

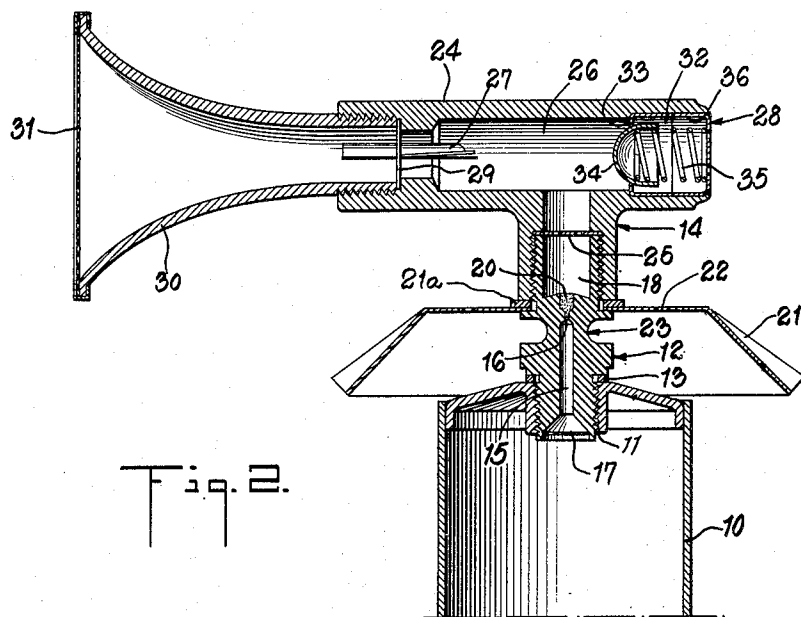
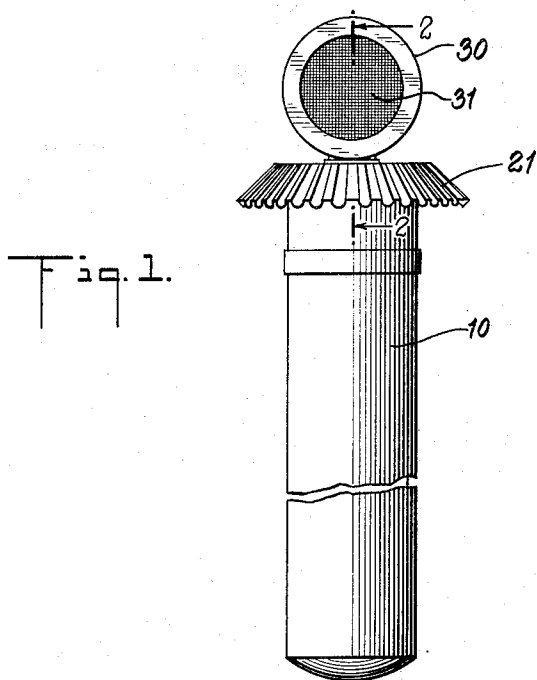
Jan. 15, 1957

W. C. MESSICK
FIRE ALARM DEVICE

2,777,416

Filed Nov. 13, 1953

2 Sheets-Sheet 1



INVENTOR
WILLARD C. MESSICK

BY

Burgess, Ryan & Hickey
ATTORNEYS

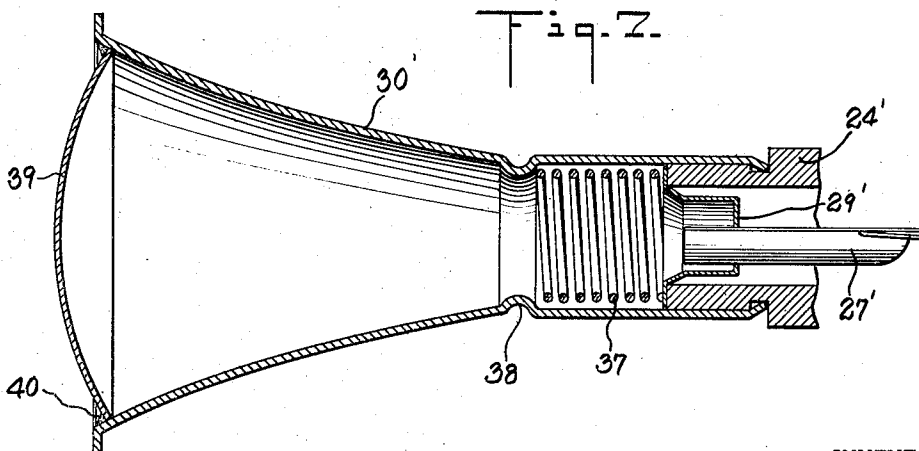
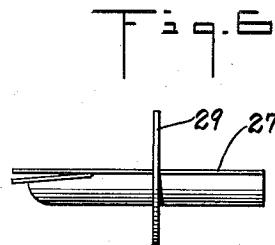
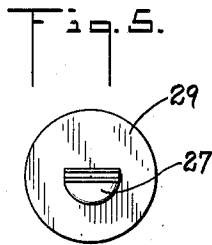
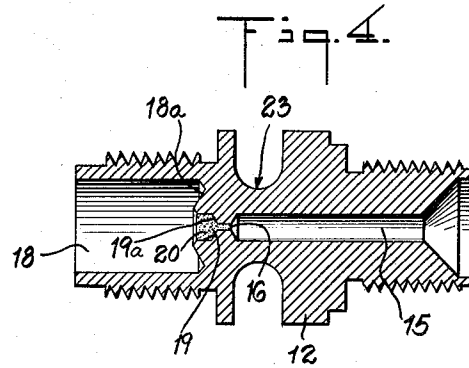
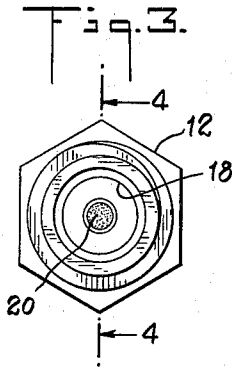
Jan. 15, 1957

W. C. MESSICK
FIRE ALARM DEVICE

2,777,416

Filed Nov. 13, 1953

2 Sheets-Sheet 2



INVENTOR
WILLARD C. MESSICK

BY
Baughman Ryan & Hiebert
ATTORNEYS

1

2,777,416

FIRE ALARM DEVICE

Willard C. Messick, Summit, N. J., assignor to Fyr-Larm Co., Inc., Summit, N. J., a corporation of New Jersey

Application November 13, 1953, Serial No. 391,848

7 Claims. (Cl. 116—106)

The present invention relates to a signalling device and relates, more particularly, to a fire alarm device which will automatically produce an audible signal when the temperature of the atmosphere surrounding the device is raised by a fire or similar hazard.

An object of the invention is to provide a fire alarm device which is entirely self-contained and which will produce an audible signal for a considerable period of time when the ambient temperature is raised to a predetermined temperature. Another object of the present invention is to provide a fire alarm device which is reliable in its operation and which may be produced at a relatively low cost. Other objects and advantages of the invention will be apparent and best understood from the following description and the accompanying drawings in which:

Fig. 1 is a front view of a fire alarm device embodying the present invention;

Fig. 2 is a fragmentary section view taken along the line 2—2 of Fig. 1;

Fig. 3 is an end view of a part of the fire alarm device illustrated in Fig. 1;

Fig. 4 is a section view taken along the line 4—4 of Fig. 3;

Fig. 5 is an end view of another part of the fire alarm device shown in Fig. 1;

Fig. 6 is a side view of the part shown in Fig. 5; and

Fig. 7 is a fragmentary view in section illustrating a modification in a fire alarm device embodying the invention.

Referring to the drawings in detail, there is a pressurized cylinder 10. The cylinder 10 is preferably charged with substance that will create a substantial pressure within the container under the temperature conditions in which the device is to operate. An example of such a substance is a group of halogenated hydrocarbons containing one or more fluorine atoms which are known commercially as "Freon" and in particular dichlorodifluoromethane (CCl_2F_2) or "Freon 12" which has a boiling point at one atmosphere of pressure of -29.8°C . or -21.6°F .

The "Freons" are especially suitable for this purpose since they are stable, non-toxic, non-flammable and non-corrosive. The use of such substances also permits the cylinder to be made with relatively thin side walls.

Satisfactory operation of a fire alarm embodying the invention has been obtained by charging a cylinder of approximately 2 inches in diameter and 11 inches in length with about ten ounces of "Freon 12." Such a charge will develop approximately 80 lbs. per square inch pressure within the cylinder at 78°F . and approximately 200 lbs. per square inch pressure at 136°F . The vapor pressure within the cylinder may be developed with different amounts of "Freon," but the duration of the audible signal will depend on the amount of "Freon" in the cylinder.

The top of the cylinder 10 has a threaded opening 11

2

therein into which one end of a temperature head 12 is threaded. The temperature head 12 is seated against a gasket 13 when it is screwed into the opening in the cylinder and a leak-proof seal is formed between the temperature head and the cylinder thereby.

The temperature head 12 is an elongated body having an enlarged portion and which is formed of metal having relatively high thermal conductivity such as brass. The temperature head extends beyond the top of the cylinder and its outer end is threaded to receive a sound producing unit indicated generally at 14.

As shown best in Figs. 3 and 4, the temperature head has a passageway 15 therein which communicates at one end with the interior of the cylinder and at the other end with an orifice 16. To prevent foreign bodies in the cylinder from entering the passageway 15, a screen 17 may be placed over the end of the passageway communicating with the cylinder.

The orifice 16 communicates with an expansion chamber 18 in the temperature head through an outlet 19 and the expansion chamber 18 in the temperature head communicates with the sound producing unit. Thus, the orifice 16 controls the rate at which the vapor under pressure in the cylinder can escape through the temperature head to the sound producing unit. In the device illustrated and described herein, an orifice of about twenty eight thousandths of an inch (.0028) in diameter is provided in the temperature head.

The orifice 16 and the outlet 19 are closed by a fusible metal plug 20 which will melt or fuse when the temperature head is heated to a selected temperature. An eutectic metal which will melt at 136°F . is preferably used for this purpose, however, other suitable metal having a known melting point may be used. When the temperature of the plug 20 is raised to a point where the fusible metal starts to melt, such melting will first take place along the sides of the plug which are in contact with the temperature head and hence receive the heat first. When this happens, the sides of the plug melt, the bond between the plug and the temperature head is broken and the plug will be blown out of the orifice and the outlet by the pressure within the cylinder.

The bottom of the expansion chamber 18 slopes downwardly away from the outlet 19 to form a groove 18a surrounding the outlet. This prevents the possibility of the plug 20 falling back into the outlet and causing intermittent operation of the signalling device after the plug has been blown out of the outlet and since there will be no pressure beneath the plug, it will remain in the groove.

It is important to secure a leak-proof permanent bond (up to 136°F .) between the fusible metal plug and the temperature head and to minimize plastic flow of the fusible metal of the plug. This may be accomplished by use of a flux which will cause an interfacial migration between the tin in the fusible metal and the metal of the temperature head. This removes the possibility of the pressure within the cylinder forcing an uncontrolled opening along the side of the fusible plug. The bottom of the outlet 19 may also be sloped downwardly, as indicated at 19a, so as to increase the area of the plug that is in contact with the temperature head. This also tends to increase the resistance of the plug to being blown out of the outlet prematurely and prevents leaks from developing.

The orifice 16 also reduces the effective area of the plug on which the pressure in the cylinder is exerted and thus, aids in preventing the plug from being blown out of the outlet and orifice at temperatures below that at which the device is to operate.

For the purpose of conducting heat from the surrounding atmosphere to the temperature head, a heat

conducting hood 21 is secured to the temperature head at a point adjacent the outlet and orifice. The hood 21 is made of corrugated metal and is insulated from the sound producing unit by a fibre washer 21a to prevent the bleeding of heat away from the temperature head. The hood directs upwardly rising heated air toward the temperature head and has vents 22 therein which permit the flow of the heated atmosphere through the hood and provide for a more effective transfer of heat to the temperature head. In addition, the temperature head has a portion of reduced area, as indicated at 23, to provide for a more rapid and effective heat transfer to the fusible plug 20.

The sound producing unit 14 which is secured to the outer end of the temperature head, consists of a T-shaped fitting 24. As shown in Fig. 2, the leg of the T-shaped fitting is threaded to the outer end of the temperature head and communicates with and forms a continuation of the expansion chamber 18 in the temperature head. A perforated disc 25 is located between the fitting and the end of the temperature head to prevent the plug or other foreign bodies from entering the sound producing unit.

The top of the T-shaped fitting forms a sound chamber 26 which is open at both ends. A vibratable reed 27 is located in one end of the chamber 26 and a relief valve 28 is located in the other end of the chamber. The reed 27 is mounted on a reed plate 29 which seats against a shoulder in one of the openings in the fitting. The reed plate 29 is held in place by a horn 30 which is threaded into the opening in the fitting. The outer end of the horn 30 is covered by a protective screen 31.

The relief valve 28 normally closes the other opening to the chamber 26, but will open automatically when the pressure in the chamber exceeds a selected pressure. The relief valve 28 includes a sleeve 32 which is fitted in the opening in the fitting and has an inwardly extending flange 32 at its inner end forming a valve seat. A semi-spherical valve member 34 is held in engagement with the flange 32 by a spring 35. The spring 35 is held in engagement with the valve member by a perforated spring retaining cup 36 which is forced into the opening in the end of the fitting.

When the pressure exerted against the valve member from within the fitting exceeds a pressure of approximately two pounds per square inch, the valve member will be forced away from the valve seat against the action of the spring. This relieves the pressure acting on the reed 27 and prevents the reed from becoming blocked and being rendered inoperative as may happen when a vibratable reed is subjected to excessive pressures such as may develop during the initial surge of vapor pressure escaping from the cylinder. It will be understood however that the reed will blow while the relief valve is open under such conditions.

A modified form of relief valve is illustrated in Fig. 7. In this form, there is a reed 27' which is mounted on a reed plate 29'. The reed plate 29' is movably mounted inside of the end of a horn 30' which is attached to a fitting 24' and is held against the end of the fitting by a spring 37. The other end of the spring 37 engages with an indentation 38 in the horn. The reed plate is slightly smaller in diameter than the interior of the horn and when the reed plate is moved away from the fitting against the pressure of the spring, the pressure inside the fitting will be relieved by the passage of the vapor past the edges of the reed plate. In this construction, the other end of the chamber in the fitting will be closed.

As shown in Fig. 7, the end of the horn of the sound producing unit may be sealed by a thin disc 39 of metal to prevent atmospheric conditions from affecting the reed. The disc 39 is of a slightly convex shape and may be held in place by a ring 40 of fusible metal which will melt and release the disc at or before the time that the fusible plug in temperature head has been blown out of the orifice. This also provides a convenient way of determining if

the device is in operating condition. If the device has operated when no one is present, the disc will have been removed from the horn and this can then be determined by a visual inspection of the unit.

The operation of the signalling device will now be described. When the temperature of the atmosphere surrounding the device is raised to a selected temperature such as 136° F. which would indicate the pressure of a fire, the heat is conducted to the temperature head by the heat conducting hood. The temperature head due to its thermal characteristics will be heated by the increase in temperature and will conduct the heat to the fusible plug closing the orifice and the outlet therein. The heat transmitted to the fusible plug will cause the sides of the plug to melt and the plug will be blown from the orifice and outlet in the temperature head by the pressure within the cylinder. It will be understood that the pressure within the cylinder will also increase with the increase in temperature.

When the outlet and orifice in the temperature head are opened in this manner, the vapor within the cylinder escapes through the orifice and outlet to the expansion chamber at a rate controlled by the orifice. In the expansion chamber, the vapor expands and its pressure is reduced before it passes through the fitting to the reed chamber. From the reed chamber, the vapor passes through the reed and thus, produces an audible signal. If the pressure of the vapor in the reed chamber exceeds the pressure at which the reed will operate, the relief valve automatically opens until the pressure of the vapor in the reed chamber is reduced to a suitable value.

It has been found by actual tests with signalling devices embodying the present invention, that the plug of fusible metal will be released cleanly and quickly from the outlet and orifice in the temperature head when the ambient temperature reaches 136° F. and that an audible signal of over 95 decibels will be produced continuously for a prolonged period so as to give an ample warning of a fire or similar hazard. Depending on the temperature reached, the signal will continue from five to twelve minutes.

It will be understood that various modifications may be made by those skilled in the art in the embodiments of the invention illustrated and described herein without departing from the scope of the invention as defined by the following claims.

I claim:

1. In a self-contained, temperature sensitive signalling device of the type having a cylinder containing a supply of vaporizable fluid under pressure such as dichlorodifluoromethane therein, the improvement which comprises a fitting of heat conducting material located in an opening in the top of a cylinder, said fitting having a passageway extending therethrough and communicating with the interior of the cylinder, an annular shoulder in said passageway forming a restricted orifice therein at a point intermediate its ends, and a plug of fusible material closing one end of said passageway, said plug being located in the passageway on the side of the orifice away from the interior of the cylinder and being in contact with the annular shoulder forming said orifice and with the sides of said passageway.

2. In a self-contained, temperature sensitive signalling device, the improvement as defined in claim 1 wherein the fitting of heat conducting material has an enlarged body portion located on the exterior of the cylinder and a heat conducting hood is secured to said body portion in contact therewith, said hood extending outwardly beyond the enlarged body portion of said fitting and having a number of perforations therein for permitting the flow of air through said hood and around the enlarged body portion of the fitting.

3. In a self-contained, temperature sensitive signalling device, the improvement as defined in claim 1 which includes a second fitting having imperforate side walls

5

secured to the fitting of heat conducting material, said second fitting having an expansion chamber therein communicating with the passageway in the fitting of heat conducting material and a discharge outlet communicating with the chamber, and a vibratable reed mounted in said discharge outlet whereby an audible sound will be produced by the passage of vapor under pressure from the expansion chamber through said discharge outlet.

4. In a self-contained, temperature sensitive signalling device, the improvement as defined in claim 1 which includes a second fitting having imperforate side walls secured to the fitting of heat conducting material, said second fitting having an expansion chamber therein communicating with the passageway in the fitting of heat conducting material and a discharge outlet communicating with said chamber, a vibratable reed mounted in said discharge outlet whereby an audible sound will be produced by the passage of vapor under pressure from the expansion chamber through said discharge outlet, and valve means for relieving the pressure of the vapor in the expansion chamber and acting on said vibratable reed.

5. In a self-contained, temperature sensitive signalling device, the improvement as defined in claim 1 which includes a second fitting having imperforate side walls secured to the fitting of heat conducting material, said second fitting having an expansion chamber therein communicating with the passageway in the fitting of heat conducting material and a discharge outlet communicating with said chamber, a vibratable reed mounted in said discharge outlet whereby an audible sound will be produced by the passage of vapor under pressure from the expansion chamber through said discharge outlet, valve means for relieving the pressure of the vapor in the expansion chamber and acting on said vibratable reed, said valve means including a tubular valve body fitted into an opening in the second fitting and communicating with the expansion chamber, said valve body having an inwardly extending annular flange forming a valve seat at one end thereof, a valve member movably mounted in said valve body, and a spring engaging with said valve member and normally holding said valve member in engagement with the valve seat against the pressure of the vapor in the expansion chamber.

6. In a self-contained, temperature sensitive signalling

6

device, the improvement as defined in claim 1 wherein the fitting of heat conducting material comprises an elongated body having an enlarged portion located on the exterior of the cylinder and includes a heat conducting hood secured to said body in contact therewith, said hood extending beyond said body and having perforations therein for the passage of air through the hood, a second fitting secured to the fitting of heat conducting material, said second fitting having an expansion chamber therein communicating with the end of the first fitting containing the fusible plug and a member of insulating material interposed between the hood and the second fitting.

7. In a self-contained, temperature sensitive signalling device, the improvement as defined in claim 1 which includes a second fitting having imperforate side walls secured to the fitting of heat conducting material, said second fitting having an expansion chamber therein communicating with the passageway in the fitting of heat conducting material and a discharge outlet communicating with the chamber, and a vibratable reed mounted in said discharge outlet whereby an audible sound will be produced by the passage of vapor under pressure from the expansion chamber through said discharge outlet, a heat conducting hood secured to said first fitting and contacting therewith, said hood extending beyond said fitting and having perforations therein for the passage of air through said hood and a member of insulating material interposed between the hood and second fitting.

References Cited in the file of this patent

UNITED STATES PATENTS

999,567	Kallstrom	Aug. 1, 1911
1,540,023	Kollinek	June 2, 1925
1,926,688	Schaal	Sept. 12, 1933
2,034,179	Franklin	Mar. 17, 1936
2,177,594	Eaves	Oct. 24, 1939
2,211,142	Loudon	Aug. 13, 1940
2,483,657	Messick	Oct. 4, 1949
2,649,752	Showstack	Aug. 25, 1953

FOREIGN PATENTS

517,072	France	Apr. 29, 1921
---------	--------	---------------