Nov. 2, 1943. W. WIDMANN 2,333,609

CLEANABLE MULTIPLE FILTER

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FIG. 1.

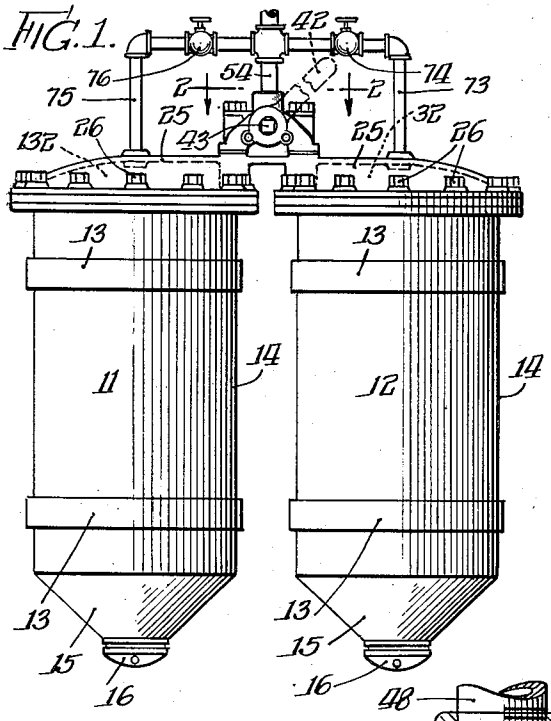

FIG. 2.

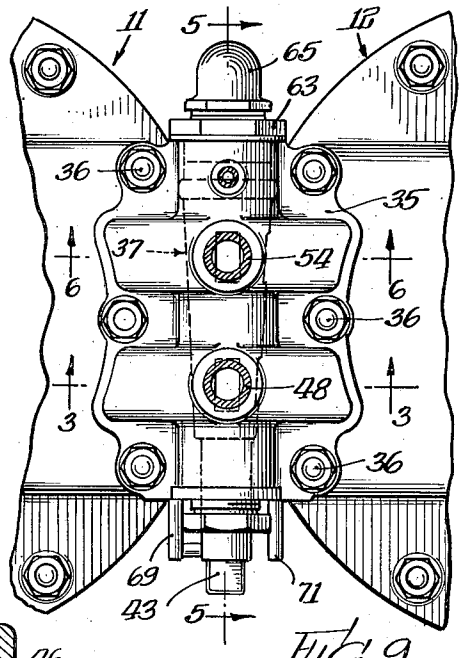

FIG. 3.

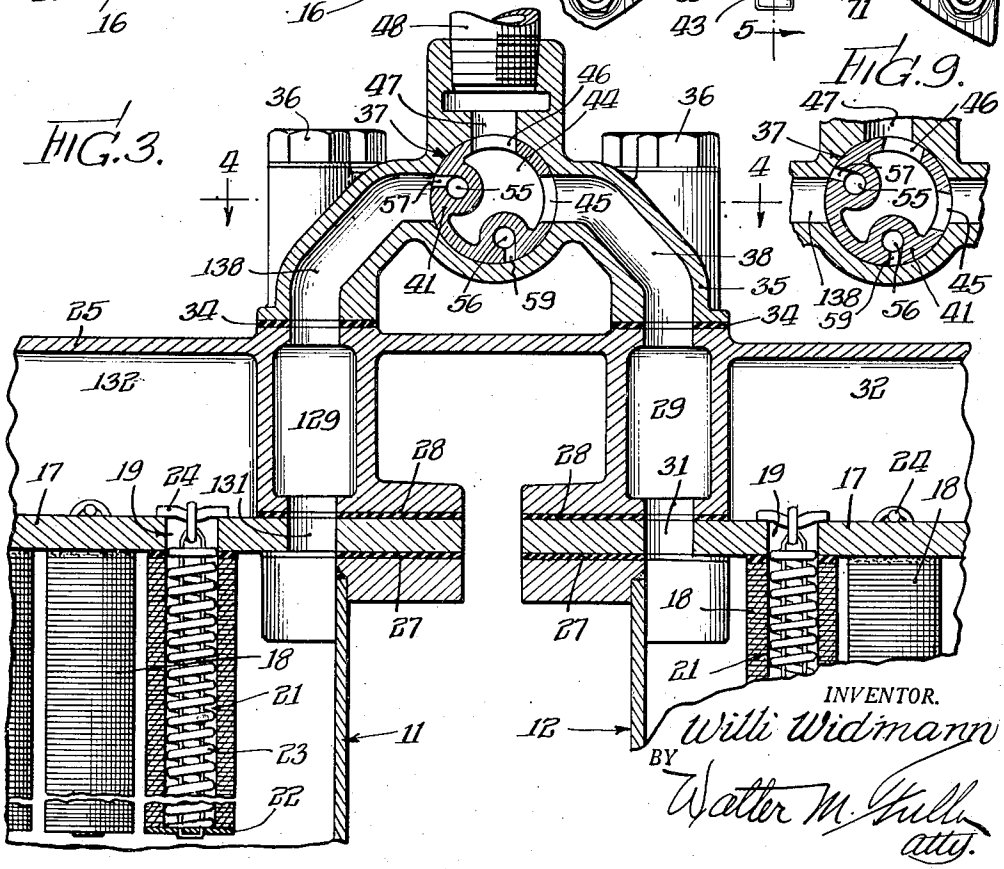

FIG. 9.

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FIG. 4.

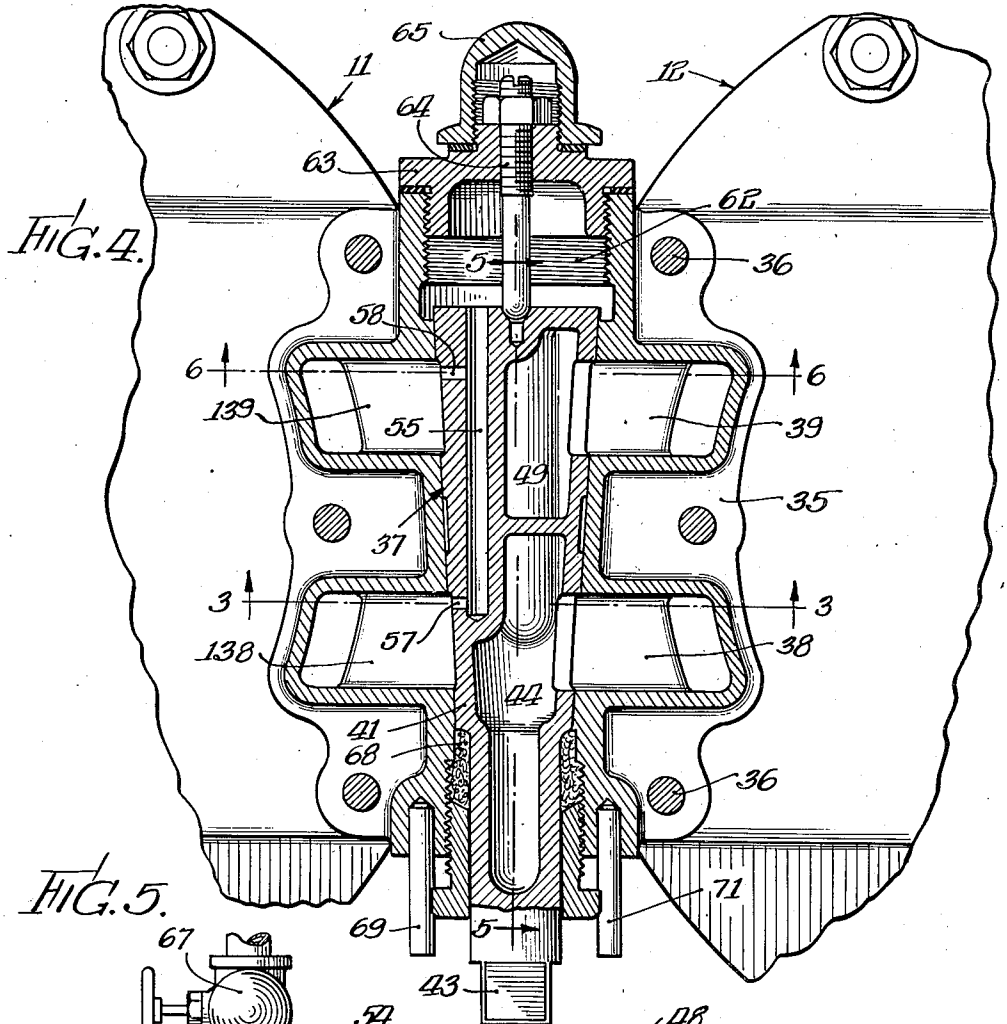

FIG. 5.

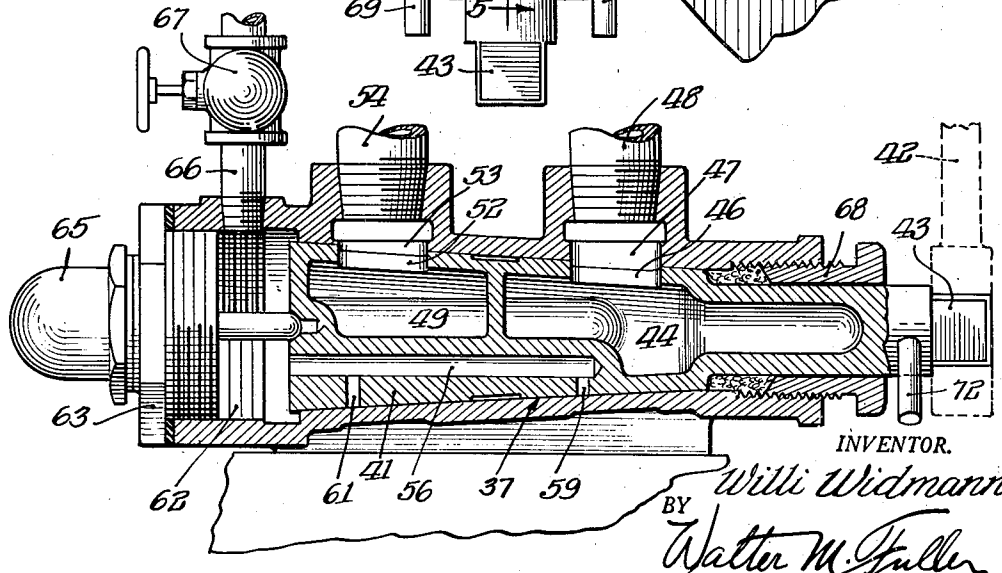

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FIG. 11.

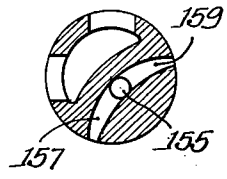

FIG. 6.

FIG. 12.

FIG. 7.

FIG. 10.

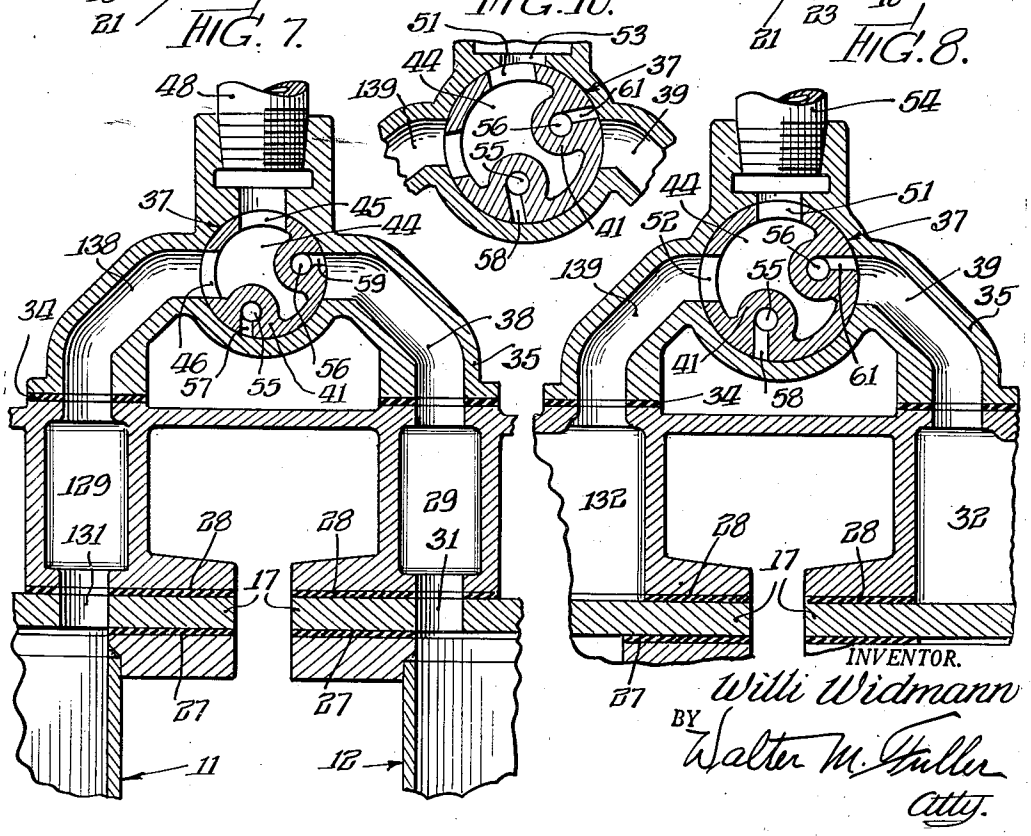

FIG. 8.

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UNITED STATES PATENT OFFICE

2,333,609

CLEANABLE MULTIPLE FILTER

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Application December 21, 1942, Serial No. 469,609

4 Claims. (Cl. 210—168)

The current invention involves structural and operating features of novelty and advantage in filters and it concerns more particularly improvements in the means for cleaning the filter-elements or filter-packs of multiple-filters, such as a pair, of which each filter is alternately operative while the other is being renovated or rehabilitated.

Among the aims and objects of the invention may be mentioned the provision of a construction of the specified type which is relatively simple in structure, which can be made at comparatively small cost, which is easily operated, which functions efficiently, and which is unlikely to become damaged or injured or unexpectedly fail in service during ordinary use.

To enable those acquainted with this art to understand the invention fully, both from structural and functional standpoints, a present preferred embodiment thereof has been illustrated in the accompanying drawings, forming a part of this specification, and to which reference should be had in connection with the following detailed description, like reference characters, for simplicity, having been used throughout the several views of the drawings to designate like parts of the construction.

In these drawings:

Figure 1 is an elevation of the new and improved multiple-filter;

Figure 2 is a fragmentary, horizontal section on line 2—2 of Figure 1;

Figure 3 is a partial, vertical section approximately on lines 3—3 of Figures 2 and 4;

Figure 4 is a horizontal, section along the axis of the main-valve on line 4—4 of Figure 3;

Figure 5 is a vertical section through the axis of such valve on lines 5—5 of Figures 2 and 4;

Figure 6 is a fragmentary, vertical cross-section through the outlet portion of the main-valve approximately on lines 6—6 of Figures 2 and 4;

Figure 7 is a section similar to that of Figure 3 showing the inlet portion of the valve in a different position;

Figure 8 is a section analogous to that of Figure 6 presenting the outlet portion of the valve in a different position.

Figure 9 is a fragmentary section illustrating the valve in still a modified position;

Figure 10 is also a partial section of the valve in another position; and

Figures 11 and 12 show in section a modified form of main-valve.

It will be noted in the drawings that the new construction involves two companion or complementary filters 11 and 12 supported side-by-side by appropriate brackets or comparable means 13, 13, each such filter being of known structure including a sheet-metal or other suitable housing 14 with a downwardly-converging bottom-wall 15 provided at its lowest point with a drain-port normally closed by a removable drain-plug 16 (Figure 1).

The top of each such housing is covered with its apertured division or partition plate 17 (Figure 3) on which is mounted, and depending from which is, a plurality of edge-acting filter-packs 18, one in register with each of the apertures 19, each such pack consisting of a large number of annular, impregnated, paper-discs or their equivalents, with their central apertures in register with one another providing a longitudinal internal-passage 21 for each pack.

The lower end of each such stack is covered and closed by a metal-disc 22 to which is attached the lower end of a coiled, contractile spring 23 occupying the internal-channel 21 of the pack and extending up through the corresponding aperture 19 of the division-plate 17 where it is connected to a short cross-rod or pin 24 bearing at its ends on the top surface of the plate.

As will be readily understood, each such spring holds the discs of its pack pressed together face-to-face so that the filtering operation occurs through the shallow spaces between the impregnated discs rather than through the material of which they are composed.

Above such plate 17 is a single, hollow casting 25 (Figures 1 and 3), common to the two filters, and secured in place by screws 26, 26, suitable gaskets 27, 27 and 28, 28 being used to make the several joints pressure-tight, this member 25 having two inlet-ports 29 and 129 therethrough in communication with complementary admission-ports 31 and 131 through plate 17 leading into the two filter-housings 12 and 11 respectively outside of the several filter-packs therein, such member 25 also having two spaces or chambers 32 and 132 in communication with the internal filter-pack passages or conduits 21, 21 of the two filters 11 and 12 (Figure 6), such chambers having upper discharge-ports 33 and 133.

Mounted on the casting 25 by screws or nuts on screw-studs 36, with suitable gaskets 34, 34 between them, is a main-valve casing casting 35 having a central, horizontal, tapered valve-seat 37 with opposed inlet-ports 38 and 138 (Figures 3 and 4) connecting with the ports 29 and 129 and with opposite discharge-ports 39 and 139

connecting with ports 33 and 133 (Figures 6 and 8).

The tapered main-valve 41, oscillatory in such valve-seat 37 by means of its accessible handle 42 (Figures 1 and 5) demountably held on the squared-end 43 of the valve, has an inlet-chamber 44 (Figures 3, 4 and 5) with two ports 45 and 46 at 90° to one another, the former port being adapted for register with the port 38, as presented in Figure 3, when port 46 is in register with the casing-port 47 connected to admission-pipe 48, and when the valve is rocked to another position, as illustrated in Figure 7, when port 45 is at port 47, port 46 connects with port 138.

Further along its length valve 41 has an outlet or discharge chamber 49 (Figures 3, 4 and 6) having two 90° ports 51 and 52 designed to co-operate with port 39 and port 53 connected to discharge-pipe 54 in one position of the valve and to coact with ports 53 and 139 in another angular position of the valve.

In addition, valve 41 has two longitudinal passages 55 and 56 as shown, the former having lateral inlet and outlet ports or branches 57 and 58 (Figure 4), respectively, designed at times to connect with the topmost parts of the main inlet and outlet ports 138 and 139, whereas passage 56 has analogous side inlet and outlet ports 59 and 61 (Figure 5) arranged to coact in similar manner with admission and discharge ports 38 and 39 respectively.

As is illustrated in Figures 4 and 5, the two lengthwise passages 55 and 56 connect at one end only with a chamber 62 an opening into which is normally closed by a screw-threaded plug 63 carrying an adjustable screw 64 bearing against the adjacent end of the main-valve to determine its tightness of fit in the valve-seat 37, the protruding end portion of such screw desirably being concealed by a demountable screw-threaded cap 65.

An air-vent or upstanding overflow pipe 66 (Figure 5) connects with such chamber 62, the pipe being equipped with a manually-operated shut-off valve 67.

At its opposite end a reduced-diameter section of the oscillatory valve 41 extends out of its surrounding casting through an appropriate stuffing-box 68 (Figures 4 and 5), and, adjacent thereto, such casting is supplied with a pair of stop-pins 69 and 71 (Figure 4) with which an external radially-projecting pin 72 (Figure 5) on the valve coacts to limit the degree of turning of the valve by its handle 42.

As is indicated in Figure 1, the outlet-pipe 54 has a lateral pipe-connection 73, equipped with a hand-operated valve 74, with the interior of chamber or space 32, and another lateral pipe-connection 75, supplied with a manual-valve 76, with the interior of chamber 132.

The operation of the described duplex or double filter is substantially as follows, one filter only being in action at a time:

Assuming that valve 41 is in the position illustrated in Figures 3 and 6, and that filter 12 is in operation, the procedure is as follows:

The contaminated fluid, such as impure oil, enters the system under suitable pressure through the inlet-pipe 48 (Figures 2, 3 and 5) and flows through passages or ports 47, 46, 44, 45, 38, 29 and 31 into the housing of filter 12 where it flows inwardly through the several filter-packs 18 between their discs leaving its separated impurities in part adhered to the exteriors of the filter-packs and probably in part deposited in the lower section 15 of the housing.

It then passes upwardly in the filter-pack passages 21, through apertures 19 into compartment 32 from which (Figure 6) it flows up through ports and passages 33, 39, 51, 49, 52 and 53 into the outlet or discharge-pipe 54 from which it is delivered as purified oil, the two valves 74 and 76 being closed during such procedure.

When, however, it is desired to clean and refill the then inactive filter 11, it is accomplished in this manner without interrupting the operation of the filter 12.

Drain-plug 16 is removed from filter 11 and the impure, unfiltered oil in its housing outside of the filter-packs drains away carrying with it any separated impurities accumulated in the lower portion of the housing and any washed from the surface of the packs by the discharging oil.

This drainage, at least in some cases, may be facilitated by opening valve 67 to allow air to enter the housing above such oil through passage 55 and its side ports 57 and 58, as shown in Figure 4.

In order to more thoroughly clean the external surfaces of the several filter-packs 18 of such filter 11 by forcing clean oil through them reversely, the following procedure is resorted to.

Valve 41 is turned clockwise just enough to bring ports 57 and 58 out of communication with ports 138 and 139, thereby only closing ports as shown in small degree in Figure 9, whereupon valve 76 (Figure 1) is opened, thus allowing purified or clean filtered oil to pass from pipe 54, by reason of its pressure therein, through valve 76 and pipe 75, into chamber 132 from which it flows through apertures 19 into the interiors of all of the filter-packs, then outwardly between their discs into housing 14 from which it discharges through the now-open drain at the bottom of the housing.

The above-specified flow of the clean oil constitutes a reverse or counter flow through all of the filter-packs which cleans their outer surfaces from adhering matter and this also is delivered through the open drain.

Thus the filter is efficiently and easily cleaned and renovated and this having been accomplished, the drain-plug is put back in place closing the drain and valve 41 is turned slightly to cause port 57 to register with the extreme top part of port 138 and to cause port 58 to register with the upper part of port 139, as shown in Figures 3 and 6, whereupon the entering purified oil fills the entire housing 14 of filter 11 both inside and outside of the filter-packs, this oil also gradually filling the numerous passages and ports 131, 129, 138, 57, 132, 133, 139, 58, 55, chamber 62, pipe 66 and valve 67, such oil in thus filling the filter forcing out any air therein before it through the open vent-valve 67, and, when such oil begins to overflow from pipe 66, valves 67 and 76 are closed, and at any time thereafter, when filter 12 requires like cleaning, filter 11 is ready to be placed in service by turning valve 41 into the position shown in Figure 7, filter 12 then being out of operation.

To start the cleaning of filter 12, after filter 11 has been thus rendered operative, its drain-plug 16 is removed, and much of the oil is allowed to drain out while valve 67 is open to facilitate such action.

Then valve 41 is turned to the position presented in Figure 10 and valve 74 is opened to

bring about the back-washing and cleaning of the filter-packs referred to.

This having been completed, valve 41 is again turned to the position presented in Figure 7 and valve 67 is opened, and as soon as oil overflows through pipe 66, valve 67 is closed thus completing the cleaning operation of filter 12.

It will be understood that the valve 41 is turned to the two positions shown in Figures 9 and 10, during the reverse or back flow of purified oil through the filter-packs, to close the otherwise by-passes around the filter-packs which, if allowed to remain open, might at least in some cases preclude the accomplishment of the reverse flow of liquid through the filter-packs.

Hereinafter, the two passages 38—29—31 and 138—129—131 will be designated as the filter-inlets, the passages 39—33 and 139—133 as the filter-outlets, the valve conduits 46—44—45 and 52—49—51 as the valve inlet-passage and outlet-passage respectively, pipe 48 and port 47 as the inlet-conduit and port 53 and pipe 54 as the discharge-conduit.

Those acquainted with this art will readily understand that this invention is not necessarily limited and restricted to the precise and exact details of structure and function set forth and that various modifications or changes may be resorted to without departure from the heart and essence of the invention, as defined by the appended claims, and without the loss or sacrifice of any of its substantial benefits and advantages.

For instance, instead of using two passages 55 and 56, a single properly-connected passage 155 may be employed with all four ports 157, 158, 159 and 161 (corresponding to ports 57, 58, 59 and 61) connected thereto as shown in Figures 11 and 12.

I claim:

1. In a multiple filter construction, the novel combination of first and second complementary filters, each having a housing, a filter-inlet, a filter-outlet, an openable and closable drain, and a filter-medium in said housing between said inlet and said outlet through which the fluid undergoing filtration passes, an inlet-conduit, a discharge-conduit, a main-valve having an inlet-passage and an outlet-passage, said main-valve inlet-passage in one position of said valve connecting said inlet-conduit with the filter-inlet of said first filter and said discharge-conduit with the filter-outlet of the same filter, said valve inlet-passage in a second position of said valve connecting said inlet-conduit with the filter-inlet of said second filter and said discharge-conduit with the filter-outlet of said second filter, a first duct connecting said discharge-conduit with the interior of said first filter on the outlet side of its filter-medium, a first-valve in said first duct, a second duct connecting said discharge-conduit with the interior of said second-filter on the outlet side of its filter-medium, and a second valve in said second duct, whereby when either filter is operated with the other filter inoperative, the drain of the inoperative filter may be opened and the valve in the duct of such inoperative filter may be opened to clean the filter-medium of such inoperative filter by forcing filtered fluid reversely therethrough.

2. The novel combination of features in a multiple-filter construction set forth in claim 1, in which said main-valve has vent-means connecting with the filter-inlet and the filter-outlet of either filter only when such filter is inoperative, and a control valve-means in said vent-means.

3. The novel combination of features in a multiple-filter construction set forth in claim 1, in which the top portion of said filter-inlets and filter-outlets are the highest parts of the connections with their filters, and in which said main-valve has vent-means connecting with the filter-inlet and the filter-outlet of either filter only when such filter is inoperative, and a control valve-means in said vent-means.

4. The novel combination of features in a multiple-filter construction set forth in claim 1, in which said main-valve has vent-means connecting with the filter-inlet and the filter-outlet of either filter only when such filter is inoperative, and a control valve-means in said vent-means, said main-valve being capable of occupying a position in which said vent-means is closed without closing the filter-inlet and the filter-outlet of the then operative filter.

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