

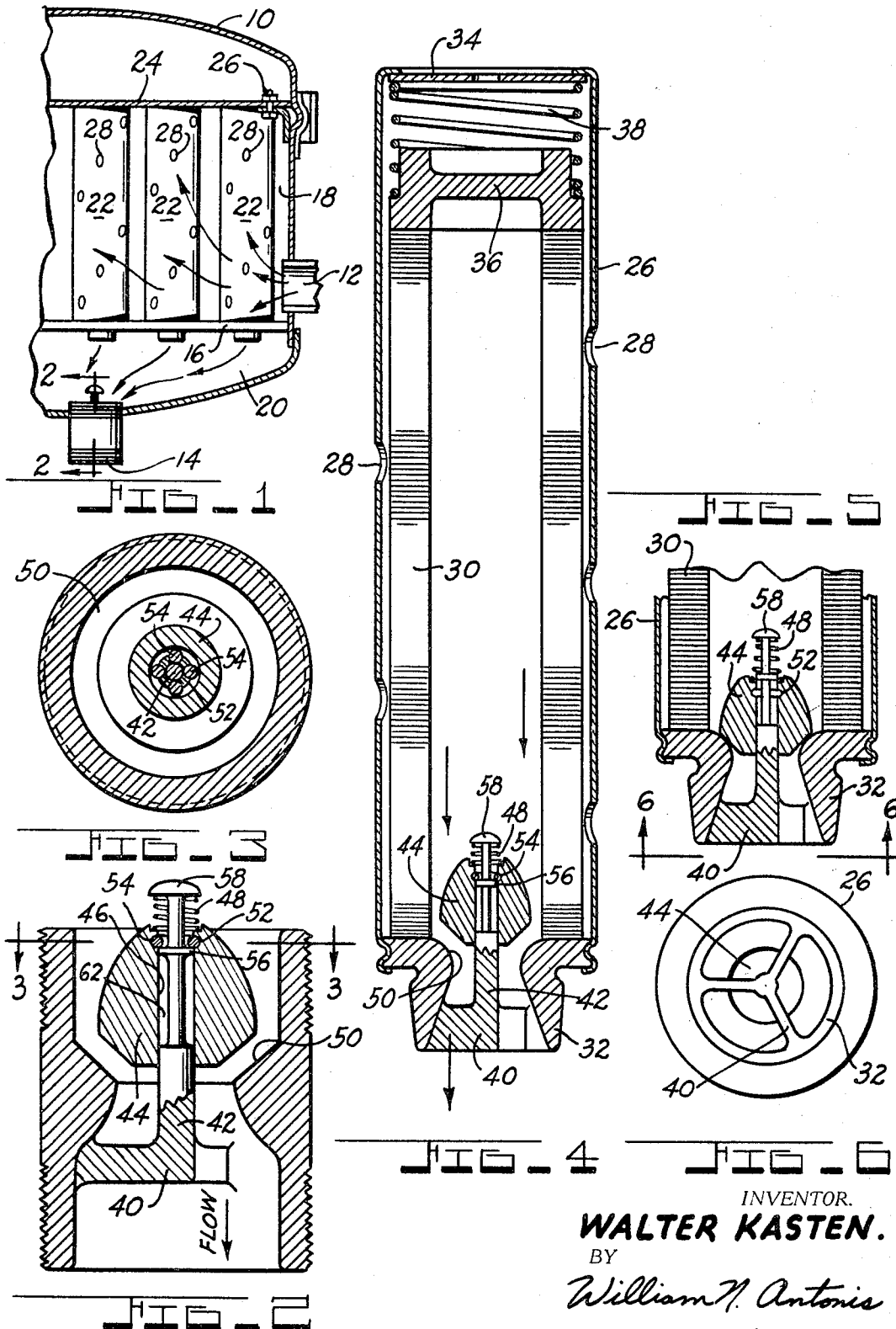
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FUEL TRANSFER DEVICE HAVING WATER SENSING SHUTOFF VALVE

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FUEL TRANSFER DEVICE HAVING WATER SENSING SHUTOFF VALVE

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1 Claim

ABSTRACT OF THE DISCLOSURE

A water sensing shutoff mechanism which is used for interrupting the flow of fuel through a fuel transfer device in the event such fuel contains free water. This shutoff mechanism, which can be incorporated in the outlet of any fuel transfer device, includes a valve member for closing the outlet and preventing further flow there-through, and water soluble pellets which are arranged so as to prevent closure of the valve member as long as the pellets remain solid, but permit closure thereof after dissolving in any undesirable free water contained in the fuel.

BACKGROUND OF THE INVENTION

In most present day refueling installations, fuel monitoring devices, of the type described in my Patent No. 3,117,925, are located downstream of conventional filter water separators. In such installations, the fuel monitoring devices will normally operate for long periods of time without being exposed to large amounts of contamination. During such normal operations, the pressure drop through the fuel monitoring device will build up gradually, and the fuse elements will be replaced after a scheduled time interval, e.g., 6 months, or when the pressure differential across the fuse elements reaches a predetermined value, e.g., 15 to 20 p.s.i. Under such conditions, the fuse elements of the fuel monitoring device will retain all, or most all, of the solid and water contaminants in the fuel flowing therethrough.

More recently, in many installations fuel monitoring devices have been effectively utilized in place of filter water separators rather than in combination therewith. Even in such installations, if the fuel is of average quality, that is contains only relatively small quantities of water and solid contamination, the fuse elements will have no difficulty in retaining or trapping the contamination. However, in such installations, certain operating conditions can occur which will cause small quantities of water to seep between the layers forming the edge-type fuse elements and flow to the outlet port of the fuel monitoring device. For example, if the fuel monitoring device is utilized in place of a filter water separator and the device is used at a fraction of its rated flow (25% or less), and if, in addition, the pumping system used to pump the fuel through the device has only a rather limited low operating pressure, then in those situations when the fuel flowing therethrough is contaminated with a high percentage of water, it will be possible for some of the water to seep through the fuse elements. The reason for this is that, under such conditions of limited flow and low pumping pressure, the piston in the fuse element cannot compress the edge-type filter element sufficiently to completely close off the pores between the layers and prevent further flow through the element. Thus, under such conditions water can, in effect, "seep" through the elements.

To date various types of positive shutoff devices have been utilized for controlling such water "seepage" and for preventing the transfer of fuel containing free water. Such devices are disclosed in detail in the following co-pending U.S. patent applications: 596,989; 596,990 (now

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Patent No. 3,339,734); 596,993 (abandoned); 600,224 (now Patent No. 3,357,560); and 604,067 (now Patent No. 3,339,735). However, all of these devices are intended for use in the fuse elements per se of the fuel monitoring device and are not useable in the outlet port of any type of fuel transfer device.

SUMMARY OF THE INVENTION

Accordingly, it is an object of this invention to provide a positive shutoff device which can be used in the outlet port of any type of fuel transfer device, whether it be in a fuel discharge nozzle, a pipeline, the outlet of a filter water separator casing, the outlet of a fuel monitor casing, in filter elements, or within the fuse elements of fuel monitors.

Another object of this invention is to provide a poppet valve type shutoff device for use in interrupting the flow of fuel through any type of fuel transfer device if the fuel flowing therethrough contains free water.

A further object of this invention is to provide a positive water sensing shutoff device which will monitor all of the fuel passing through a fuel transfer device as opposed to some existing water sensing devices which monitor only a small portion of the total fuel passing through the fuel transfer device.

More specifically, it is an object of this invention to provide valve means located in the outlet port of any type of fuel transfer device, the closure of which is controlled by restraining means which are insoluble in fuel but soluble in water, said restraining means having a first solid state for preventing closure of the outlet port by the valve means as long as the fuel flowing through the outlet port contains no free water and a second dissolved fluid state which permits closure of the outlet port by the valve means when the fuel flowing through the outlet port contains free water.

The above and other objects and features of this invention will become apparent from the following description taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a fragmentary view partially in section of a fuel monitoring device containing a plurality of filter units;

FIGURE 2 is an enlarged sectional view of the invention taken along line 2-2 of FIGURE 1;

FIGURE 3 is a sectional view taken along line 3-3 of FIGURE 2;

FIGURE 4 is a sectional view of a filter or fuse unit incorporating the invention and showing the shutoff valve in an open position;

FIGURE 5 is a fragmentary sectional view of the fuse unit shown in FIGURE 4 showing the shutoff valve in a closed position; and

FIGURE 6 is a view taken along line 6-6 of FIGURE 5;

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGURE 1 of the drawings, it will be seen that numeral 10 indicates a tank having a fuel inlet port 12 and fuel outlet port 14. Suitably attached to the housing is a partition 16 which separates the interior of the housing into an inlet chamber 18 and an outlet chamber 20. A plurality of filter or fuse units 22 (only three of which are shown) are suitably attached to partition 16 and are retained in position by a retainer plate 24 which is operatively connected to housing 10 by three bolts and nuts 26 (only one of which is shown). The direction of flow through the tank is indicated by the arrows.

Each filter or fuse assembly 22 includes a metal tube 26 having a plurality of perforated inlet ports 28 surrounding a compressible porous tubular edge-type filter element 30 formed from a plurality of washers in registered face-to-face contact. A nipple-like ferrule 32 is suitably connected to one end of the tube and is in abutment with one end of the filter element. A retainer washer 34 is located at the other end of the tube and a movable piston-like endplate 36 is located within the tube and is in abutment with the other end of the filter element. A preloaded piston spring 38 is located between the retainer washer 34 and the piston 36 for placing the edge-type filter element under the desired calibrated precompression. The washers which are used in the filter may be formed from paper, cellulose, or other suitable fibrous or non-fibrous materials and are arranged so that flow through the filter element will be via the radially extending pores formed between the washers. The filter element may also be formed by utilizing a ribbon-like material wound edge-wise. The method for winding and making the ribbon-type element is disclosed and claimed in my Patent No. 2,421,704. In the arrangement shown in FIGURE 1, flow will be from outside the filter element to inside the filter element. For additional details regarding this type of fuse assembly, reference may be made to my Patent No. 3,117,925 and Patent No. 3,151,071.

Referring to FIGURES 2 and 3, it will be seen that the water sensing shutoff device which is located in outlet port 14, includes a spider-type guide member 40 having a centrally located guide pin 42 extending therefrom, and a valve poppet 44 having a bore 46 extending therethrough for receiving the guide pin. The valve poppet is slidable on the guide pin and is urged by a spring 48 towards valve seat 50 which is formed in the outlet port. The bore 46 of the valve poppet is formed with an annular groove 52 for receiving a plurality of locking balls or pellets 54 which abut a shoulder or pellet support collar 56 formed on the guide pin. With the pellets in the annular groove 52 and in abutment with the shoulder 56 it will be obvious that the valve poppet will be restrained or prevented from moving from its open position to a closed seated position on valve seat 50.

The balls or pellets are made out of water soluble materials (e.g., sodium, water soluble resins, etc.) which will not be affected or dissolved by fuel, but which upon coming in contact with water, will dissolve or disintegrate. The construction of the poppet 44 and the guide pin head 58 are such that turbulent flow is caused in the pellet cavity 62 so that any free water present in the fuel will come in intimate contact with the pellets and thus cause them to dissolve or disintegrate. When this occurs, the cavity 62 below the pellet support collar will trap the dissolved or disintegrated pellets and the poppet will no longer be suspended above the valve seat but will be moved by the flow of fluid and by the spring into contact with the valve seat, thus preventing further flow through the outlet port. It should be understood that in most installations the flow of fluid through the outlet port, in and of itself, is sufficient to move the valve poppet against the valve seat, in which event, if desired, spring 48 could be eliminated. It should also be understood that by varying the type, size, or number of pellets used, different degrees of water sensitivity can be obtained. Furthermore, by making the guide pin head 58 or the guide pin 42 detachable, it is possible to reset and reuse the shutoff device by inserting a new set of pellets.

Referring to FIGURES 4, 5, and 6, it will be seen that, if desired, a water sensing shutoff device of the type described can be made a part of the outlet nipple 32 of each of the fuse elements 22. Since the operation of each individual fuse shutoff device is exactly the same as the operation of the shutoff device already described, like parts have been designated with like numerals. Furthermore, it will be seen that the valve poppet is shown in an open position in FIGURE 4 and a closed position in FIGURE 5.

Those acquainted with this art will readily understand that the invention set forth herein is not necessarily limited and restricted to the precise and exact details presented and that various changes and modifications may be resorted to without departing from the spirit of my invention. Accordingly, I do not desire to be limited to the specific details described herein primarily for purposes of illustration, but instead desire protection falling within the scope of the appended claim.

Having thus described the various features of the invention, what I claim as new and desire to secure by Letters Patent is:

1. A fuel transfer device comprising housing means having at least one inlet port and an outlet port which includes a valve seat formed therein, a valve member located in said outlet port and having an open position to permit flow through said outlet port and a closed position to prevent flow through said outlet port, said valve member including a bore extending therethrough and having an annular groove formed in said bore, a guide pin centrally located in said outlet port and extending through said bore to permit said valve member to move therealong until seated on said valve seat, said guide pin including a shoulder formed thereon, restraining means characterized by being insoluble in fuel but soluble in water, said restraining means being located in said groove and abutting said shoulder and being exposed to fuel flowing through said outlet port, said restraining means having a first solid state which prevents movement of said valve member along said guide pin from said open to said closed position as long as fuel containing no free water flows through said outlet port and a second dissolved fluid state which permits movement of said valve member from said open to said closed position when fuel containing free water flows through said outlet port, and a cavity located between said guide pin and said valve member, said cavity being constructed and arranged to trap said restraining means after said restraining means is transformed to said dissolved fluid state.

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