Aug. 26, 1947. A. F. UNDERWOOD 2,426,327

OIL CLEANER

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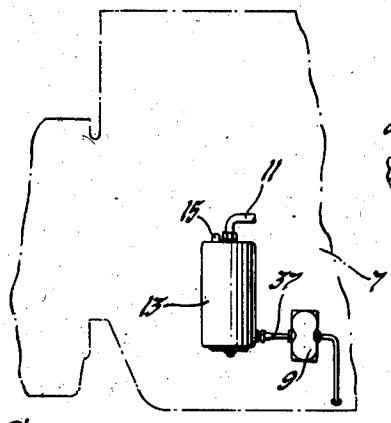


Fig. 1

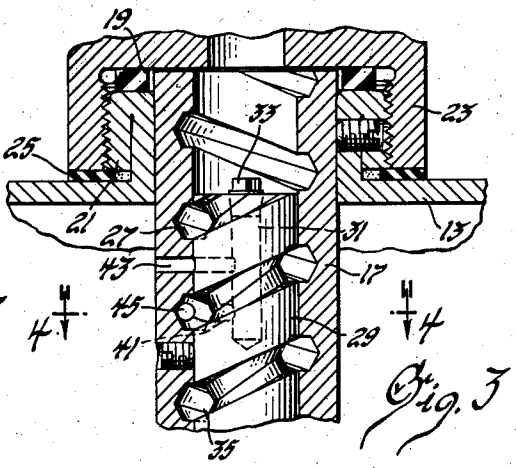


Fig. 3

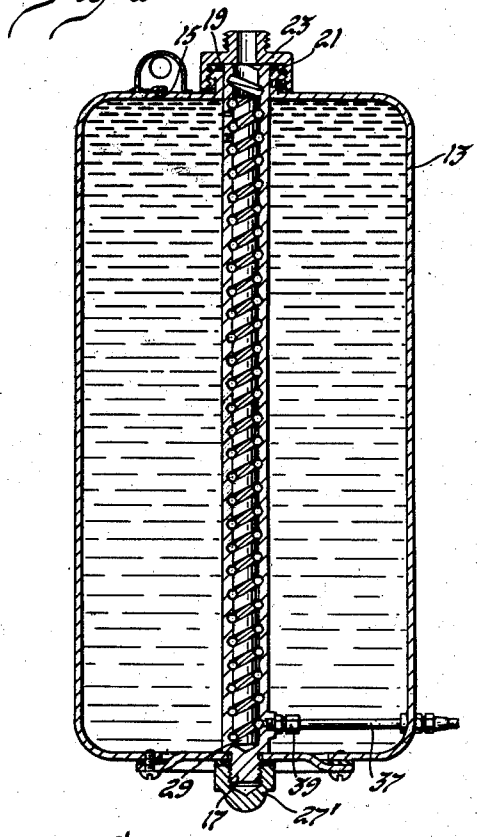


Fig. 2

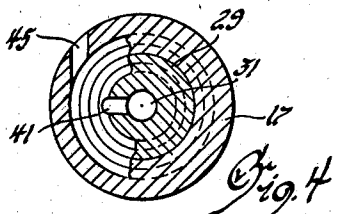


Fig. 4

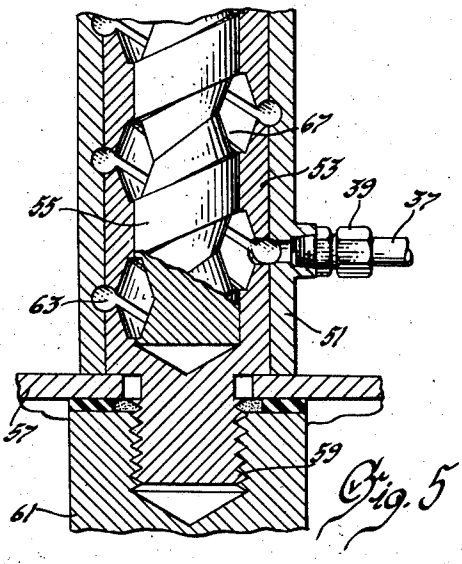


Fig. 5

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OIL CLEANER

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7 Claims. (Cl. 210—51)

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This invention relates to oil cleaners. Prior to this invention it has been proposed to circulate a column of liquid such as oil under pressure through a spiral path and to separate contained air by an exit or exits at a point or points in the spiral path nearest the axis of the spiral, and to provide for the escape of heavier particles from a region adjacent the outermost part of the spiral path. In that connection I may refer to my application for oil cleaner Serial No. 503,881, filed September 27, 1943. This invention may be described as an improvement over my earlier invention, the improvement consisting mainly in a new cross-sectional shape of the spiral path which is designed to effect a better separation of foreign matter. It also embodies the discovery that improved results are obtained by taking off the foreign matter at one end only of the spiral path.

Although the invention has been described for use in separating air and solid particles from oil it will be understood that the inventive idea is not restricted to use with oil but that it may be applied wherever a forced flow of fluid medium needs to be freed from foreign substances.

Fig. 1 is a view in elevation of the improved cleaner installed in the lubricating system of an engine, the engine being shown in outline.

Fig. 2 is a vertical section through the cleaner.

Fig. 3 is a similar view on an enlarged scale of the upper end of the cleaner.

Fig. 4 is a section on line 4—4 of Fig. 3.

Fig. 5 is a vertical section of the lower end of a modified but now preferred form.

The engine is indicated by numeral 7. The lubricating system includes an engine driven pump 9, and a delivery pipe 11. A container 13 is located between the pump 9 and the pipe 11. An air vent 15 is provided in the container to permit the escape of air. Sediment may settle to the bottom. A tube 17 extends vertically through the container. At its upper end it has a gasket 19 overlying a doubled over flange 21 around an opening in the upper wall of the container through which opening the tube 17 extends. An apertured plug 23 is threaded to flange 21 and clamps the gasket 19 in place, there being a sealing ring at 25. Any suitable fitting secures pipe 11 to plug 23. At the lower end a reduced part of tube 17 extends through an opening on the lower wall of the container and is threaded to a closed plug 27'.

A spiral path for the flow of fluid through the container is formed by shaping the inner wall of tube 17 with a groove 27 of angular shape as

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shown. Within the tube 17 is a cylindrical member 29 terminating somewhat below the upper end of tube 17 where it is given an axial bore 31 closed by a plug 33. At its lower end the member 29 seats on a shoulder of tube 17 as shown by Fig. 2. The outer surface of part 29 is formed with an angularly shaped spiral groove 35. Grooves 27 and 35 register to form a spiral path. At the lower end of the assembly as described, a pipe 37 extends from the pump through the wall of the container and communicates by any suitable fitting 39 with the said spiral path.

The fluid under pressure from the pump is thus forced through the spiral path which extends to a position near the end of tube 17 whence it is transmitted by pipe 11 to the parts to be lubricated.

Near the upper end of the assembly a passage 41 leads to the central passage 31 from a part of the passage 35 nearest the axis. From the central passage a conduit 43 extends through parts 29 and 17 to the chamber of the container. Also near the passage 41 there is a passage 45 extending tangentially to the spiral passage through the wall of tube 17 and opening into the chamber of container 13.

As the oil is forced through the spiral passage the influence of centrifugal force causes the air to collect adjacent the axis and the sediment is carried to the outer region. When the region marked by line 4—4 is reached the heavier particles escape through tangential passage 45 and collect at the bottom of the container. The air passes through passages 41 and 43, and its escape is provided by the vent 15.

A somewhat more efficient modification is illustrated by Fig. 5. In this form the spiral passage is developed by providing grooves in three concentric members 51, 53, 55. The outermost part is a hollow tube 51. It rests on the lower wall 57 of the container. Its part of the spiral passage is substantially semi-circular in cross section. The intermediate part 53 has a reduced lower end 59 extending through wall 57 where it is clamped by a nut 61. The outermost part of its contribution to the spiral path is substantially semi-circular to make, together with the semi-circular groove in part 51, a groove of circular cross section. The other part of its contribution is of angular formation, it having two faces terminating in an apex marked 63 which merges into the circular part. The inner member 55 rests on a shoulder of part 53. It has a similar angular faced passage to match with that of part 53 mak-

ing together a sort of hexagonal formation with an apex in that part nearest the axis as at 67.

It is unnecessary to illustrate the upper end. There will be outlets extending tangentially from the circular part of the passage for the escape of dirt and a passage from the apex 67 to a central passage (like 31) for the escape of air. This preferred form provides a narrow opening between the sloping walls of the hexagonal part and the outer circular part so that the solid particles are readily discharged into this circular region and, trapped therein, travel until they reach their escape outlet. To effect the best results the cross-sectional area is made as large as possible, the outer V-shaped wall facilitating the escape of solid particles to the circular part, and the inner V-shaped wall providing for a movement of air to a position closely adjacent to the central axis to facilitate its escape to the passage in that axis as shown by Fig. 3.

I claim:

1. For freeing from foreign matter a fluid column flowing under pressure, means having angular walls forming a spiral path for the passage of said fluid, inlet and outlet means leading to and extending from said spiral path respectively conduit means adjacent one end of said path and in open communication with its radially innermost part to permit the escape of air and other conduit means adjacent said first conduit means and in open communication with the radially outermost part of said path to permit the escape of solid particles.

2. The invention defined by claim 1, the angular walls converging to an apex at the region nearest the axis of the spiral path.

3. The invention defined by claim 1, said other conduit means extending tangentially from the spiral path.

4. The invention defined by claim 1, said path having a radially inner region which is hexagonal in section with an apex adjacent the axis and a radially outer region circular in section and having a restricted communication with the inner region whereby relatively heavy particles circulate in the outer region and relatively light particles circulate in the inner region.

5. A fluid cleaner adapted for being used between a source of pressure and a utility conduit, said cleaner including an outer shell, an intermediate shell and an inner cylinder, said outer shell having on its inner wall a spiral groove, said inner cylinder having on its outer wall a spiral groove, said intermediate shell having in its outer wall a spiral groove matching the spiral groove of the outer shell and also having on its inner wall a spiral groove matching the spiral groove of the inner cylinder, the two grooves of the intermediate shell communicating throughout their length whereby radially outer and radially inner spiral paths are formed, inlet means for connecting said source to one pair of adjacent ends of said spiral paths, outlet means for connecting the other ends of said spiral paths to said utility conduit, first conduit means leading from adjacent the outlet end of the spiral path formed by the outer and intermediate shells to permit the escape of solid particles and second conduit means leading from adjacent said outlet end of the spiral path formed by the cylinder and the intermediate shell to permit the escape of gases.

6. The invention defined by claim 5, said parts forming a path which in cross section is outwardly circular and inwardly angular with an apex at the region nearest the axis of the spiral path.

7. The invention defined by claim 5, the matching grooves of the outer and intermediate parts form a path circular in section and the matching grooves of the intermediate and inner parts forming a path hexagonal in shape.

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