April 20, 1948. W. KASTEN 2,439,936

FILTER BY-PASS VALVE CONSTRUCTION

Filed Aug. 23, 1944

Fig. 1.

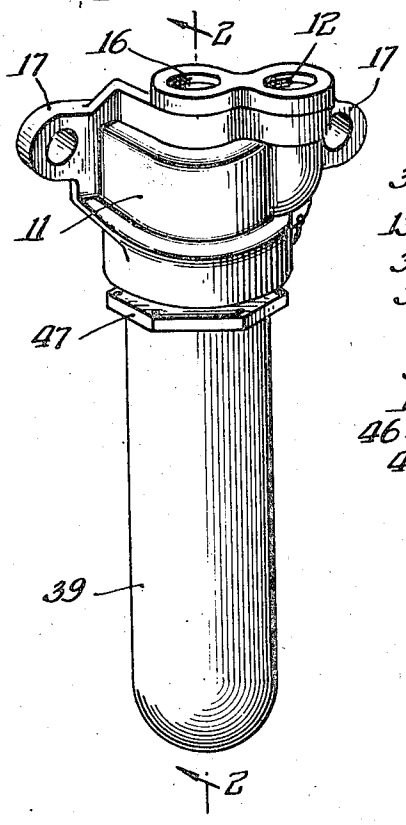


Fig. 2.

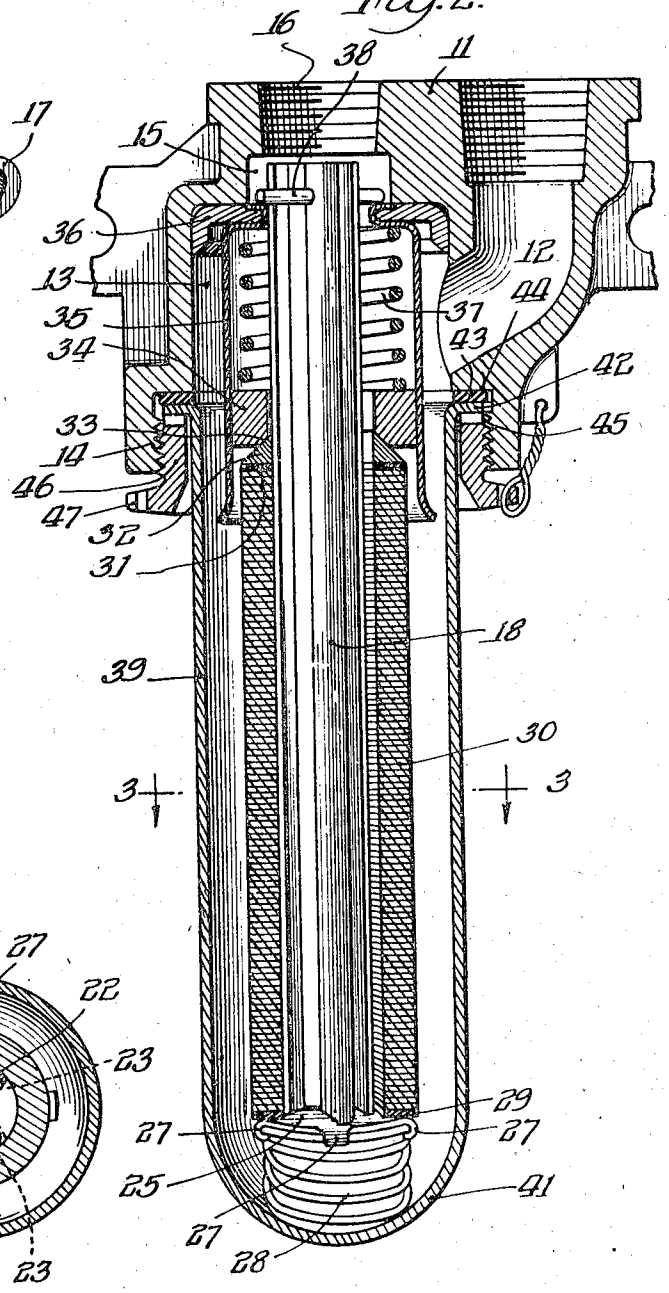
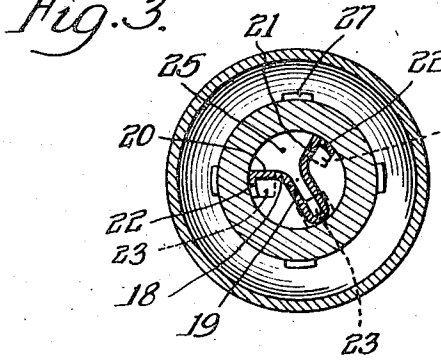


Fig. 3.



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FILTER BY-PASS VALVE CONSTRUCTION

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1 Claim. (Cl. 210—183)

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The present invention concerns certain features of betterment in filters and it relates more particularly to novel structural and functional advantages in a valve-mechanism controlling a by-pass around the filter-element which is automatically opened when and if such element becomes more or less clogged, so that the fluid flow through the filter housing or casing will not be stopped although the filtering function is thus temporarily suspended.

Structures of this general character or type have been heretofore known and used, but this invention possesses certain innovatory features of substantial value in the construction of the filter and in the efficiency of its operation.

In order that those skilled in this art may fully understand the invention, its incorporation in appropriate physical form has been illustrated in detail in the accompanying drawing, which forms a part of this specification, and to which reference should be had in connection with the following description.

For simplicity, like reference numerals have been employed in the drawing to designate the same structural members in the different views.

The invention, of course, may be embodied satisfactorily in various types and styles of filters; for convenience, however, it is presented herein in a filter of the general form set forth in U. S. Patent No. 2,360,020, Skinner and Kasten, granted October 10, 1944.

In this drawing—

Figure 1 is a general perspective view of the complete filter;

Figure 2 is a longitudinal or vertical section on a larger scale on line 2—2 of Figure 1 with its lower portion slightly in perspective; and

Figure 3 is a horizontal section on line 3—3 of Figure 2.

Referring to the drawing, it will be observed that the new and improved filter includes a main, hollow, supporting body, casting or head 11 provided with a screw-threaded inlet-passage 12 communicating with the side of the main, cylindrical chamber 13, the latter having a downwardly-open, larger, internally-screw-threaded mouth 14, chamber 13 also having a reduced-diameter, cylindrical, centrally-located, upward extension 15 connected to a screw-threaded outlet or discharge passage 16, the casting 11 being

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fitted with a pair of apertured, oppositely-outstanding lugs or ears 17, 17 by means of which and bolts or screws (not shown) the filter may be fastened to a suitable support.

The filter-element, which performs the filtering operation, includes a central, internal, longitudinally-bent, sheet-metal rod 18 having three more or less radially-disposed ribs or arms, of which one 19 is of double-thickness of metal, whereas the other two 20, 21 are of single thickness with laterally-bent sections 22, 22, the lower end of such rod having three downwardly-directed ears 23, 23, 23 extended through holes in an end metal disc or terminal member 25 and bent over below the disc to hold the latter fixedly attached permanently to the rod, such disc 25 having in addition marginal ears 27, 27, 27 bent down around the top ring or convolution of a spiral-spring 28 thus fixedly securing the spring to the under side of the disc.

The present filter includes an edge-filtration stack or pack 30 of washer-shaped, uneven-surface paper or other comparable discs, or a filter-element composed of the helically-wound convolutions of a ribbon of the same material, suitably charged or impregnated with an agent, which prevents the liquid or gas to be filtered or any of its contaminants or diluents from deleteriously or injuriously affecting the material of the bodies of the discs or windings, said discs or convolutions being mounted face-to-face on, and maintained in superposed register with one another by the rod 18. The diameter of the discs or convolutions is practically the same as the internal caliber of the central passage of the stationary filter-element 30, the bottom disc or layer bearing on the upper surface of a neoprene or other similar disc 29 on the top surface of the end member 25 which closes the lower end of the passage mentioned.

The top disc or convolution of the element 30 bears against the under surface of a neoprene layer 31 interposed between such top of the filter and a ring-shaped conical valve 32, each of the two elements 29 and 31 being desirably adhered at its opposite sides to the members with which it is in contact.

Valve-member 32 cooperates with a conical seat 33 on the lower face of a metal, ring-shaped, valve-seat member 34 snugly fitting inside of the cylindrical wall 35 of a sheet-metal, round, com-

bined shield, distributor or barrier extended downwardly around, and spaced away from, the corresponding portion of the filter-element, and projecting downwardly well below the level of the opening of inlet 12 into chamber 13.

As portrayed in the drawing, this sheet-metal barrier 35 at its top end extends inwardly, then upwardly providing a round central opening, and then outwardly, these three parts clamping firmly and fixedly between them the round inner portion of a ring-shaped leather or other comparable gasket 36 of right-angle cross-section.

The outer circular section of such gasket is located between the top portion of the round wall of chamber 13 and the circular outer surface of member 35, the lower edge of such gasket being bevelled upwardly inwardly as shown.

A sheet-metal shell or casing 39 with a rounded, lower end 41 and an outstanding, circular flange 42 surrounding the top, open mouth of the member 39 encloses a substantial portion of the filter-pack 30 and a part of the barrier 35, the top face of such casing-flange 42 bearing against the under surface of a ring-gasket 43 of suitable material, dependent upon the nature of the material to be filtered, for instance a neoprene gasket if oil is to be filtered. The upper face of gasket 43 presses against a flat, horizontal shoulder 44 of the main-body 11, another ring-gasket 45 being interposed between the under surface of the flange 42 and the top flat end of a hollow nut 46 having an angular head 47 by which it may be turned, the exterior screw-thread of the nut coacting with the internal screw-thread 14 of casting 11, whereby the nut in its normal position forces the three parts 43, 42 and 45 into pressure-tight relation with one another and with the nut and the main-body.

When the parts are in their assembled positions indicated in Figure 2, the casing 39 compresses spring 28 and the latter pushes the filter-pack assembly up sufficiently to hold the gasket 36 in firm engagement with the upper end-wall of chamber 13.

A coiled spring 37 of suitable strength is interposed between the top surface of the ring-shaped, centrally-apertured valve-seat member 34 and the under surface of the centrally-open end-wall of the barrier 35, a cross-pin 38 extended through registered apertures in the upper portion of rod 18 bearing on the top surface of such barrier end-wall and thereby maintaining such spring under a predetermined compression which force is obviously transmitted to element 34 normally holding the valve closed and the parts of the filter-element pressed together.

Ordinarily also opposed to the pressure of the spring on the valve-member 34 is the upward pressure of the unfiltered fluid, liquid or gas, inside of the barrier 35 on the under annular surface of the part 34 outwardly beyond its conical valve-seat 33, but when the filter is filtering properly, such upward pressure of the fluid is insufficient to overcome the downward pressure of the spring and the valve remains closed.

It should also be borne in mind that when the filter is functioning efficiently, the pressure of the filtered fluid also acts downwardly on the top surface of the element 34, but the upward pressure of the unfiltered fluid is inadequate to overcome both downward pressures on such part.

Cross-pin 38 occupying cavity or chamber 15 is longer than the diameter of the discharge-passage 16 and when rod 18 rises by reason of increased pressure on the underside of end-closure 25, due to clogging of the filter-pack, such ascent is terminated when the end portions of the pin engage the top surface of chamber 15, thus limiting the compression of spring 37 and its effect on valve-member 34, whereas further increase of pressure on the underside of member 34 causes the opening of the short-circuiting valve and the continued discharge of the fluid although it is not properly filtered.

When the pressure drop of the filtered fluid decreases substantially by reason of partial or total clogging of the filter, then the specified upward pressure of the unfiltered fluid on the valve-member 34 is sufficient to force such member upwardly and to open the valve, so that the fluid thereafter passes directly from the inlet to the outlet through such open valve and not through the filter, thus maintaining the flow of the fluid through the filter casing uninterruptedly although the filtering function remains terminated until the filter is cleaned or replaced with a new one.

Stated somewhat differently, it should be observed that, when this increase in pressure of the unfiltered fluid occurs and such augmented pressure acts upwardly on the filter-pack disc 25, it forces the filter-unit and supplemental valve-construction up until the cross-pin 38 engages the top surface of chamber 15, whereupon no further upward travel of the filter-pack can take place, but such increased fluid-pressure acting on the underside of ring 34 lifts the latter, against the action of spring 37 and the lesser fluid-pressure above such element 34, away from the now stationary conical-valve member 32 opening the by-pass between the parts 32 and 34 allowing the unfiltered fluid to flow therethrough short-circuiting the filter-element.

It might be noted in passing that during normal operation of the filter, the pressure of the filtered fluid acts downwardly on the disc 25 at the lower end of the filter-element, but this is of no moment because the valve 32 cannot respond to such pressure due to the constant upholding action of the cross-pin 38. Also, when valve-seat member 34 opens as indicated a somewhat greater pressure may be exerted on disc 25 but the valve-member 32 does not descend.

From what precedes, it will be apparent that the circular barrier 35 performs the novel multiple functions of providing means for properly supporting the gasket 36, of effectively distributing the fluid to be filtered, of supplying a housing for the coiled spring, and of affording a guide for the movements of the valve-seat member 34.

This invention is not necessarily limited and restricted to the precise and exact details of structure set forth herein since reasonable modification may be resorted to without departure from the heart and essence of the invention and without the loss or sacrifice of any of its material benefits and advantages.

I claim:

In a filter of known type having a housing with an inlet and outlet, a hollow filter-element in said housing operative between said inlet and outlet and with its interior connected to said outlet, and a hollow barrier enclosing at least a part of the length of said filter-element and spaced therefrom and having an apertured end-wall through which the filter-element discharges its filtered fluid into said outlet, the novel improvement of a normally-closed bypass for said filter-element including a spring-closed valve having a valve-seat member and a valve-member both of which are outside of, and apertured in register with,

said filter-element, one of said members being mounted on the discharge end of said filter-element and communicating with its interior, the other cooperating member being inside of, slidable in, and guided by, said barrier and subjected to the pressure of the unfiltered fluid in said housing, the spring of said valve being located in said barrier and acting on said cooperating member to maintain the valve normally closed.

WALTER KASTEN.

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