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FIRE ALARM SYSTEM

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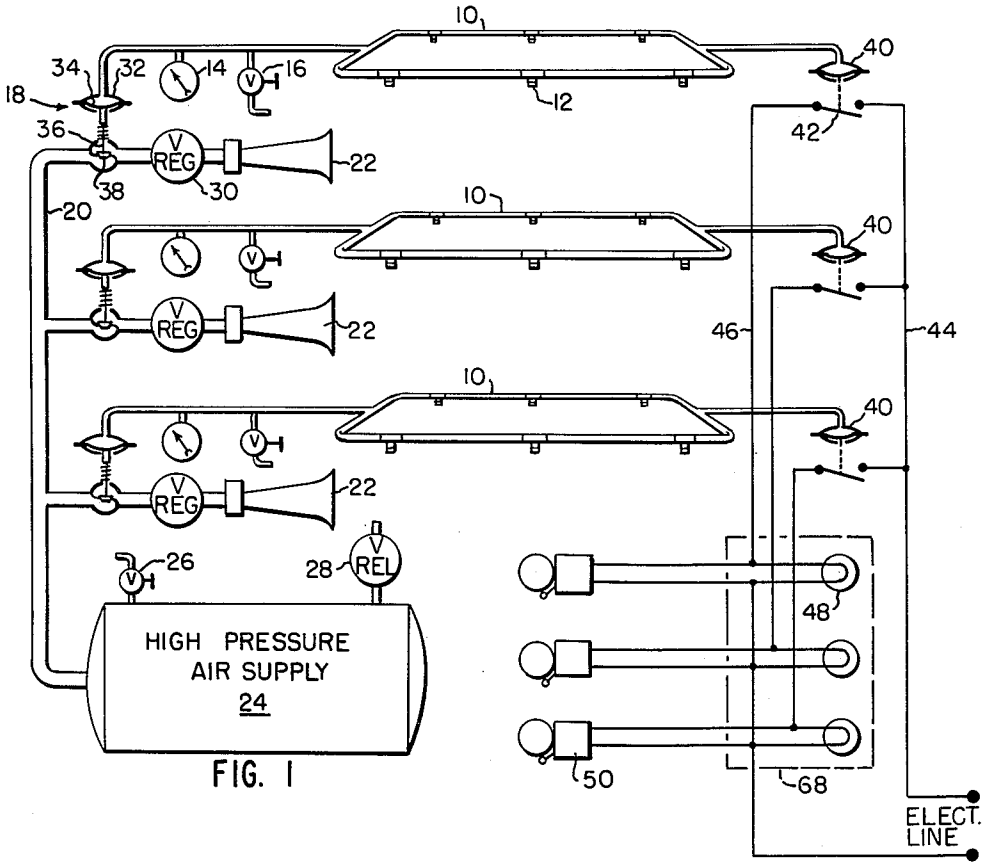
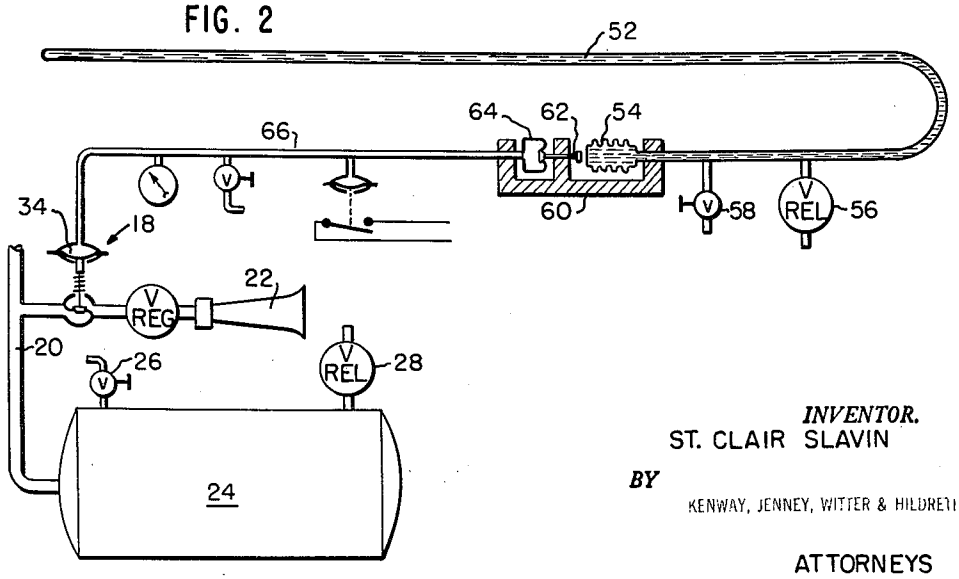


FIG. 1

FIG. 2



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FIRE ALARM SYSTEM

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This invention relates to fire alarm systems for locating and indicating the outbreak of fire in buildings, vessels or plants, and comprises more particularly a new and improved system which is self-contained and requires no external source of energy for reliable and unfailing operation.

A great many of the fire alarm systems now used in homes, hotels and other commercial buildings are dependent either partially or completely upon an electric power source for their continued operation. While such electric systems may be desirable for reasons of flexibility, they present a very serious problem since their components are subject to being easily disabled in the event of fire. Such a weakness obviously defeats the purpose of the system. Moreover there is always the danger of short-circuiting in the system which of itself may cause a fire.

Other systems utilize the expansion of gas as a means to trigger an alarm but these systems require complicated refinements to compensate for wide variations in temperature in areas normally subject to such conditions. These refinements tend to make the cost of the system objectionally high and usually require the services of skilled mechanics for their repair.

It is an object of this invention to provide a fire alarm system that is entirely self-contained and independent of any external power source.

Another object of this invention is to provide a reliable fire alarm system that is simple and inexpensive to produce and install yet requires little or no maintenance.

Another object is to provide a fire alarm system that is positive in operation and easily adapted to accommodate a wide range of temperatures.

One feature of the invention comprises a low pressure air system including a length of metal tubing extending throughout a building and provided with a number of outlets closed by fusible plugs. In the event of fire one or more of the fusible plugs will melt, thereby releasing the low pressure air. The release of this air will actuate a service valve which in turn will cause high pressure air to be admitted to an air-operated alarm. Alternatively for areas of normally low temperatures expansion of a fluid with a low freezing point may be utilized to release low pressure air and then operate the alarm.

Other features and objects will appear from a detailed description of preferred embodiments of the invention taken in connection with the accompanying drawings in which:

FIG. 1 is a diagrammatic view of the invention, and

FIG. 2 is a similar view showing a modification of the invention.

Referring now to FIG. 1 of the drawing there is illustrated a fire alarm system arranged in three branches for separate levels, typical of installation that may be installed in a multi-story building. This arrangement is shown only by way of example since the system may be laid out in a number of different ways depending on the building structure and particular needs.

The invention comprises two separate but operatively connected air systems, one being a low pressure air system indicated by the reference character 10 and constituting the sensing portion of the invention. The other is a high pressure air system 20 providing the alarm portion of the invention. For the low pressure air system 10 a loop or loops of one-quarter inch copper tubing has been found convenient to use by reason of its low cost and ease of handling. A pressure in the neighborhood of 15 p.s.i. is suitable for this low pressure portion.

Spaced along the tubing 10 are a number of replaceable fusible plugs 12 composed of a material having a low melting point. In the presence of fire it is intended that the plug or plugs nearest the fire will melt and release the low pressure air contained in the tubing 10. For this purpose plugs made of lead and tin compounds have been used with success although other materials might also be used. Under normal conditions the composition of the fusible plugs should be such as will melt between 135 to 150° F. For areas of normally high temperatures such as in the vicinity of heaters, etc. the plug should be set to melt at about 212° F. Other spaces of abnormal or subnormal temperatures should be equipped accordingly. A pressure gauge 14 and an air filling station 16 may be added to the low pressure system if desired.

The high pressure system 20 comprises a storage reservoir 24 having an inlet supply valve 26, a relief valve 28 and an outlet pipe of substantially greater diameter than the tubing 10 of the low pressure branches. The outlet pipe is herein shown as having three branches, one connected with each branch 10 of the low pressure system.

Connected to one end of each branch of the low pressure system is a pneumatic service valve 18. This valve connects with the high pressure air system 20 and is biased to its open position but shown closed by the force of the low pressure air depressing a relatively large diaphragm 34 mounted in a dome head 32. The diaphragm connects with a spring loaded stem 36 which is provided at its extremity with a valve disk 38 of relatively small diameter. In the event of fire the low pressure air is released permitting the valve disk 38 to lift and in turn release the high pressure air. The escape of the high pressure air will now cause a horn 22 to sound to alert personnel to the presence of the fire.

Each horn 22 is shown disposed in the vicinty of its respective branch since it can be heard throughout an average size building. However for larger installations it may be desirable to locate the horn either outside the building or near a location where it is most apt to be heard.

For any installation, but particularly for those having a number of branches or levels, there may be added a master control panel 68 with separate alarms 50 or flashing lights 48 to indicate the location of the fire. These alarms are actuated by a normally closed pneumatic-electric relay valve 40 that is held in an open position by the low pressure air. Upon the release of the low pressure air the valve 40 will cause its switch 42 to close, thereby completing a circuit between the leads 44 and 46. It will be obvious then that an alarm or light corresponding to a particular low pressure air loop will operate on the master panel 68 upon the occurrence of fire in the locale served by that loop. Air for both the low pressure and high pressure portions of the system may be supplied by means of a compressor or portable charging cylinders (not shown). The high pressure air is reduced by the regulating valve 30 from approximately 250 p.s.i. to about 17 p.s.i. at the horn 22. In place of the horn, a whistle, siren or any air actuated alarm may be used. Where steam is readily available, as aboard ship, it may be convenient to use steam in place of the high pressure air.

In FIG. 2 there is illustrated a modification of the fire alarm system such as may be used in areas of normally low temperatures such as cellars, cold storage rooms, etc. As before, the high pressure air system 20 is used and a low pressure system similar to that described in reference to FIG. 1. However, an important feature of this embodiment resides in the use of a sealed tube 52 filled with glycerine, or similar liquid having a low freez-

ing point, at a maximum pressure of about 20 p.s.i. The tube is provided at one end with an expandible bellows member 54. In addition to a filling connection 58 a relief valve 56 is also provided to protect the bellows from damage by over-expansion.

This bellows 54 is mounted in a bracket 60 and aligned with the stem 62 of a button valve 64 also mounted in the bracket 60. The button valve is fitted to the terminal portion of a low pressure air system 66 somewhat similar to that described above. The air pressure is maintained at 15 p.s.i. and controls the high pressure system 20 by way of the service valve 18 in a fashion similar to that of FIG. 1. However, in this instance the heat of fire will cause the liquid in the tubing 52 to expand thereby enlarging the bellows 54. The bellows in turn will push against the stem 62 of the button valve 64 releasing the air from the low pressure tube 66. The sequence of operation that follows is the same as that in the first described embodiment. The service valve 18 will release high pressure air sounding the horn 22, and an electric pneumatic switch will close a circuit to trigger a secondary alarm.

These systems described herein have great practical utility in that they may be easily installed at a very low cost. Only a minimum amount of maintenance is required to keep the system in perfect working order. In the event of fire a signal will be given even if electric service should be interrupted.

Having thus disclosed my invention what I claim as new and desire to secure by Letters Patent is:

1. A fire sensing and alarm apparatus comprising in combination a sealed tube, an expandible element fitted to said tube, a liquid having a low freezing point filling said tube, a low pressure air system including closed tubing of small diameter and a first valve arranged adjacent said expandible element, a high pressure air system including piping of rather large diameter, an alarm

operatively connected therewith, a second valve operatively connected with said two systems, an abnormal rise in temperature causing said liquid to increase in volume and expand said element thereby causing said first valve to release said low pressure air, release of said low pressure air in turn causing said second valve to release said high pressure air and sound said alarm.

2. A fire detecting and alarm apparatus comprising a closed branch of small diameter tubing adapted to maintain a charge of air under low pressure, fusible plugs in said tubing for releasably confining the low pressure air therein, a reservoir and piping adapted to maintain a supply of air under high pressure, connections between the said low-pressure tubing and the high pressure piping comprising a valve biased to open position and held normally closed by the low-pressure air of the tubing, and signal means operatively connected to the high pressure piping.

3. A fire detecting and alarm apparatus as described in claim 2, further characterized in that the small diameter low-pressure tubing is connected to the high pressure piping through a valve held closed by low pressure air acting on a diaphragm of substantial area and biased to open position by a spring opposing the pressure closing of the valve by action of the diaphragm.

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