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FLOW-INTERRUPTING DEVICE

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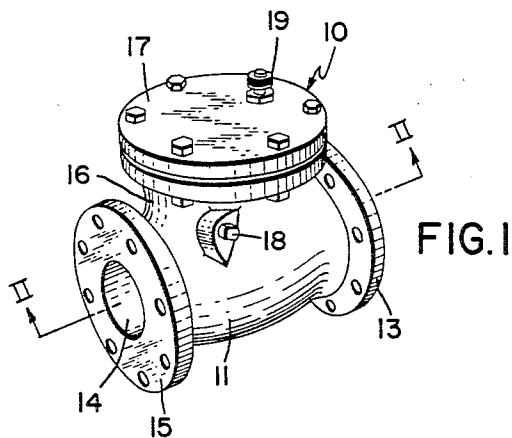


FIG. 1

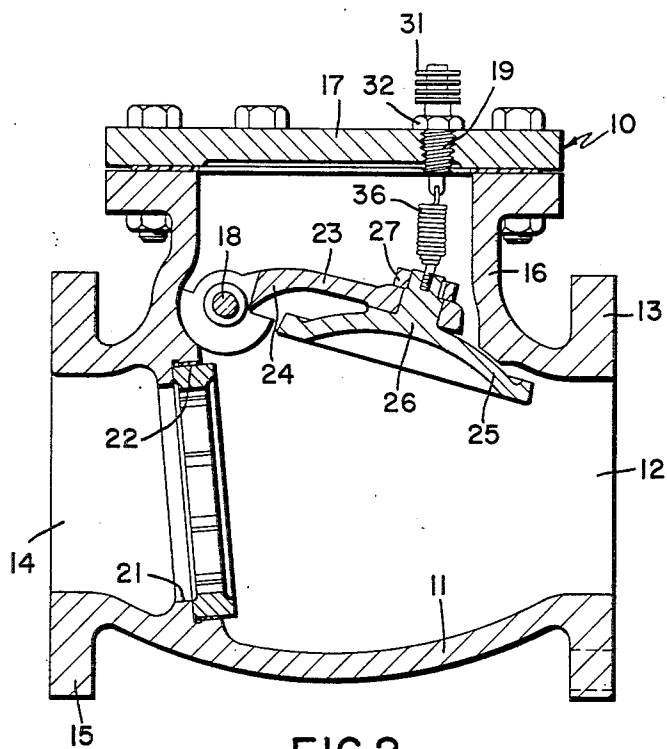


FIG. 2

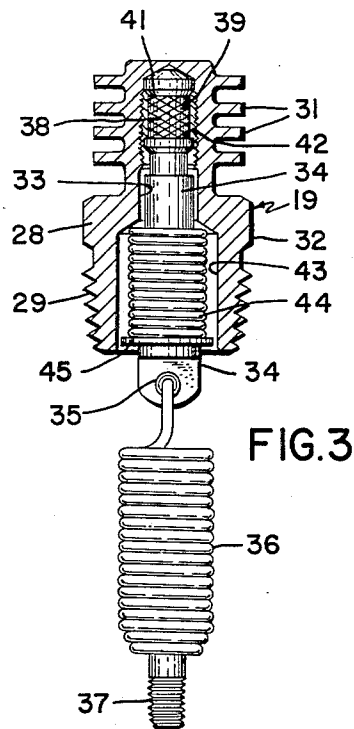


FIG. 3

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FLOW-INTERRUPTING DEVICE

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8 Claims

ABSTRACT OF THE DISCLOSURE

This invention has to do with a flow-interrupting device and, more particularly, to apparatus arranged to stop the flow of a fluid in the event of a fire consisting of a plug and bore with a low temperature melting sleeve between the two and adjacent inclined surfaces to prevent the premature shearing of the alloy plug.

It is common practice to provide safety devices for interrupting electrical current in the case of a home heating furnace or for interrupting the flow of gas in the case of a gas heating system by providing a closure which is normally prevented from operating by a fusible link. In the past, many difficulties have occurred in connection with these devices, not the least of which has been the erratic operation of such fusible links; they fail to operate on occasion and there is difficulty in obtaining standard amounts of metal and thicknesses in the fusible link during the manufacturing process. These and other difficulties experienced with the prior art devices have been obviated in a novel manner by the present invention.

It is, therefore, an outstanding object of the invention to provide a flow-interrupting device having a novel construction of fusible link.

Another object of this invention is the provision of a flow-interrupting device in which a fusible member is readily provided during manufacture.

A further object of the present invention is the provision of a flow-interrupting device which is simple in construction, inexpensive to manufacture, and which is capable of a long life of useful service with a minimum of maintenance.

It is another object of the instant invention to provide a flow-interrupting device in which a fusible link is manufactured separately of the other elements and incorporated into the device at a later stage in manufacture.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

The character of the invention, however, may be best understood by reference to one of its structural forms as illustrated by the accompanying drawings in which:

FIG. 1 is a perspective view of a flow-interrupting device incorporating the principles of the present invention,

FIG. 2 is a sectional view of the device taken on the line II—II of FIG. 1, and

FIG. 3 is an enlarged sectional view of a fusible link forming part of the invention.

Referring first to FIG. 1, wherein are best shown the general features of the invention, the flow-interrupting device, indicated generally by the reference numeral 10, is shown for the purpose of illustration as a valve to be used in a heating-gas system. It is provided with a main body 11 formed of malleable iron, having an inlet port 12 surrounded by a flange 13 and an outlet port 14 surrounded by a flange 15. It is provided with a bonnet 16 having a cover 17 which is bolted in place. A hinge pin 18 extends transversely through the main body 11, while a heat-sensitive plug 19 extends from the cover 17.

FIG. 2 shows the manner in which the main body 11 is

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provided with a valve orifice 21 which is provided with a valve seat 22 formed of bronze. Mounted on the hinge pin 18 is a movable element 23 which, for the purpose of illustration, is shown as the gate of the valve. The movable element is provided with an arm 24 on whose outer end is mounted a disc-like gate 25. The position of the hinge pin 18, the length of the arm 24, and the location of the gate 25 are selected so that, when the arm is swung clockwise, from the position shown in FIG. 2, the periphery of the gate contacts the annular valve seat 22 and closes off flow of fluid through the valve. The gate is provided with a central shaft 26 which is threaded at its upper end, which extends through an aperture in the outer end of the arm 24, and which is held in place by a nut 27.

FIG. 3 shows the details of the plug 19. It is provided with a body 28 which has a lower threaded portion 29 extending through a similar threaded aperture in the cover 17, as is shown in FIG. 2. The upper end of the plug extends upwardly from the cover 17 and is provided with extended-surface elements, such as fins 31. In the central portion, it is provided with a hexagonal wrench-engaging surface 32. Entering the bottom end and extending upwardly through the body 28 is a bore 33. In this bore is mounted a stud 34 having at its lower end an aperture 35 which is fastened to one end of a coil spring 36. The other end of the spring is provided with a threaded bolt 37 which engages a similar threaded hole in the upper end of the shaft 26 associated with the gate 25.

The upper end of the stud 34 is provided with a reduced portion 38 defining a generally cylindrical, knurled surface 39 connected by a conical end surface 41 to a portion of the main surface at the extreme upper end of the stud. The bore 33 is slightly smaller in the area of this reduced portion 38 and the stud 34 is large enough in the lower part of the bore 33 to fit it with a sliding action.

Lying between the upper surface of the upper portion of the bore 33 and the reduced portion 38 of the stud 34 is a sleeve 42 which is formed of a low-temperature melting alloy which, in the preferred embodiment, is 147° F. fusible solder. In the preferred embodiment, the body 28 of the plug 19, the spring 36, the bolt 37, and the stud 34 are formed of stainless steel to resist corrosion and to provide good heat transfer through the fins 31. The lower portion of the plug 19 is provided with a counterbore 43 which carries a coil spring 44 which presses at one end against the bottom of the counterbore and at the other end against a flange 45 formed on the lower part of the plug 34.

The operation of the apparatus will now be readily understood, in view of the above description. The flow-interrupting device is placed in the flow of material which is to be interrupted with the movable element held in a normal, non-interrupting position by the sleeve of low-melting material. In the preferred embodiment, the material whose flow is to be interrupted is gas flowing through a valve whose movable element is the gate 25 and whose sleeve is formed by the low melting alloy 42 residing in the space formed between the bore 33 and the stud 34. Normally, heating gas flows into the heating system from the exterior of the residence through the inlet port 12, through the annular valve seat 22 and the valve orifice 21, and into the system through the outlet port 14. The gate 25 is held away from the valve seat 22 by the plug 19 and the associated equipment. If a fire takes place, the hot gases from the fire surround the valve and impinge on the fins 31, so that heat will be transmitted to the body 28 to the sleeve 42. Because of the extended-surface nature of the plug 19, the heat will be transmitted readily from the surrounding atmosphere into the interior. When the sleeve 42 reaches 147° F., in the preferred embodiment, it will become liquid. At that time the weight of the gate 25 operating through the spring 36 will pull downwardly

on the stud 34 and, since the stud is no longer impeded by the presence of the sleeve 42, it will move downwardly in the bore 33 until the gate 25 strikes the valve seat 22. In addition, the compressed spring 44 will press against the flange 45 on the stud 34 and assist in ejecting the stud from the bore 33 when the sleeve 42 has melted. The valve is now closed and gas no longer flows into the system. At the same time, the gas is not able to escape through the bore 33 nor is the body 28 likely to melt, since it is made of stainless steel. There is no way for the gas to escape into the system to feed the fire. At the same time, the sleeve 42 is very sensitive and receives the temperature readily because of the fact that the plug 19 extends well up into the atmosphere above the cover 17 and has extended-surface elements. The spring 36 isolates the thermal sleeve 42 from any shock due to swinging of the gate 25. Normally, the gate 25 is in an upper position where it rests against the side of the housing 11 of the valve but, occasionally, in handling the valve, it may be dropped and, if there were no isolation by means of the spring 36, the sleeve 42 might be fractured and result in lack of proper operation of the valve. Because the thermal element 42 is out of the gas stream, the cooling effect of the gas is negligible. The fact that all parts of the release mechanism are made of stainless steel which is resistant to chemical action prevents rusting or binding or the parts and assures positive protection year after year.

It should be pointed out that the sleeve 42 is formed in a rather novel manner. The plug 19 is heated in a reversed position, i.e., with the bore 33 facing upwardly. A small amount of the low-temperature alloy is then dropped into the bottom of the bore. The low-temperature alloy melts, the plug being heated. Then, the stud 34 is inserted into the bore and pressed into the bottom of the bore. The molten material flows upwardly around the reduced portion 38 of the plug and flows into the protrusions and into the V-shaped knurls or grooves on the surface 39 and flows into contact with the conical end surface 41. Then, the plug 19 and the stud 34 are cooled and the low-temperature alloy freezes into position to hold the two parts together. When this is done, the reaction between the inclined surfaces of the sleeve 42 and the knurled surface 39 as well as the reaction between the end of the sleeve 42 and the conical portion 41 produce a wedging action which prevents removal of the stud 34 from the plug under the action of time. It prevents what is known as "cold flow." Any movement of the stud 34 out of the bore 33 brings about a wedging action between the sleeve and the inclined surfaces of the knurling and the conical portion 41. The force reaction is against the bottom surface of the bore and tends to prevent movement of the plug 34 that might otherwise take place over great lengths of time.

In the preferred embodiment, the reduced portion of the bore 33 (at the upper end where the sleeve 42 resides) is formed with regular helical threads and these threads cooperate with the material 42 to add to the wedging effect. Angular grooves of the same V-shaped cross-section may also be used in this area. The concept is to provide as many angular surfaces between the sleeve 42, on the one hand, and the stud 34 and the surface of the bore 33 of the plug 19, on the other hand, to prevent movement of the stud from the plug due to cold working with the passage of time.

It is obvious that minor changes may be made in the form and construction of the invention without departing from the material spirit thereof.

The invention having been thus described, what is claimed as new and desired to secure by Letters Patent is:

1. A flow-interrupting device, comprising
 - (a) a main body,
 - (b) a movable element mounted in the main body, including means for biasing the element toward a flow-interrupting position, the main body having a bore and the element having a stud portion which resides in the bore when the element is in a normal open position, and
 - (c) a sleeve formed of low-melting material residing in an annular space between the bore and the stud, the sleeve having angular surfaces which engage and mate with a corresponding angular surface of the stud and the bore and capable of holding said element in the open position as a result of said surfaces cooperating to effect a wedging action on the sleeve upon movement of the stud from the bore, when the body and element are subjected to heat of a predetermined intensity, the sleeve melts and releases the stud, the stud leaves the bore, and the element moves from the said normal position to the said flow-interrupting position, the angular surfaces of the stud and the bore having their adjacent extremities close to and on opposite sides of an imaginary concentric cylindrical surface.
2. A device as recited in claim 1, wherein the said angular surfaces are in the form of knurling of V-shaped grooves in a diamond pattern.
3. A device as recited in claim 1, wherein the said angular surfaces are in the form of threads.
4. A device as recited in claim 1, wherein the said material is a fusible solder.
5. A device as recited in claim 1, wherein the movable element is a gate of a valve, which gate is hingedly connected to the main body.
6. A device as recited in claim 1, wherein the stud is formed with a reduced central portion and conical surfaces leading from the ends of the reduced portion to the remainder of the surface of the stud forming the angular surfaces on the stud.
7. A device as recited in claim 6, wherein the said reduced portion is provided with a knurled surface further forming the angular surfaces on the stud.
8. A device as recited in claim 1, wherein the main body is provided with a plug which screws in place and has the said bore formed therein, the plug having an outer portion which protrudes from the body and which is provided with surface extension means to readily absorb heat from the surrounding atmosphere.

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