May 13, 1952 H. S. MALUTICH 2,596,704

ALARM SWITCH

Filed Nov. 26, 1948

Fig. 1.

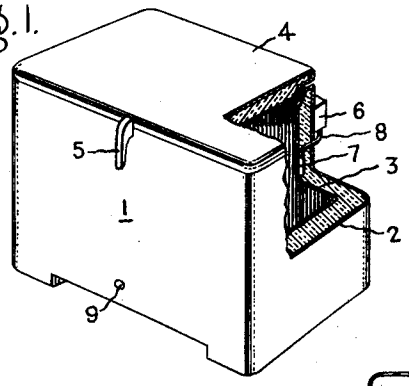


Fig. 2.

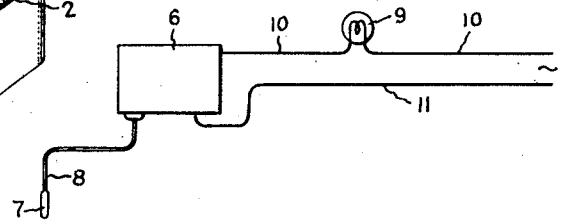


Fig. 3.

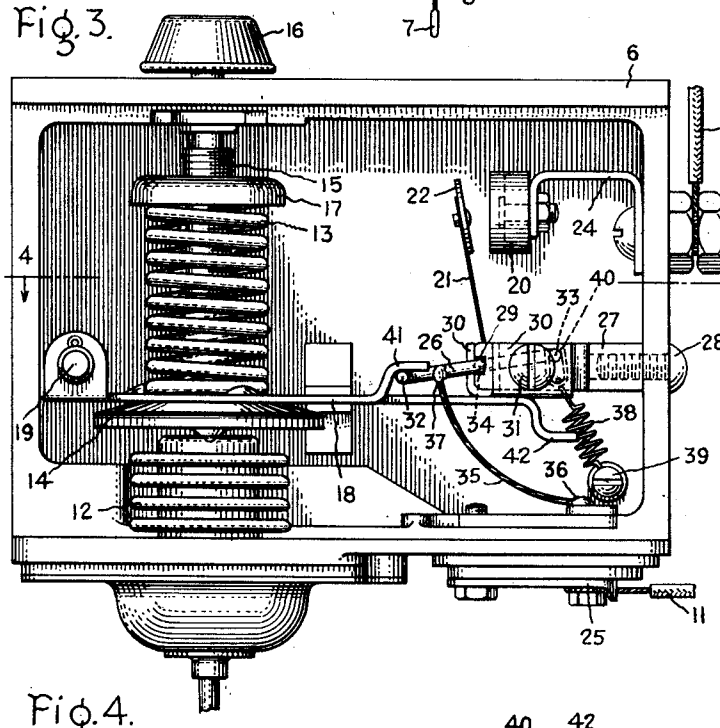


Fig. 5.

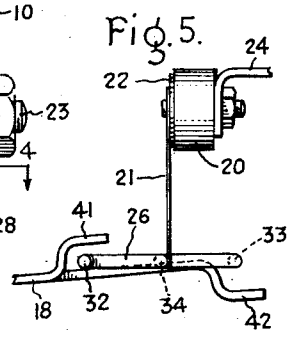


Fig. 6.

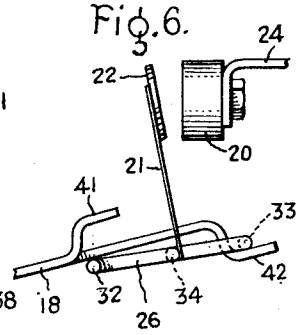
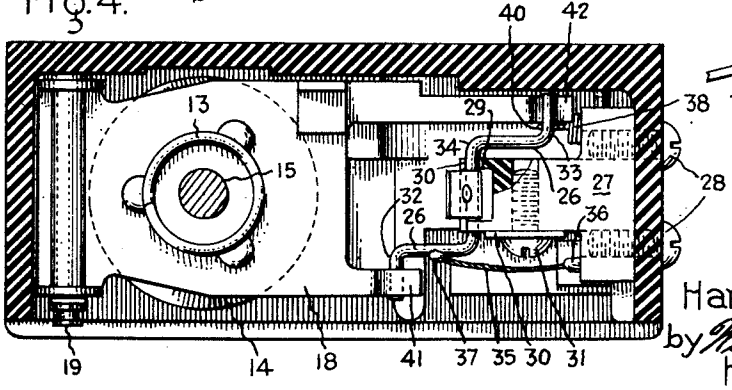


Fig. 4.



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ALARM SWITCH

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6 Claims. (Cl. 200—140)

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My invention relates to alarms and more particularly to bellows-actuated alarms.

Bellows-actuated alarms have been used for indicating various abnormal conditions. In the use of such alarms it is possible for a leak to develop in the bellows with a resultant collapse of the bellows. This collapse of the bellows, of course, renders the alarm ineffective. By my arrangement the collapse of the bellows causes an actuation of the alarm giving a signal identical with that resulting under abnormal conditions, so that the defective bellows will be noted and replaced.

Accordingly, it is an object of my invention to provide an improved bellows-actuated alarm including provision for indicating failure of the bellows.

It is a further object of my invention to provide an improved alarm including a single arm for actuating a switch to indicate abnormal conditions and to indicate failure of the bellows.

Further objects and advantages of my invention will become apparent as the following description proceeds and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

For a better understanding of my invention reference may be had to the accompanying drawing in which Fig. 1 is a perspective view, partly broken away, of a freezer cabinet incorporating my invention; Fig. 2 is a schematic diagram of an alarm circuit utilizing the device of my invention; Fig. 3 is an elevation view of the alarm; Fig. 4 is a plan view taken along the line 4—4 in Fig. 3; Fig. 5 shows the switch portion of the alarm in its closed position; and Fig. 6 shows the switch in its open position.

By way of illustration, I have shown my alarm applied to a home freezer cabinet. In connection with home freezers it is desirable to provide some sort of alarm so that the existence of abnormally high temperature conditions within the freezer cabinet is brought to the attention of the user. In the illustration I have employed, the alarm is arranged so that a light, which is illuminated under normal conditions, is extinguished on the occurrence of an abnormally high temperature in the freezer. By my invention, should a leak develop in the bellows, the resultant collapse of the bellows is also effective to actuate the alarm and extinguish the light. Thus the user is informed promptly of the existence of abnormally high temperatures in the freezer cabinet and is enabled to take proper steps to prevent spoilage of any foods stored therein. Further, the existence of a defective bellows, which would prevent the proper operation of the alarm for indicating abnormally high temperatures, is also brought to the attention of the user.

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Referring now to Fig. 1, there is shown a freezer cabinet 1 including an outer shell 2 and an inner liner 3. A lid 4 is provided for closing the top opening of the cabinet, the lid being held in closed position by a latch (not shown) operated by a handle 5. A housing 6 within which the alarm structure is enclosed is secured to the exterior of the outer wall 2. A thermostat bulb 7 is placed adjacent the refrigerated inner liner 3 of the freezer and is connected to the housing 6 by a tube 8.

A light 9 is provided in the front panel of the freezer cabinet, this light, when illuminated, indicating that normal conditions prevail within the freezer cabinet. As shown in Fig. 2, the light 9 is supplied from any suitable power source through a circuit including the alarm structure, which is enclosed within the housing 6. Power is supplied through lines 10 and 11.

The alarm structure is illustrated in detail in Figs. 3 and 4. This structure includes the housing 6 on one wall of which is mounted a bellows 12 for actuating the alarm. The bellows is connected to the thermostatic bub 7 by the tube 8, so that the bellows expands upon increase in the temperature within the freezer cabinet and contracts upon decrease in this temperature. The tendency of the bellows to expand is opposed by a spring 13 which acts against a circular plate 14 interposed between the bellows and the spring. The compression of the spring is adjusted by a screw threaded rod 15 which is controlled by a knob 16 on the exterior of the housing 6. Turning of the knob 16 moves a cap 17 up or down, decreasing or increasing the compression of the spring 13.

An arm 18, which is pivoted at 19, is provided for transmitting and amplifying the movement of the bellows for actuating a switch. The switch includes a stationary contact 20 and a movable switch element 21, which carries a movable contact 22. If desired, the terminal 20 may be in the form of a copper-coated magnet so as to give a snap action operation and minimize arcing at the contacts. The line 10 is connected to a terminal 23 mounted on the wall of the housing 6, and the terminal 20 is supported on the terminal 23 by a bracket 24. The other line 11 is secured to a terminal 25, also mounted on a wall of the housing 6.

In order to transmit motion of the bellows 12

and the pivoted arm 18 for operating the switch element 21, a switch arm or pivoted lever 26 is provided. The switch element 21 is secured to or formed as an integral part of the switch arm 26. In order to mount the switch arm 26 for pivoted movement an insulating bracket 27 is secured to a wall of the housing 6 by screws 28 or other suitable mounting devices. The insulating bracket 27 includes a recess 29 at its outer end, and the open front of this recess is closed by a cover 30. This cover extends along the bottom, one side, and front of the bracket 27 and is supported on the bracket by a screw 31 which extends into the side of the bracket 27. The switch arm 26 is in the form of a crank having two crank arms 32 and 33, the crank arms extending in opposite directions from a central leg 34 of the switch arm. The central leg 34 is received within the recess 29 for pivotally mounting the switch arm, and the central leg is held in position within the recess by the cover 30. A flexible lead 35 is provided from the terminal 25 to the switch arm 26 to complete the alarm circuit to the switch element 21 and the contact 22. The lead 35 may be secured to the terminal 25 and the switch arm 26 in any suitable manner, as by soldering as indicated by 36 and 37.

A tension spring 38 is employed for biasing the switch to its closed position. One end of the spring 38 is secured by a screw 39 or other suitable fastening device to a wall of the housing 6, and the other end of the spring is connected by a clip 40 to the crank arm 33 of the switch arm 26. It can be seen by reference to Fig. 3 that the spring 38 tends to effect a clockwise movement of the switch arm 26 thereby bringing the contacts 20 and 22 into engagement to close the circuit through the light 9 from the lines 10 and 11. A conventional control (not shown) may be employed for starting and stopping the refrigerating apparatus to maintain the temperature within the freezer cabinet within a predetermined range. While the freezer is operating within this temperature range the limited movement of the arm 18 does not affect the switch, and the switch remains in its closed position under such normal conditions. Thus, in the arrangement shown, under normal conditions, the circuit of the light 9 is closed and the resultant illumination of this light indicates the existence of satisfactory temperature conditions within the freezer cabinet.

In order to actuate the switch arm 26 under abnormally high temperature conditions or upon the failure of the bellows 12 the pivoted arm 18 is provided with two ears 41 and 42, the ear 41 being adapted to engage the crank arm 32 and the ear 42 being adapted to engage the crank arm 33 for moving the switch to its open position. The ear 41 extends above the plane of the remainder of the pivoted arm 18 and, under normal conditions, as illustrated in Fig. 5, the ear is spaced from the crank arm 32. The ear 42 extends below the plane of the remainder of the pivoted arm 18 and, under normal conditions as illustrated in Fig. 5, is spaced from the crank arm 33. As best illustrated in Fig. 5, the arrangement of the ears 41 and 42 relative to the crank arms 32 and 33 respectively provides a lost motion arrangement so that the bellows may expand and contract through a range corresponding to normal temperature conditions within the freezer cabinet without having either the ear 41 or ear 42 engage its respective crank arm. As explained above, the freezer temperature may be maintained within this normal temperature range by a conventional control which starts and stops the refrigerating apparatus upon the occurrence of predetermined maximum and minimum temperatures in the freezer cabinet.

The operation of the alarm is as follows. Under normal conditions wherein, as explained above, the ears 41 and 42 of the pivoted arm 18 are spaced out of engagement with their respective crank arms 32 and 33, the bellows may expand and contract over a limited range corresponding to the normal range of temperatures within the freezer cabinet without having any effect on the operation of the switch. Under normal conditions the switch element 21 is biased to its closed position by the spring 38, closing the circuit of the light 9 and causing illumination of this light. Should an abnormally high temperature occur within the freezer cabinet the bellows moves beyond the normal limited range. Upon the occurrence of a predetermined maximum travel of the bellows in the expanding direction and a resultant maximum counterclockwise movement of the pivoted arm 18, the arm 18 reaches the position shown in Fig. 6 wherein the ear 42 has engaged the crank arm 33 and continued upward movement of the ear 42 has moved the switch element 21 to its open position. The alarm circuit is broken by the shifting of the contact 22 out of engagement with the terminal 20, thereby extinguishing the light 9 and indicating to the user the existence of such abnormal conditions. Although the alarm has been illustrated with a normally closed switch so that the light 9 is illuminated under normal conditions, it will be apparent that, if desired, the switch arm 21 could occupy a normally-open position, being moved to the closed position for illuminating the light 9 upon failure of the bellows or upon the occurrence of abnormal temperature conditions.

On the other hand, should a leak occur in the bellows with the resulting collapse of the bellows, the pivoted arm 18 is moved in a clockwise direction to the position illustrated in Fig. 3. Under this condition the ear 41 engages the crank arm 32 of the switch arm 26, causing the counterclockwise movement of the switch arm and of the switch element 21. The alarm circuit is thereby broken by the separation of the contacts 20 and 22 and the light is extinguished, bringing the situation to the user's attention. If, upon investigation, the user finds that the temperature within the freezer cabinet is within the normal range he is then aware that the extinguishing of the light has resulted from a failure of the bellows and the bellows can be replaced. In the absence of this latter arrangement the user would be unaware that the alarm was not in operating condition and any subsequently occurring abnormally high temperature conditions would go unnoticed.

While I have illustrated my invention as applied to a freezer cabinet, it will be apparent to those skilled in the art that the alarm can be used equally well to indicate other abnormal conditions such as abnormally high or low pressures, speeds, etc. coupled with an indicating of failure of the bellows. Therefore, I do not desire my invention to be limited to the particular construction shown and described and I intend, by the appended claims, to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An alarm comprising a bellows, a pivoted arm actuated by said bellows, and a switch arm adapted to open and close an alarm circuit, said first-mentioned arm engaging said switch arm at a predetermined extreme position in one direction of travel of said first-mentioned arm for moving said switch arm to one position, said first-mentioned arm engaging said switch arm at a predetermined extreme position in the opposite direction of travel of said first-mentioned arm for moving said switch arm to said one position, said switch arm being biased to a second position at all times, said first-mentioned arm being disengaged from said switch arm during travel intermediate said extreme positions whereby said switch arm occupies said second position.

2. An alarm comprising a bellows, a pivoted arm actuated by said bellows, and a switch arm adapted to open and close an alarm circuit, said first-mentioned arm engaging said switch arm at a predetermined extreme position in one direction of travel of said first-mentioned arm for moving said switch arm to its open position, said first-mentioned arm engaging said switch arm at a predetermined extreme position in the opposite direction of travel of said first-mentioned arm for moving said switch arm to its open position, said switch arm being biased toward its closed position at all times, said first-mentioned arm being disengaged from said switch arm during travel intermediate said extreme positions whereby said switch arm occupies its closed position.

3. An alarm comprising a bellows, a pivoted arm actuated by said bellows, a pivoted lever having two oppositely extending crank arms, said pivoted lever including a switch element adapted to open and close an alarm circuit, and means for biasing said switch element to its closed position, said pivoted arm including two ears, one of said ears being arranged to engage one of said crank arms after a predetermined travel of said pivoted arm in one direction for moving said switch element to its open position, the other of said ears being arranged to engage the other of said crank arms after a predetermined travel of said pivoted arm in the opposite direction for moving said switch element to its open position.

4. An alarm comprising a bellows, a pivoted arm actuated by said bellows, a pivoted lever having two oppositely extending crank arms, said pivoted lever including a switch element adapted to open and close an alarm circuit, and means for biasing said switch element to its closed position, said pivoted arm including two ears, one of said ears being adapted to engage one of said crank arms after a predetermined maximum travel of said pivoted arm in one direction for moving said switch element to its open position, the other of said ears being

adapted to engage the other of said crank arms after a predetermined maximum travel of said pivoted arm in the opposite direction for moving said switch element to its open position, said ears being spaced from said crank arms during movement of said pivoted arm under normal conditions whereby said switch element remains in its closed position under normal conditions.

5. An alarm comprising a bellows, a pivoted arm actuated by said bellows, a pivoted lever having two oppositely extending crank arms, said pivoted lever including a switch element adapted to open and close an alarm circuit, and a spring connected to one of said crank arms for biasing said switch element to its closed position, said pivoted arm including one ear spaced from one of said crank arms during normal conditions, said pivoted arm including a second ear spaced from the other of said crank arms during normal conditions, said one ear being adapted to engage said one of said crank arms after a predetermined maximum travel of said pivoted arm in one direction resulting from abnormal expansion of said bellows under abnormal conditions for moving said switch element to its open position, said second ear being adapted to engage said other of said crank arms after a predetermined travel of said pivoted arm in the opposite direction resulting from collapse of said bellows.

6. An alarm comprising a bellows, a pivoted arm actuated by said bellows, a pivoted lever having two oppositely extending crank arms, said pivoted lever including a switch element adapted to open and close an alarm circuit, and means for biasing said switch element to one position, said pivoted arm including one ear spaced from one of said crank arms and a second ear spaced from the other of said crank arms providing a lost motion arrangement whereby said ears do not engage said pivoted lever during limited movement of said bellows under normal conditions, said ears engaging said crank arms upon predetermined maximum travel of said bellows in either direction for moving said switch element to its second position.

HARRY S. MALUTICH.

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