Nov. 3, 1936. C. E. JOHNSON ET AL 2,059,358

OIL CLARIFIER

Filed June 23, 1934

Fig. 1.

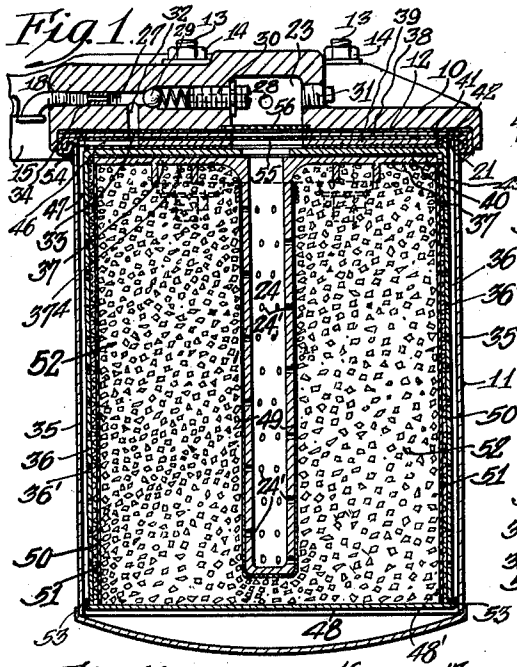


Fig. 2.

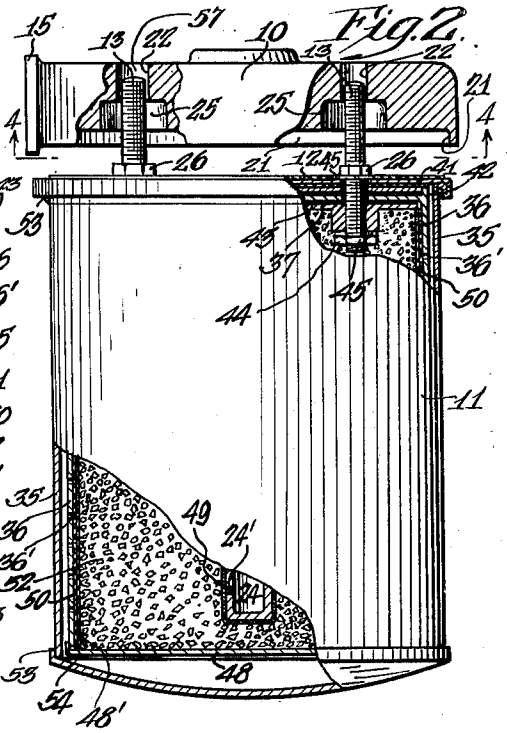


Fig. 3.

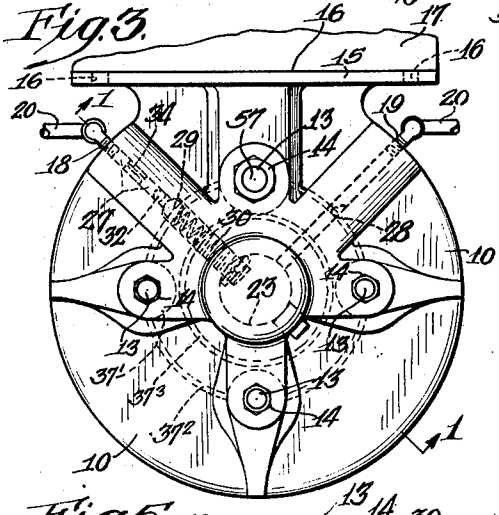


Fig. 4.

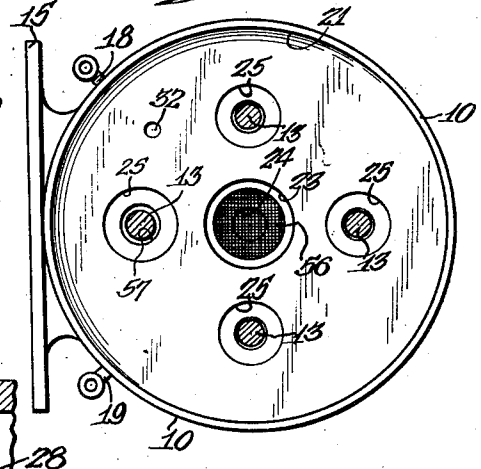
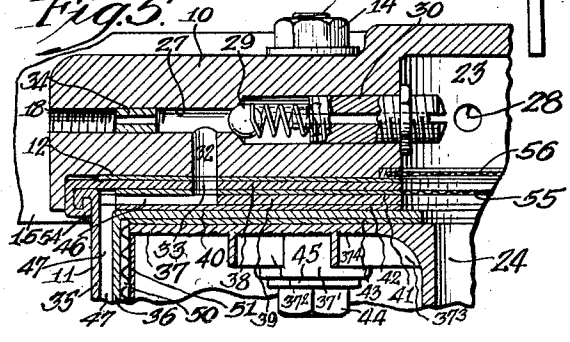


Fig. 5.



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OIL CLARIFIER

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11 Claims. (Cl. 210—131)

The invention described herein is an improvement in the field of pressure clarifiers, and, as such, is believed to have its widest application in the purification of lubricating oils of automobile engines, aeroplane engines, Diesel engines, gasoline-electric engines and other internal combustion engines, and has therefore been described in connection with the oil system of an internal combustion engine.

The invention is also well adapted to clarifiers for the cleaning of insulating oils, such as are used in electric power transformers and oil circuit breakers, and to other clarifiers, for example, those for the purification of different types of motor oils, turbine oils, and of gasoline as applied to the dry cleaning industry and the like.

The invention is directed to that type of pressure clarifier in which the clarifying and filtering agent occupies an annular space intermediate laterally perforated concentric cylinders within an outside casing, the liquid under purification, usually lubricating oil or gasoline, having inlet into the casing near the circumference thereof and filtering through the agent in a direction generally radially inward to the interior of the inner cylinder to find outlet therefrom usually in a generally axial direction.

An object of the invention is to provide a novel pressure clarifier of the character indicated that will well meet the needs of service and be of a simple construction, rugged and inexpensive to manufacture.

Another object is to provide for easy assembly and disassembly of the permanent and non-permanent members of a clarifier of the character indicated.

We locate the inlet and outlet oil connections in a permanent bracket, and locate the clarifying and filtering agent in a refill unit, with a bolt and gasket connection between the bracket and refill units, whereby the refill part of the clarifier is readily changed without in the least disturbing the piping of the oil system in which the clarifier may be operating.

Another object is to clamp together the different elements of a refill portion of a clarifier of the character indicated by the same bolts that clamp the refill unit to the bracket.

Another object is to arrange the connection between the permanent and refill portions of a clarifier of the character indicated so that the connection can be made only when the members are in their proper registry with one another.

Another object is to avoid oil channeling at the top of the charge of clarifying material within an oil clarifier by downward baffles into the material or/and downwardly presenting a roughened or indented surface thereto.

Another object is to totally enclose a straight line relief valve in a head portion of a clarifier of the character indicated, adapting the clarifier to operate under constant oil pressure and the relief valve to be readily sealed from unauthorized access.

Another object is to locate a throttle orifice in the oil inlet to a clarifier of the character indicated, thereby preventing any excessive flow of oil to the lubricator.

Other objects will appear in the specification and in the claims.

We have elected to show one only of the different forms of our invention, selecting a form however that is practical and efficient in operation and which well illustrates the principles involved.

Figure 1 is a front sectional elevation, taken on the line 1—1 of Figure 3, of structure embodying a desirable form of our invention.

Figure 2 is a left side elevation of Figure 3, partly sectioned, and showing the head and refill portions of the clarifier slightly separated.

Figure 3 is a top plan view of the structure of Figures 1 and 2.

Figure 4 is a bottom plan view of the clarifier head, being a section on the line 4—4 of Figure 2.

Figure 5 is a fragmentary view of a portion of Figure 1 to enlarged scale, to more clearly indicate details thereof.

Like numerals refer to like parts in all figures. Describing in illustration and not in limitation and referring to the drawing.

The clarifier comprises permanent and refill units 10 and 11 respectively, with an intermediate gasket 12, the two units being removably clamped together upon the intermediate gasket by bolts 13 and nuts 14.

The permanent member 10 carries a flange 15 by which it may be fastened at 16 to stationary frame structure 17 of an internal combustion engine or the like and is connected at its oil inlet fitting 18 and oil outlet fitting 19 into a pipe line 20 carrying the circulating oil of the engine.

The permanent unit or head 10 is here shown as an integral casting, upwardly recessed on the bottom at 21 to fit the top of the refill unit 11, with perforations 22 to pass stud bolts 13, and presents a downwardly directed cup 23 over the open end of an oil receiving well 24 of the refill unit, the cup 23 forming an outlet compartment of the head.

The bolt perforations in the head 10 are enlarged at 25 to receive nuts 26 on the stud bolts 13.

The head 10 is radially bored at 27 and 28 into the outlet compartment to provide the inlet and outlet passages thereof respectively from and to the fittings 18 and 19.

The inlet bore 27 is extended through the one wall of the inverted cup and counterbored to receive an adjustable spring relief valve 29 (here shown as a ball) the spring of which valve is supported against the inner end of a tubular plug 30 adapted to be adjusted by the aid of a screw driver when the plug 31, directly in line with the tubular plug 30, normally closing the outer end of the counterbore, has been removed.

If desired the plug 31 may be permanently closed after the relief valve has been set to its best position and to prevent unauthorized adjustments thereof.

A downward branch bore 32 from the bore 27 presents its lower end to the inlet port 33 of the refill unit.

We usually prefer to insert a throttling plug 34 in the inlet passage of the head, to suitably limit the flow of oil to the clarifier, the size of the throttle orifice in this plug being selected to best suit the intended service conditions to be met by the clarifier.

This throttling plug may obviously be omitted if the intended service conditions make its presence unnecessary or undesirable.

The refill unit 11 includes outer and inner cylindrical containers 35 and 36, the oil well 24 and oil clarifying material intermediate the perforated walls of the well and inner container, the inner container being perforated at 36^1 and the oil well being perforated at 24'.

The well is suitably an integral casting with a top flange 37 of size to loosely fit the interior of the inner container, and with its inner or downward side provided with bosses 37^1 and downward concentric flanges 37^2 and 37^3. The bosses 37^1 interconnected by successive portions of the flange 37^2 are drilled and tapped to receive the inner ends of the studs 13. These studs are suitably threaded throughout their lengths to permit longitudinal adjustment of the studs. The entire under surface of the flange 37 is roughened or indented as with punch markings 37^4 for the purpose of lessening channeling of oil flowing inwardly at this surface to the well.

The top of the refill unit includes the head 38 of the outer container, a spacer plate 39, the top 40 of the inner container and preferably intermediate gaskets 41, 42 and 43, all strongly clamped together between the heads and nuts 44 and 26 of the bolts 13, with spring and gasket washers 45 under the nuts.

The spacer plate 39 is outwardly slotted at 46 to provide an oil passage from the inlet port 33 to the annular space 47 between the inner and outer containers.

In manufacture the top members of the refill unit are clamped together as above, initially without the outer container except its head 38 and without the bottom 48 of the inner container, so that the partially assembled unit comprises at this time an annular cup open at 48'.

The well 24 is preferably provided with a sheath 49 suitably of canton flannel, and the perforated cylindrical wall of the inner compartment is preferably lined with a moisture absorbent wadding 50 (suitably cellucotton) with an inner layer 51 (suitably blotting paper).

The annular space between the sheath 49 of the oil well and the inner lining layer 51 of the inner compartment is now filled with the selected clarifying agent 52 which may suitably be fuller's earth, after which the bottom 48 of the inner container and the main body of the outer container are successively fastened to place, as by soldering at 53 and seaming and soldering at 54.

Safety screens, of fine wire mesh, are indicated at 55 and 56, respectively at the central opening of the spacer plate over the top of the oil well and across the bottom of the compartment 23 in the permanent head 10.

In operation, the unclean oil, under the pressure (or suction which amounts to the same thing) of an oil circulating system, enters the clarifier at the fitting 18, passes preferably through a restriction at the plug 34 or elsewhere, through the passages 32, 33 and 46 into the space 47 between the inner and outer containers.

The incoming oil is normally hot, completely fills the space between the inner and outer containers and heats the materials within the inner container, making the operation of these materials more effective.

From the space between the containers the oil flows radially inward toward the receiving well, first through the perforations 36^1 of the inner container, then through the demoisturizing material 50, through the protective lining 51, then through the clarifying material 52, and through the sheath 49 into the laterally perforated oil well, whence the clarified oil passes upwardly through the safety screens 55 and 56 into the outlet compartment 23 of the permanent head, and thence by the passage 28 and fitting 19 into the external piping 20 of the circulating oil system.

The downwardly extending flanges 37^2 and 37^3 and indentations at 37^4 over the under surface of the flange 37 all aid in wholly or nearly eliminating any channelling of the oil in its inward flow at the under surface of the flange 37.

It will be understood that the sheath 49 serves to prevent any of the clarifying agent 52 from being carried into the well 24.

Any desired portion of the circulating oil, according to the setting of the relief valve 29, may by-pass the clarifying material, going by the relief valve and the tubular plug 30 directly to the outlet compartment 23 where it mixes with that portion of the circulating stream passing to and through the clarifying material.

It will be evident that the oil may be circulated in the reverse direction from that described; more usually however this will result in a shorter life of the refill member and is therefore usually less desirable. As the annular surface of clarifying agent is greatest near the outside of the filter, it is best to bring the impure oil from the outside inward, thus depositing the bulk of the impurities near the outside. It will be evident too that if the direction of circulation is reversed there should be a corresponding reversal of the relief valve, as by seating the ball at the other end of the spring, that is at the end of the tubular plug 30.

It will be seen that we assure proper registry between the permanent and refill members by making one of the bolts 13, as at 57, and the corresponding perforations therefor, larger than the others. In this way the two members cannot be assembled except in the right way.

In view of our invention and disclosure, varia-

tions and modifications to meet individual whim or particular need will doubless become evident to others skilled in the art to obtain all or part of the benefits of our invention without copying the structure shown, and we therefore claim all such in so far as they fall within the reasonable spirit and scope of our invention.

Having thus described our invention what we claim as new and desire to secure by Letters Patent is:

1. In an oil clarifier, a supporting main head having inlet and outlet channels for connection into a circulating oil system, the channels having downward openings respectively for outlet and inlet, a refill unit presenting inlet and outlet openings to the downward openings from the channels and including a well having a head flange and laterally perforate sides, a laterally perforate container outside the well and having an upper end open above the well, a clarifying agent in the annular space outside the well and inside the container, a casing surrounding the container having a head open for outlet above the well and for inlet toward its circumference into the space between the casing and container, and means clamping the head flange and casing together upon the intermediate container and removably clamping the refill unit to the main head.

2. In an oil clarifier, a supporting main head having inlet and outlet channels for connection into a circulating oil system, the channels having downward openings respectively for outlet and inlet, a refill unit presenting inlet and outlet openings to the downward openings from the channels and including a well having a head flange and laterally perforate sides, a laterally perforate container outside the well and having a head open above the well, a clarifying agent in the annular space outside the well and inside the container, a casing surrounding the container having a head open for outlet above the well and for inlet toward its circumference, a spacer plate between the head of the container and head of the casing, said plate having openings registering with the openings of the casing head with the outer opening extending to the annular space between the casing and container, and means clamping the flange and casing head together upon the intermediate container head and spacer plate and removably clamping the refill unit to the main head.

3. In an oil clarifier, a supporting main head having inlet and outlet channels for connection into a circulating oil system, the channels having downward openings respectively for outlet and inlet, a refill unit presenting inlet and outlet openings to the downward openings from the channels and including a well having a head flange and laterally perforate sides, a laterally perforate container outside the well and having an upper end open above the well, a clarifying agent in the annular space outside the well and inside the container, a casing surrounding the container having a head open for outlet above the well and for inlet toward its circumference into the space between the casing and container, a plurality of bolts extending upwardly through the flange and the heads of the container and casing, nuts on the bolts cooperating therewith to clamp the flange and casing head together upon the intermediate container head, upwardly extending bodies of the bolts passing the main head and other nuts thereon cooperating with the bolts to removably clamp the refill unit to the main head.

4. In an oil clarifier, a supporting main head having inlet and outlet channels for connection into a circulating oil system, the channels having downward openings respectively for outlet and inlet, a refill unit presenting inlet and outlet openings to the downward openings from the channels and including a well having a head flange and laterally perforate sides, a laterally perforate container outside the well and having an upper end open above the well, a clarifying agent in the annular space outside the well and inside the container, a casing surrounding the container having a head open for outlet above the well and for inlet toward its circumference, a spacer plate between the container head and the casing head, said plate having openings registering with the openings of the casing head with the outer opening extending to the annular space between the casing and container, a plurality of bolts extending upwardly through the flange, the container head, plate and casing head, nuts on the bolts cooperating therewith to clamp the flange and casing head together upon the intermediate container head and plate, upwardly extending bodies of the bolts passing through the main head and other nuts thereon cooperating with the bolts to removably clamp the refill unit to the main head.

5. In a refill unit for an oil clarifier, a well having a head flange and laterally perforate sides, a laterally perforate cylindrical container surrounding the well, open at the bottom and having a top open above the well, clarifying material in the space between the cylindrical container and the well, a bottom for the cylindrical container, a casing head above and outwardly overlapping the container, said head having an opening above the well and a second opening into the space outwardly overlapping the container, a casing surrounding the cylindrical container and secured to the head, and bolts and nuts clamping the flange and head together upon the intermediate top and presenting upwardly extending bodies for removably clamping the unit to a main head to support the unit and to be connected into a circulating oil system.

6. In an oil clarifier, a supporting head having inlet and outlet passages and a removable refill unit to receive unclarified oil from the head inlet channel and discharge the clarified oil into the head outlet channel, the said unit consisting of an outside container, a laterally perforated inside container, an absorbent de-moisturizing wall, a porous protective liner there adjacent, a central laterally perforate well, a cloth sheath about the well, fuller's earth in the annular space intermediate the liner and sheath, a flange on the well about the top thereof and a clamping connection between the flange and supporting head.

7. In an oil clarifier, a head, a refill unit, the head and refill unit having cooperating spaced openings to permit oil flow between the head and refill unit, and means connecting the unit to the head and including one relatively large assembly clamping bolt and a plurality of smaller assembly clamping bolts whereby the unit and head can be assembled in but one position, the correct position, with gasket between the body and head to complete the union between them.

8. In an oil clarifier, a head, and a refill unit consisting of an outside container, an inner laterally perforated container inwardly spaced from and surrounded by the outside container, walls

forming an inlet opening to the space between the containers, an absorbent wadding de-moisturizing material within the inner container, a porous protective liner inwardly covering the de-moisturizing material, clarifying clay inwardly of the liner, a laterally permeable outlet well within the clay and walls forming an outlet opening from the outlet well.

9. In an oil clarifier, a head and a refill unit, there being cooperating oil flow openings between the head and refill unit, the unit having an outer container, an outer container head, having inlet port toward its circumference, an inner container, an oil clarifying material in the inner container, an inner container head, a spacer reinforcement plate between the heads and gaskets between the plate and heads, and the plate being recessed at one side to provide an oil channel from the said inlet port.

10. In an oil clarifier, an outer container having inlet and outlet passages, a laterally perforated well, inside the outer container and open to the said outlet passage thereof, a perforated annular second container surrounding and outwardly spaced from the well, oil clarifying material between the well and the container, walls forming a surface extending above and in contact with the oil clarifying material from the well to the second container and baffles extending into the material from the surface and impeding radial flow between the second container and the well along the surface, the said inlet passage of the outer container being to the interior portion thereof outside the said second container.

11. In an oil clarifier, an outer container having inlet and outlet passages, a generally vertical laterally perforated well inside the outer container and open to the said outlet passage thereof, a flange connected to the well at its upper end and extending radially, said flange having an irregular lower surface to prevent channelling, a laterally perforated second container surrounding and laterally spaced from the well and extending up to the flange and oil clarifying material in the space between the well and the second container and in contact with the irregular lower surface of the flange, the said inlet passage of the outer container being to the interior portion thereof outside the said second container.

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