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OIL CLEANERS

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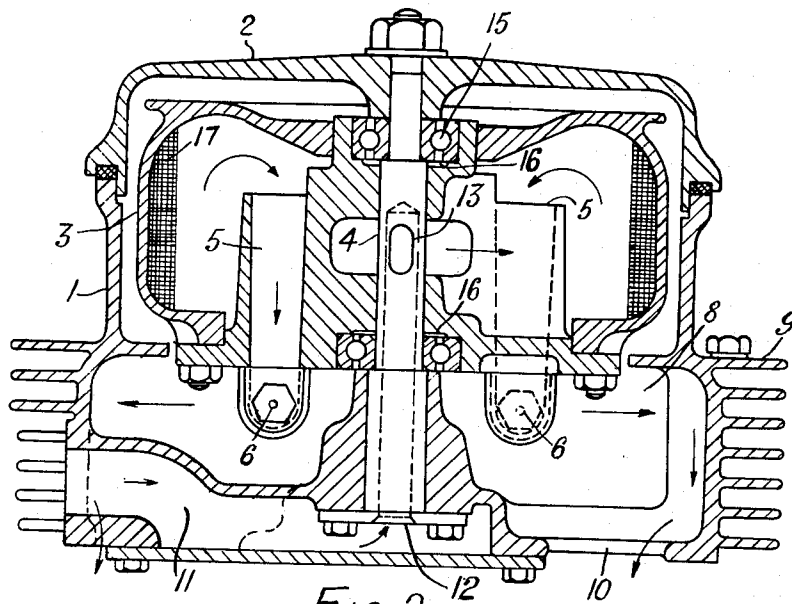


FIG. 2.

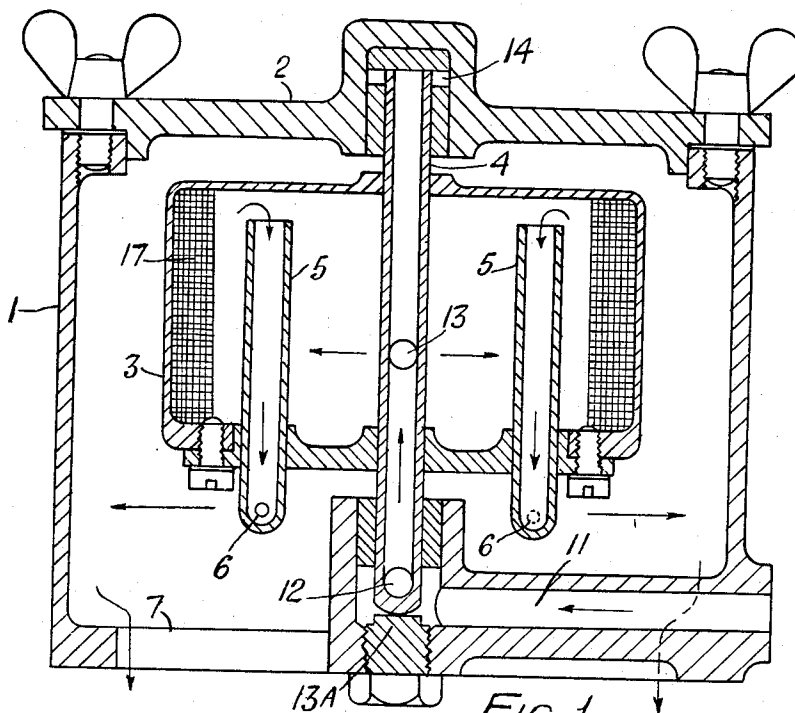


FIG. 1.

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OIL CLEANERS

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6 Claims. (Cl. 233—23)

This invention relates to improvements in centrifugal oil cleaners and is a development of that described in the specification of our prior application Serial No. 181,178, dated August 24, 1950, now Patent No. 2,650,022, granted August 25, 1953, incorporating a drum surrounded by a casing and caused to rotate by the reaction of jets from nozzles.

In an oil cleaner according to the present invention each nozzle is fed from a downcomer pipe which presents an oil entrance located at an altitude inside the drum of at least approximately two-thirds of the drum height.

Practical embodiments of the invention are illustrated in the accompanying drawings in which Fig. 1 is a section through a diametral plane of one construction, and Fig. 2 is a section through a diametral plane of another construction.

In the drawings, 1 denotes a casing fitted with a removable cover 2. 3 denotes a drum mounted on a hollow vertical shaft or spindle 4. 5 denotes downcomer pipes projecting into the drum 3 to an altitude of about two-thirds that of the drum, said downcomer pipes terminating in discharge nozzles 6, each of which latter has a tangential component. In the construction illustrated in Fig. 2, the downcomer pipes 5 are integral with the drum 3. In the construction illustrated in Fig. 1, the bottom of the casing is formed with an opening 7 through which centrifuged oil discharged from the nozzles 6 may drain into a conveniently placed tank. In the construction illustrated in Fig. 2, the casing 1 is formed with an upper compartment receiving the drum 3 and with a lower compartment 8 integral with part of the lateral wall of the casing and into which the centrifuged oil is discharged from the nozzles 6, the compartment 8 being formed with external cooling fins 9 and with a bottom opening 10 through which centrifuged oil may drain to a conveniently placed tank. 11 denotes an oil inlet passage providing access to the lower end of the shaft 4 which is formed with an inlet port 12 and with a discharge port 13 providing access to the interior of the drum 3. In the construction illustrated in Fig. 1 the shaft 4 rotates in plain bearings and the weight of the drum and shaft is taken by a footstep bearing 13A at the lower end of the shaft 4, which bearing, being open to the oil entering through the inlet passage 11, is always well lubricated. At the other (upper) end of the shaft 4 there is provided an annular pocket 14 which is fed with oil from the interior of the shaft 4 so that the upper bearing is always supplied with an adequate quantity of lubricant. In the construction illustrated in Fig. 2, the shaft 4 is fixed, and the drum is rotatable about the fixed shaft 4 in ball bearings 15, the stationary elements of which are fastened to the shaft, and the movable elements of which are fastened to the drum. The body of the drum 3 is formed with two annular pockets 16, each adjacent to an associated ball bearing 15, and each adapted to receive oil which has leaked past the shaft 4 so that the ball bearings 15 are always adequately lubricated. 17 denotes foreign matter centrifuged out of the oil and deposited on the inner wall of the drum 3. It will be

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noted that the drum 3 is so constructed that there are no joints in the region of dirt accumulation so that no dirt can leak out through faulty joints.

In practice, oil is fed to the cleaner through the passage 11, enters the hollow shaft 4 through the port 12, passes upwards through the interior of the shaft 4, and enters the drum 3 through the port 13. The bulk of the circulating oil travels by a short route from the port 13 to the entrances of the downcomer pipes 5. During its travel the oil is subjected to a primary cleaning operation by which the larger dirt particles are separated by centrifugal action at approximately the radius of the downcomer pipes 5. At the same time there is a slow interchange of oil between the main oil stream and the semi-stagnant oil in the maximum radius zone of the drum 3. The oil in the outer zones moves at a low velocity relatively to the drum and is subjected for a prolonged period to the high centrifugal separating force therein. The consequent secondary cleaning operation causes even extremely small dirt particles to be extracted.

Since the entrances to the downcomer pipes 5 are at an altitude of at least about two-thirds of the drum height, the length of the oil route through the drum 3 is as long as is practicable; at the same time a trapping space is provided at the bottom of the drum 3 for sludge and water which may have become dislodged from the vertical wall of the drum 3 during a period of disuse of the cleaner.

While the cleaner is in use, the pockets 14 and 16 are filled with oil so that the bearings are adequately lubricated, and adequate pressure sealing of the drum is ensured.

The oil contained in the pockets 14 and 16 provides sufficient lubrication for the bearings during the period after the oil supply is cut off when the drum is spinning freely under its own momentum before coming to rest.

In the construction illustrated in Fig. 2, the cooling fins 9 ensure that the oil is cooled before returning to the lubricating circuit.

The cleaner may be connected to the pressure lubricating oil circuit of an internal combustion engine the oil pump capacity of which has been increased by the amount necessary to operate the particular size of centrifugal cleaner fitted, it being understood that, as the pressure head of the oil is entirely expended in the cleaner, the oil is returned under gravity to the oil reservoir which may be the engine sump.

If the cleaner is connected to the scavenge oil circuit in a dry sump type internal combustion engine and is driven by the scavenge pump oil pressure, variation of the oil supply pressure may be taken care of by using an overload relief valve which prevents excessive build up of pressure inside the drum 3.

What is claimed is:

1. A centrifugal oil cleaner for separating dirt from oil including a casing and a cylindrical drum mounted within the casing for rotation about a vertical axis, said drum having top, bottom and side walls and being adapted to retain the dirt separated from the oil, a hollow vertical spindle extending axially through the top and bottom walls of the drum on which said drum is mounted for rotation, the axis of said spindle being coincident with the axis of rotation of said drum, means for conducting the oil to be cleaned to one end of the hollow spindle, said spindle being provided with at least one lateral port opening into the interior of the drum for conducting oil to be cleaned from the hollow spindle to the interior of the drum, at least one oil discharge nozzle for discharging clean oil from the drum, said nozzle having an inlet communicating with the bottom of the drum and a discharge portion positioned tangentially with respect to the drum, whereby said drum is caused to rotate by the reaction of a jet of clean oil flowing through the nozzle and issuing

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therefrom, and a downcomer pipe communicating with the inlet to the nozzle and extending upwardly in the drum, said downcomer pipe having an entrance opening therein positioned above the bottom of the drum a distance of at least approximately two-thirds of the drum height and at a substantial distance inwardly from the side wall of the drum.

2. A centrifugal oil cleaner as claimed in claim 1 in which the spindle is fixed to and rotatable with the drum.

3. A centrifugal oil cleaner as claimed in claim 2 including bearings mounted in the casing for supporting the respective end portions of the spindle, a pocket being provided in the casing adjacent to and in communication with the bearing remote from the oil inlet end of the spindle.

4. A centrifugal oil cleaner as claimed in claim 1 in which the spindle is fixed, and the drum is rotatable on the spindle.

5. A centrifugal oil cleaner as claimed in claim 1, in

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which the spindle is mounted in fixed position with respect to the casing and the drum is rotatable on the spindle, and bearings for rotatably supporting the drum on the spindle, each bearing including stationary and movable elements, the stationary elements of the bearings being fastened to the spindle and the movable elements of said bearings being fastened to the drum, the drum being formed with pockets adjacent to and in communication with said bearings.

6. A centrifugal oil cleaner as claimed in claim 1 in which the casing integrally includes a compartment below the drum for the reception of oil issuing from the oil discharge nozzle.

References Cited in the file of this patent

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