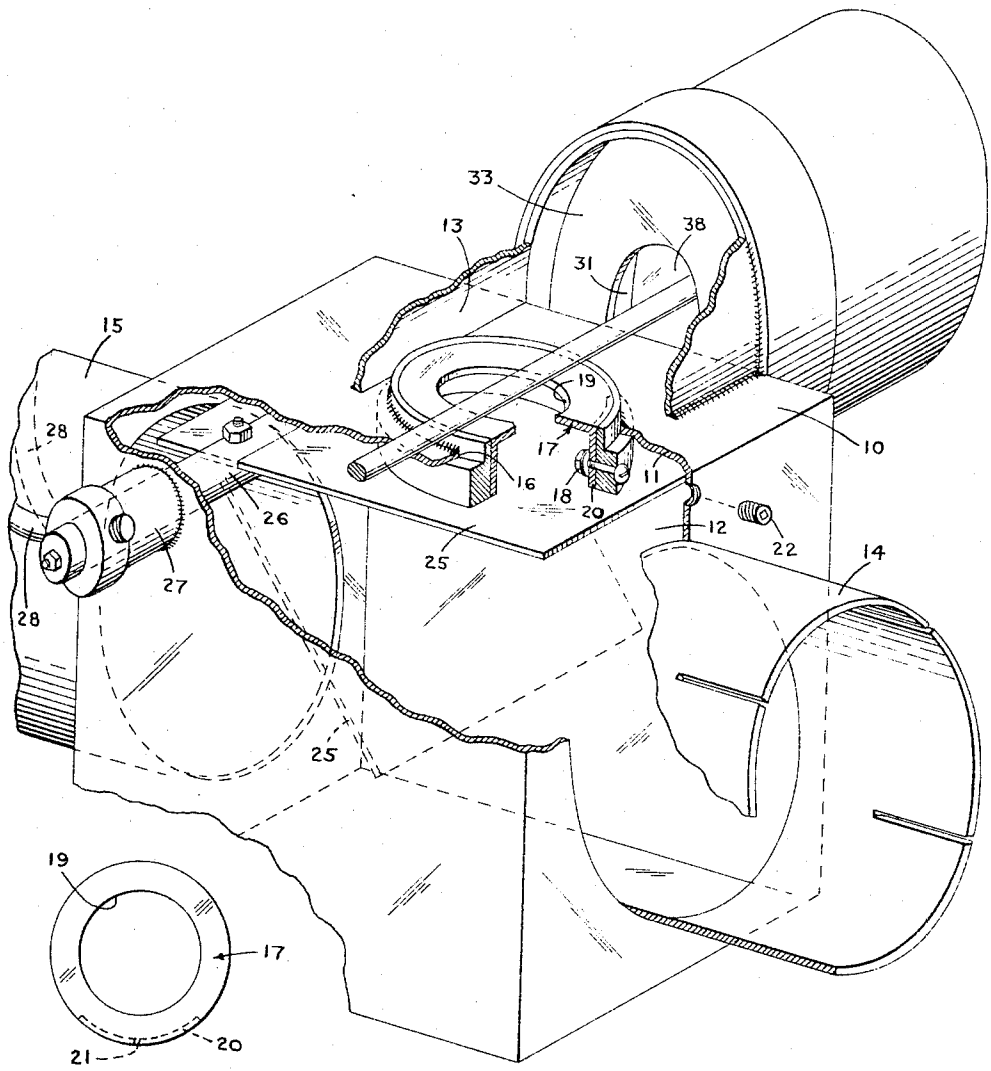


FIG. 4

FIG. 5

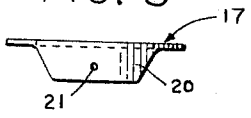


FIG. 6

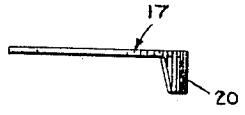


FIG. 7

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3,276,420

EXHAUST WHISTLE

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7 Claims. (Cl. 116—138)

This invention relates generally to tone chambers or whistles used as signalling devices and more particularly to whistles operated by exhaust gases from internal combustion engines, diesel and gas turbine engines, and similar pressure gas mixtures.

Whistles or signal devices operated by the exhaust gases of internal combustion engines for exhaust steam from steam operated tugboats and other vehicles are known.

These devices suffer from a major defect in that they create uncontrolled back pressure particularly, for example, in the exhaust manifold of internal combustion engines of fire engine vehicles which use such signalling devices, to the extent that the operative efficiency of the engine is affected.

Furthermore, these known devices did not include any means for varying the extent of the particular gas pressure mixture used for operating the whistle or for varying the pitch of the whistle.

In addition, the known exhaust whistles, for example, those operated off exhaust gases from internal combustion engines, had no means for permitting the whistles to be removed for cleaning or to permit the tone chambers thereon to be changed.

The present invention overcomes these and other problems by providing an exhaust whistle wherein a common collecting chamber of relatively large size coacts with an associated means for adjusting the pressure therein and with individual supply chambers for each of the whistle tones or whistle units on the exhaust whistle which supply means or chamber in turn has means for adjusting the pitch at which the whistle will operate.

It is also a further function of the present invention to provide an exhaust whistle wherein each of the whistle means or tone chambers are adapted to be fixedly mounted or removably mounted from the assembled position.

Accordingly, it is an object of the present invention to provide an exhaust whistle which minimizes the effect of back pressure acting in the manifold feeding the exhaust gases, exhaust steam, or other pressure gases for operating the whistle.

It is another object of the present invention to provide an exhaust whistle having means for adjusting the pressure at which the pressure gas is supplied from the main manifold.

It is a further object of the present invention to provide an exhaust whistle having means for adjusting the pressure at which a gas is supplied to each of the individual whistles means thereon.

Other objects and advantages will be apparent from the following description of several embodiments of the invention and the novel features will be particularly pointed out hereinafter in the claims.

FIGURE 1 is a front elevation showing a preferred form of the invention.

FIGURE 2 is a side elevation of the form of the invention shown in FIGURE 1.

FIGURE 3 is a vertical section taken on line 3—3 of FIGURE 2.

FIGURE 4 is a partial perspective of the invention shown in FIGURE 1, showing one whistle means or tone chamber; partly in vertical section and partly broken away to show the invention.

FIGURE 5 is a plan view of the port sizing means.

FIGURE 6 is a front means of the port sizing means.

FIGURE 7 is a side elevation of the port sizing means.

FIGURE 8 is a vertical section taken on line 8—8 of FIGURE 3 showing the pitch adjusting element for the supply chamber for one of the whistle means.

FIGURE 9 is a vertical section taken on line 9—9 of FIGURE 3.

FIGURE 10 is a modified form of the invention of FIGURE 1 wherein the whistle means or the tone chamber is removable.

Referring to the drawings, FIGURES 1, 2, 3 and 4 show one form of the exhaust whistle as including a centrally located housing generally designated **10**, having a partition **11** transversely disposed to divide the housing into a main flow passage **12** and a common expansion chamber **13**.

The main flow passage has an inlet conduit **14** and an outlet conduit **15** which permits the exhaust whistle to be connected, for example, in the exhaust manifold (not shown) of an internal combustion engine, the inlet side of the whistle being connected to the upstream or engine side of the exhaust manifold and the outlet conduit **15** being connected to the downstream or discharge side of the exhaust manifold.

The partition **11** has an opening **16** formed therein in which a removable port sizing means **17** is mounted as by the threaded member **18**.

The port sizing means **17** is a flat annular member having a centrally disposed opening **19** and a downwardly or vertically projecting portion **20** on the outer periphery. A threaded bore **21** in the projecting portion **20** receives threaded member **18** when the port sizing means **17** is held in the assembled position in the opening **16** as clearly shown in FIGURES 3 and 4 of the drawings.

As indicated in FIGURE 4, the threaded means **18** can be reached by removing the plug **22** in the central housing **10** and using a suitable device such as an Allen wrench or screw driver, as may be required.

The port sizing means takes its name from the fact that the opening or port **19** can be cut to any particular size desired and the present invention can be sold or provided with various port sizing members having various size openings therein so that the member can be inserted and removed to provide different operating characteristics for any given basic whistle construction, as described herein.

When the exhaust whistle is not in operation, it will be in the normally open position, i.e., the pressure gases or exhaust gases will pass from the source through the manifold or pipe feeding the main flow passage **12** and such passage will be unimpeded or unobstructed entering from the upstream side of the manifold in which the exhaust whistle is connected, thence to the inlet conduit **14** to the main flow passage **12** and on through to the outlet conduit **15** to the discharge or downstream side of the manifold.

The flow, however, can be diverted from the main flow passage **12** through the opening or port **19** in the port sizing means **17** to the common expansion chamber **13** to operate the respective tone chambers or whistle means generally designated **23** and **24**.

This is accomplished by means of a baffle plate **25** mounted on and movable with shaft **26** rotatably carried in any suitable bearing means **27** at the upper portion of the main flow passage **11** so that the baffle plate **25** lies inside the main flow passage and can rotate from a position parallel to the gas flow path through the main flow passage **11** which corresponds to the unobstructed or normally open position to a position transverse to the gas flow path which is the position in which the tone chambers or whistle means **23** and **24** will be operated.

The shaft **26** for operating the baffle plate **25** extends to the outside of the main housing **10** where a lever arm **28** is fixedly connected thereto and when moved will rotate the shaft **26** and the baffle plate **25** connected to and rotatable

with the shaft from the normally open position to either a partial or full transverse position as is indicated by the full lines and the dotted lines at FIGURES 2 and 4 of the drawings.

The lever arm **28** is held by a spring **29** to normally position the baffle plate **25** to the open position where unobstructed flow of the pressure gas mixtures will occur.

Any siutable means, for example, the pull cord **30** illustrated in FIGURE 2 of the drawings, can be used to actuate lever arm **28** to move the baffle **25** to a partial or full transverse position in operating the exhaust whistle as indicated by the solid and dotted lines in FIGURES 2 and 4 of the drawings.

The common expansion chamber **13** may have any desired form and will have a volume which will be proportioned as a function of the size of the opening or port **19** in the port sizing means **17**.

The size of the opening or port **19** in the port sizing means **17** will in turn be a function of the extent of the back pressure which the manifold from which the pressure gas mixture is delivered can reasonably tolerate without affecting the efficiency, for example that of the internal combustion engine, delivering exhaust gases.

The effect, however, of this construction will be to form a pressure dome to which a pulsating stream of pressure gas is delivered but from which a constant stream of pressure gas can be supplied.

In the present invention, the constant stream of pressure gas will be supplied to the respective pressure gas supply chambers indicated at **31** and **32** for the respective tone chambers or whistle means **23** and **24**.

In the preferred forms of the invention as shown in the drawings only two-tone chambers or whistle means are illustrated with their corresponding gas supply chambers. It will be understood, however, that more than two whistle means or tone chambers can be utilized without departing from the scope of the present invention and that the only limit in tone chambers or whistle means is the extent to which the housing forming the common expansion chamber can accommodate these units both from a mechanical area standpoint and a functional standpoint.

In the form of the invention as shown in FIGURE 3 of the drawings the pressure gas supply chamber is formed integrally with the tone chamber or whistle means **23** and **24**. As will be understood by those skilled in the art the supply chamber for each respective whistle means can be separated therefrom and then in assembly the portions can be brought into juxtaposition with each other.

Furthermore, as is also shown in FIGURES 3, 4, 8 and 9, each pressure gas supply chamber is provided with a pitch adjusting means as at **33** which is a flat annular member having a sized port or opening **34** formed therein which sized port or opening **34** coacts with the relative volume of the supply chamber to that of the common expansion chamber **12** so as to modulate the pressure in the supply chamber and thus regulate the pitch and tonal quality or effect of the tone chamber or whistle means **23** and **24**.

Although the pitch adjusting means **33** is illustrated as a fixed member for the supply chamber on which it is utilized, it is belived clear that it could be made removable and replaceable with openings of any desired size to produce the operative effect desired.

The tone chamber or whistle means **23** and **24** are shown as differing from each other only to the extent that one member is slightly longer than the other. The purpose of the difference in sizing is to vary the pitch of each of the respective whistles.

The whislte means as shown in FIGURES 1 to 9 includes cup-shaped members **35** and **36**, for the respective whistle means **23** and **24**.

The cup-shaped members **35** and **36** are provided with a plurality of circumferentially spaced openings **37** which may be oval or circular and extend through the sides of

the cup-shaped members a short distance from their open or mouth ends as is clearly shown in FIGURE 3.

As is shown at FIGURE 8, a transverse partition **38** is connected as by spotwelding at **39** to the inner wall of the respective cup-shaped members **35** and **36** at mid-point position with respect to the openings **37** so that they divide the cup-shaped members **35** and **36** into the pressure respective gas supply chamber **31** and **32** on the side adjacent the open or mouth end and sound chambers **41** and **42** on the side of the transverse partition **38** remote from the open or mouth end of the cup-shaped member.

Annular band members as at **43** and **44** are connected adjacent the open or mouth end of the respective cup-shaped members **35** and **36** on the exterior portion thereof so that it extends down to cover a substantial portion of the circular openings **37** and form with the transverse partitions **38** whistle passages as at **44**, on each of the respective tone chambers or whistle means **23** and **24**. The cup-shaped members **35** and **36** are connected and formed integrally with the annular band means **43** and **44** and the entire assembly is connected as by welding at **45** and **46** about the open or mouth end of the respective cup-shaped members to the assembled position as shown in FIGURE 3 so that the pressure gas supply chambers **31** and **32** of the respective whistle members **23** and **24** will be in continuous communication with the common supply chamber **12** and will reecive pressure gas from the common supply chamber whenever the same is delivered thereto.

A rod means **47** having threaded members **48** on the ends extends through the ends of the respective whistle members and transversely through the entire assembly to hold the whistle members in tight relationship to the central housing **10** and to overcome any problems that might develop from vibration during operation of the whistle.

It will also be noted that the pitch adjusting means **33** for the pressure gas supply chamber is illustrated in FIGURE 3 as being a fixed member for the particular pressure gas supply chamber **31** while the pressure gas supply chamber **32** is illustrated as not having any pitch adjusting member therefor. It is believed clear that no pitch adjusting means is necessary but that it can be utilized if the control of the pitch of any particular means is desired. Further, however, while the pitch adjusting means is shown as a fixed member, it is clear that it could be made removable in a manner similar to that shown for the port sizing means **17** or it could be held in assembled relationship by any suitable means so as to permit it to be removed and replaced by another pitch adjusting means with a different size opening or eliminated completely as may be desired.

Operation

In operation, when the pull cord **30** is actuated to move the lever arm **28** from the position indicated in FIGURE 2 by the solid lines to any of the positions indicated by the dotted lines in FIGURE 2 more or less of the pressure gas passing through the main flow passage will be diverted through the port sizing means **17** into the common expansion chamber **13**.

Since the pressure gas supply chambers **31** and **32** are in continuous communication with the common supply chamber **13** the pressure gas delivered to the common expansion chamber **12** will expand into or flow or pass into the supply chambers **31** and **32** and thence pass via the whistle passages **49** across the openings **37** provided in the respective whistle means **23** and **24**.

Since the openings are associated with the respective sound chambers **41** and **42** the whistle means will be actuated to resonate the tone consistent with the size of the respective sound chamber.

If the pressure of the exhaust gas or other pressure fluid being utilized is at all times greater than is needed, the opening or port **19** in the port sizing means **17** will

coact with and maintain the common expansion chamber **13** at a controlled predetermined pressure and the pressure gas supply chambers **31** and **32** will operate as a result of this to provide a constant pitch tone from the respective whistle means **23** and **24**.

If it is desired to increase or decrease the pressure or the pitch, the port sizing means **17** and the pitch adjusting means **33** can be changed so as to regulate the opening therein as has been above described.

It will be noted by those skilled in the art that the unit as above described is of substantially integral form. Without departing from the scope of the present invention it is believed obvious that the parts for ease of manufacture can be detachably connected to each other, for example, the housing could have the main flow passage **12** and common expansion chamber **13** as separate assemblies which are detachably joined, or the whistles can be removably mounted as is shown in FIGURE 10.

Such detachable construction aids in cleaning and the replacement of parts.

Modified form of the invention

FIGURE 10 shows only a fragment in vertical section, of one whistle means to illustrate a modified form of the construction in that the whistle means can be made removably mounted instead of fixedly mounted as shown in FIGURES 1–9 of the drawings.

For this purpose an annular shoulder **50** is established adjacent the ends of the central housing **10** to which the whistle means will be held in abutment as by the rod **47** and threaded means **48**.

If a force fit is provided no gasketing means will be necessary although it will be obvious to those skilled in the art that such expedient is common where a gas type joint is desired.

While single tone whistle means are illustrated, it is known in this art that two-tone and three-tone whistles can be made by using suitable longitudinal and transverse baffle plates (not shown) in the sound chambers. Since, however, this does not form part of the present invention, this type of whistle means has not been illustrated.

It will be understood that various changes in the details, materials and arrangement of parts which have been herein described and illustrated in order to explain the nature of the invention may be made by those skilled in the art within the principles and scope of the invention as expressed in the claims.

What is claimed is:

1. A signal device to be connected in a pressure gas manifold comprising:

(a) a main housing having an inlet and an outlet to permit connection into the pressure gas manifold so as not to impede the normal flow of pressure gases through the manifold,

(b) a partition in said main housing dividing the housing into a main flow passage and a common expansion chamber,

(c) said partition having an opening formed therein to permit gas to flow from the main flow passage to the common expansion chamber,

(d) baffle means in said housing pivotally disposed whereby on movement it will direct at least a portion of the pressure gas through the opening in the partition to the common expansion chamber,

(e) said opening sized relative the volumetric capacity of said common expansion chamber,

(f) and at least one whistle means communicating with said common expansion chamber to receive pressure gases at all times when said pressure gases are directed into the common expansion chamber,

(g) and a supply chamber for each whistle means disposed for operative association between said common expansion chamber and said whistle means to regulate the back pressure on the pressure gases received from the pressure gas manifold.

2. A signal device to be connected in a pressure gas manifold comprising:

(a) a main housing having an inlet and an outlet to permit connection into the pressure gas manifold so as not to impede the normal flow of pressure gasses through the manifold,

(b) a partition in said main housing dividing the housing into a main flow passage and a common expansion chamber,

(c) said partition having a sized opening formed therein to permit gas to flow from the main flow passage to the common expansion chamber,

(d) baffle means operatively associated with said sized opening and to control the flow of pressure gas from the main flow passage to said common expansion chamber,

(e) at least one whistle means connected to said housing,

(f) a supply chamber for each whistle means disposed in operative association between said common expansion chamber and said whistle means to regulate the back pressure on the pressure gas in the pressure gas manifold,

(g) a pitch sizing orifice for at least one of said supply chambers sized relative the volumetric capacity of its associated supply chamber to regulate the pitch of the associated whistle operatively related to the sized orifice supply chamber.

3. A signal device to be connected in a pressure gas manifold comprising:

(a) a housing,

(b) a partition having an opening therethrough disposed to divide the housing into a main flow passage and a common expansion chamber,

(c) the housing having an inlet to receive pressure gas from the upstream side of the pressure gas manifold and an outlet to discharge pressure gas to the downstream side of the pressure gas manifold,

(d) said main flow passage communicating with the inlet and outlet,

(e) baffle means in the housing normally disposed to permit pressure gas to pass through the main flow passage and pivotal to direct the flow of pressure gas through the opening in the partition to the common expansion chamber,

(f) means removably disposed in the opening in said partition to regulate the size of said opening,

(g) said opening sized relative the volumetric capacity of said common expansion chamber,

(h) at least one whistle means connected to said housing,

(i) a supply chamber for each of said whistle means disposed in operative association between said common expansion chamber and said whistle means,

(j) and a pitch sizing orifice for at least one of said supply chambers sized relative the volumetric capacity of its associate supply chamber.

4. In a signal device as claimed in claim **3** having means thereon to detachably connect at least one of said whistle means to the housing.

5. In a signal device as claimed in claim **4** wherein said detachable mounting means includes:

(a) a shoulder about the point on said housing adapted to receive the detachably connected whistle means,

(b) and means to hold the pressure gas receiving end of the detachably connected whistle means in tight abutment with said shoulder.

6. A signal device to be connected in a pressure gas manifold comprising:

(a) a main housing having an inlet and an outlet to permit connection into the pressure gas manifold so as not to impede the normal flow of pressure gases through the manifold,

(b) a partition in said main housing dividing the hous-

ing into a main flow passage and a common expansion chamber,

(c) said partition having an opening formed therein to permit gas to flow from the main flow passage to the common expansion chamber,

(d) baffle means in said housing pivotally disposed whereby on movement the baffle means will direct at least a portion of the pressure gas from the main flow passage through the opening in the partition to the common expansion chamber,

(e) a port sizing means in the opening in said partition to size the opening in said partition relative the volumetric capacity of said common expansion chamber and to regultae the back pressure acting in the pressure gas manifold to which the main housing is connected,

(f) at least one whistle means connected to said housing,

(g) and a supply chamber for each whistle means disposed in operative association between said common expansion chamber and said whistle means to receive pressure gas from said common expansion chamber and deliver the same for operation of the associated whistle means.

7. A signal device to be connected in a pressure gas manifold comprising:

(a) a main housing having an inlet and an outlet to permit connection into the pressure gas manifold so as not to impede the normal flow of pressure gases through the manifold,

(b) a partition in said main housing dividing the housing into a main flow passage and a common expansion chamber,

(c) said partition having an opening formed therein to permit gas to flow from the main flow passage to the common expansion chamber,

(d) baffle means in said housing pivotally disposed whereby on movement of the baffle means it will direct at least a portion of the pressure gas through the opening in the partition to the common expansion chamber,

(e) at least one whistle means connected to said housing,

(f) and a supply chamber for each whistle means disposed in operative association between said common expansion chamber and said whistle means,

(g) and a pitch sizing orifice mounted in said housing between the common expansion chamber and at least one supply chamber to regulate the pitch of the whistle means associated with said supply chamber, control the flow of pressure gas from the main flow passage and to adjust the pressure of the pressure gas in the supply chamber.

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LOUIS J. CAPOZI, *Primary Examiner.*