April 10, 1956 R. L. DEGA ET AL 2,741,333

OIL PURIFICATION

Filed July 12, 1950 3 Sheets-Sheet 1

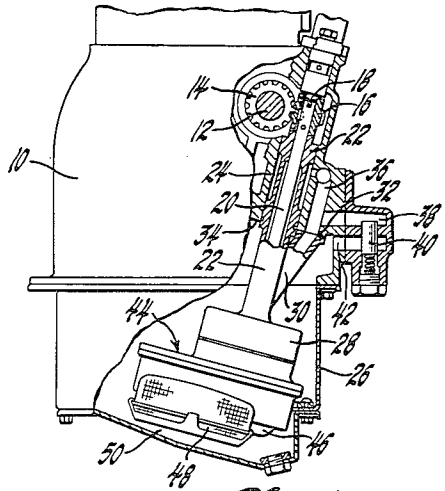


Fig. 1

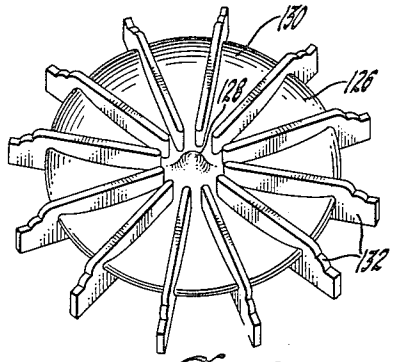


Fig. 2

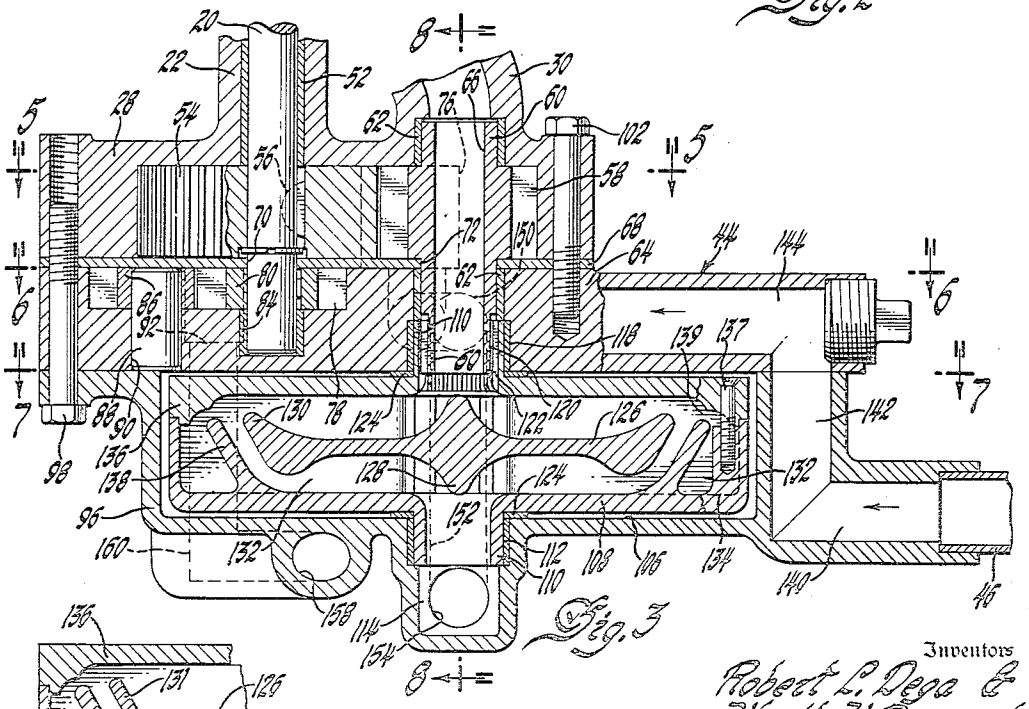


Fig. 3

Fig. 4

Inventors
Robert L. Dega &
Worth H. Percival

By
Williston, Ahrens & Daillie
Attorneys

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OIL PURIFICATION

Filed July 12, 1950 3 Sheets-Sheet 2

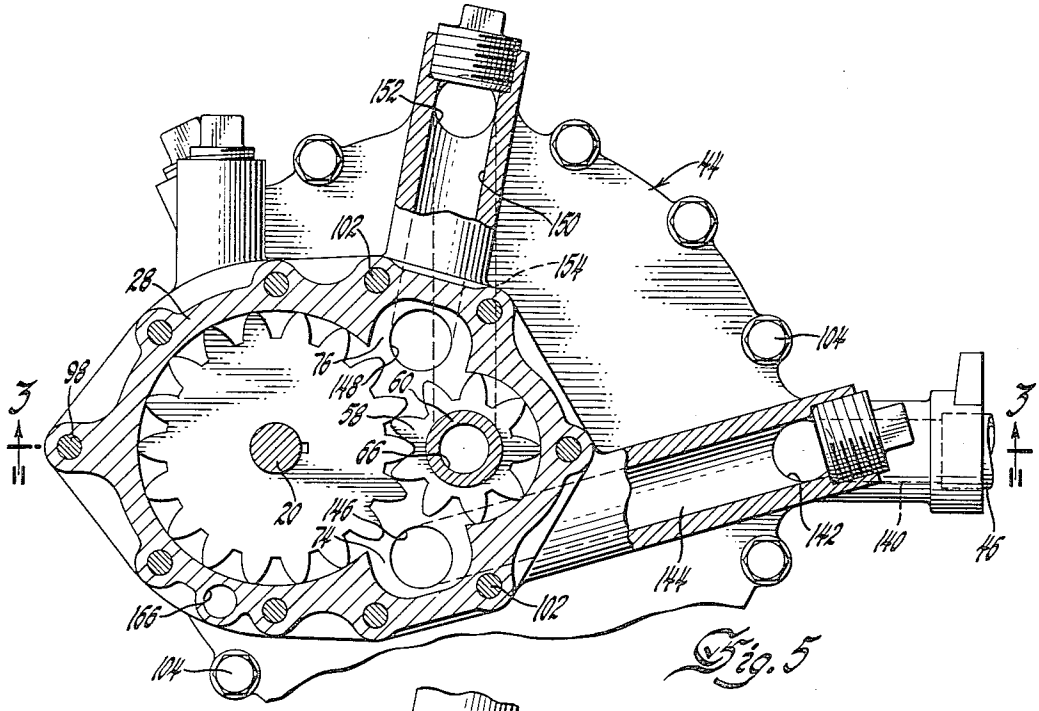


Fig. 5

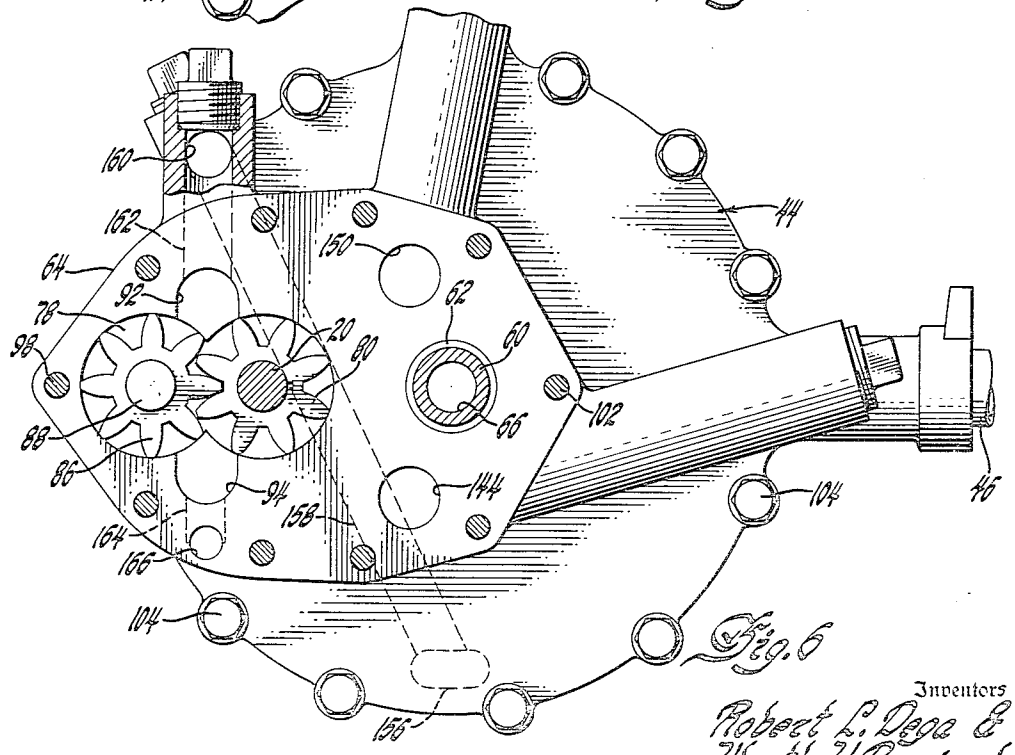


Fig. 6

Inventors
Robert L. Dega &
Heath H. Percival

By
Willits, Hellwig & Baillio
Attorneys

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OIL PURIFICATION

Filed July 12, 1950 3 Sheets-Sheet 3

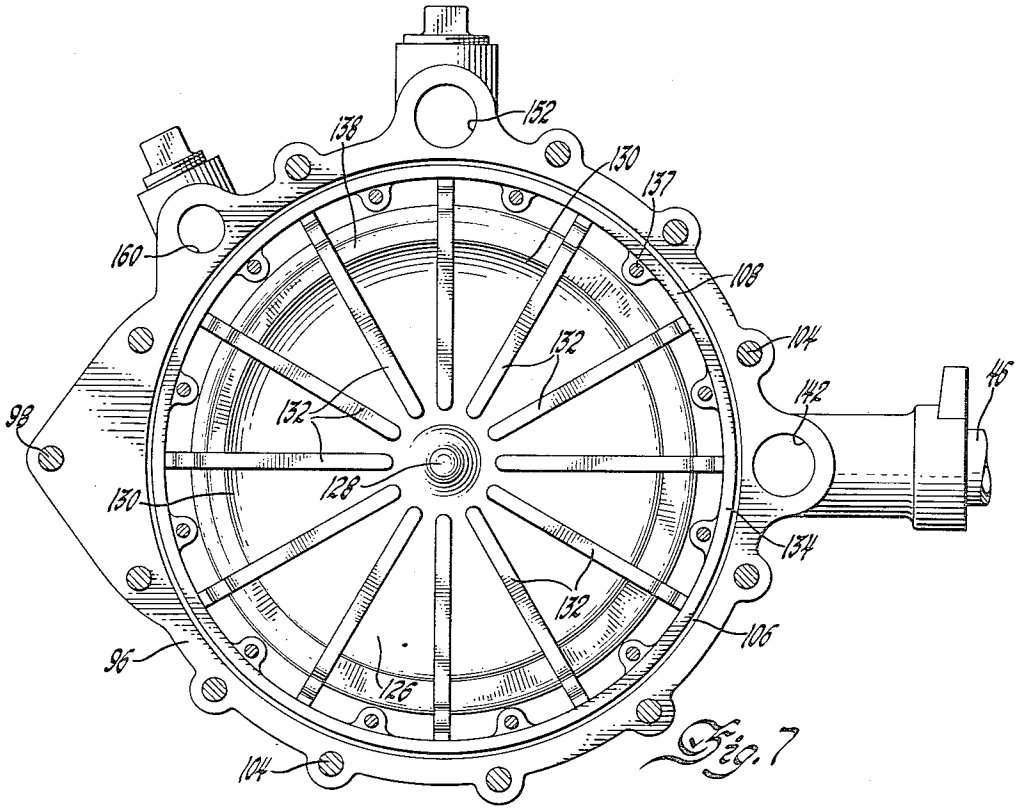


Fig. 7

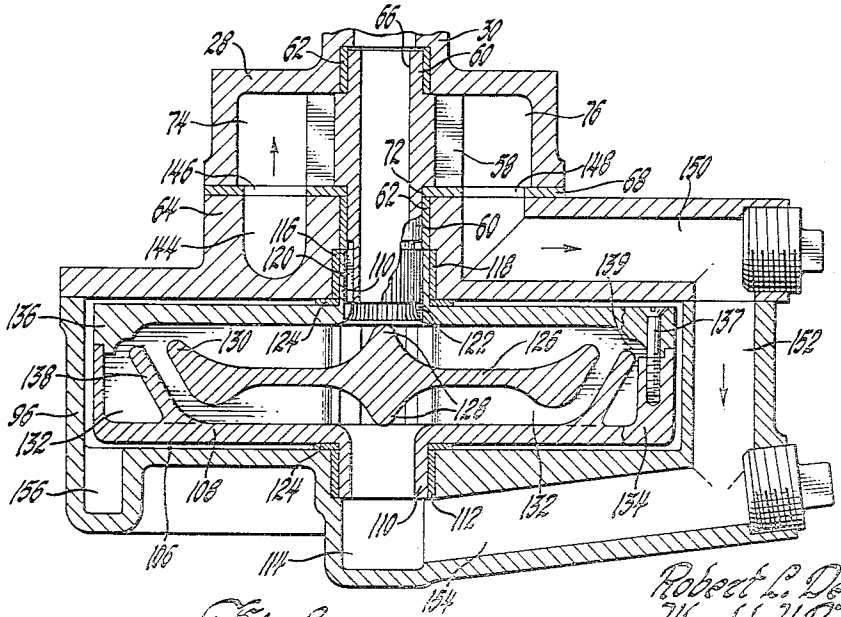


Fig. 8

Inventors
Robert L. Dega &
Worth H. Percival
By
Willis, Helwig & Bailio
Attorneys

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OIL PURIFICATION

Robert L. Dega, Royal Oak, and Worth H. Percival, Detroit, Mich., assignors to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application July 12, 1950, Serial No. 173,453

21 Claims. (Cl. 184—6)

This invention relates to an improved fluid purifier of the centrifuge type and more particularly to a combination oil pump and oil purifying mechanism which may be employed in a lubrication system.

The invention relates to an improved fluid purification and circulation mechanism illustrated by a specific embodiment designed for use in an internal combustion engine oil sump. The fluid purifier has a cylindrical rotor housing with inlet and outlet passages at the axis of rotation. A central plate directs the fluid outwardly toward the periphery of the rotor and vanes rotate the fluid at the speed of the rotor. The fluid passes a dirt chamber in which the fluid is not flowing and allows the dirt to settle to the outer periphery. The centrifuge can be combined with an oil pump to provide a compact unit to circulate and purify the fluid. The pump has a small driven gear which is used to rotate the centrifuge at a higher speed. When the unit is employed below the fluid level, such as in the sump of an internal combustion engine, a scavenger pump is also located in the unit to reduce fluid friction between the centrifuge rotor and housing.

A primary object of the invention is to provide an improved centrifuge having a partition and vanes to guide the fluid flow through the centrifuge and peripheral dirt pockets to collect the impurities in the fluid.

A further object of the invention is to provide an improved combination of an oil pump and oil purifying mechanism of the centrifugal type which may be employed to circulate and purify fluid.

A further object of the invention is to provide a combination pump and centrifugal purifier in which the pump inlet is directly connected to the oil sump in the crankcase of an internal combustion engine and the pump outlet is directly connected to the inlet of the centrifugal purifier.

A further object of the invention is to provide in a combination oil pump and centrifugal purifier which may be used in the lubricating system of an internal combustion engine a scavenging pump to drain the oil from the housing in which the centrifugal purifier operates.

A further object of the invention is to provide a combination oil pump and centrifugal purifier combined in a common housing particularly adapted to operate submerged in fluid such as the oil in the sump of an internal combustion engine.

These and other objects of the invention will be apparent from the following description of a specific embodiment of the invention illustrated in the specification and drawings.

Figure 1 is a partial section of an internal combustion engine with parts broken away to show the pump and centrifuge.

Figure 2 is a perspective view of the centrifuge impeller.

Figure 3 is a sectional view of the pump and centrifuge taken on line 3—3 of Figure 5.

Figure 4 is a fragmentary sectional view of a modified centrifuge impeller plate.

Figure 5 is a section on the line 5—5 in Figure 3 with parts broken away.

Figure 6 is a section on the line 6—6 of Figure 3 with parts broken away.

Figure 7 is a section on the line 7—7 of Figure 3.

Figure 8 is a section on the line 8—8 of Figure 3.

The invention is illustrated in a combination lubricating oil pump and centrifugal oil cleaner. For internal combustion engines, the oil pump may be driven from the camshaft in the usual way and is preferably located in the engine oil sump or crankcase. The oil pump has a large driving gear and a small driven gear which is connected to the oil centrifuge in order to drive it at substantially twice the oil pump speed which is generally engine speed. The oil is forced under pressure through the centrifuge by the pump. In the centrifuge the oil is revolved at high velocity so that the impurities of a higher density are separated from the oil and driven outwardly into the dirt pockets located at the periphery of the centrifuge. The unit also contains a small scavenger pump in order to maintain the centrifuge housing dry and thus prevent fluid friction losses.

The invention is illustrated in connection with an internal combustion engine 10 which has a cam or accessory drive shaft 12. The pump drive gear 14 is integral with or suitably keyed to the camshaft 12 and drives the pump shaft gear 16. The pump shaft gear has a slot 18 or other suitable means at the top to provide a connection with the distributor shaft. At the lower side the pump shaft gear is suitably pinned to the pump drive shaft 20. The pump drive shaft 20 is journaled in the lubricating oil pump tower 22 which is fitted in the bore 24 in the engine. The pump tower 22 extends downwardly at an angle into the crankcase 26 and terminates in the upper portion 28 of the pump housing. The upper portion 28 of the pump housing also has an outlet pipe 30 which extends upwardly and terminates in a flange 32 which engages the lower surface 34 of the engine block surrounding the bore 24. The flange structure 32 which surrounds both the terminal portion of the outlet pipe 30 and the midsection of the pump tower 22 is suitably secured by bolts not shown to the lower portion of the engine 10. Though the pump tower 22, the pipe 30, the upper pump housing 28 and the flange 32 are illustrated as an integral cast assembly, it is pointed out that they may be assembled by welding or other suitable means. The outlet pipe 30 connects with a lubricating oil passage 36 in the engine block. This passage conducts the oil to the engine lubricating system to lubricate all points in the engine. A by-pass passage 38 connects the oil passage 36 to a by-pass valve 40 which returns the excess lubricating oil through the return passage 42 to the engine crankcase 26. As best shown in Figure 1, the combination oil pump and centrifuge 44 is located in the lower portion of the crankcase 26 and has an intake pipe 46 connected to a floating strainer element 48 which is positioned in the lowest portion or oil sump 50 of the crankcase 26.

Referring to Figure 3, the bearing insert 52 is secured in the lower end of the pump tower 22 to provide a lower bearing for the pump drive shaft 20. The main pump

gear 54 is secured in driving relation to the lower end of shaft 20 by the key 56. The main pump gear 54 drives a driven pump gear 58 which is approximately one-half the diameter of and has about half the number of teeth of the main pump gear. The driven pump gear 58 has integral axial trunnions 60 and is rotatably mounted by the trunnions 60 which are journaled in the bearings 62 in both the upper pump housing 28 and the intermediate housing 64. A passage 66 located concentrically with the axis is formed in the gear 58 in order to conduct the fluid from the centrifuge to the engine as described below. The lower side of the pump is closed by a lower housing portion or cover 68 which has an aperture 70 for the pump shaft 20 and an aperture 72 for the lower trunnion 60 of the driven pump gear 58. As best illustrated in Figure 5, the upper pump housing 28 has an intake chamber 74 and an outlet chamber 76 formed therein in substantial alignment with the mating portions of the pump gears.

The intermediate housing 64 has a cavity 78 for a small scavenging pump of the gear type. The drive gear 80 of the scavenging pump is secured or keyed to the lower end of shaft 20 just above the portion of the shaft that is journaled in the end bearing 84 in the intermediate housing section 64. The scavenging pump drive gear 80 drives the driven gear 86 of the scavenger pump. The gear 86 is located in the scavenger pump cavity 78 and is rotatably mounted on the pin 88 which is fixed in the bore 90. As best shown in Figure 6, this scavenger pump has an inlet chamber 92 and an outlet chamber 94 located in the intermediate housing 64.

A centrifuge housing 96 is attached to the lower face of the intermediate housing 64 by bolts 98 at one side extending upwardly through the intermediate housing and threaded into the upper pump housing 28. Since the pump housing is smaller than the centrifuge housing, the other side of the assembly 44 is secured together by one set of bolts 102 which extend through the upper and lower pump housing and are threaded into the intermediate housing. As best shown in Figure 5, another set of bolts 104 extends through the intermediate housing 64 and are threaded into the centrifuge housing 96 in order to secure the unit together.

The centrifuge housing 96 provides a large internal cavity 106 of cylindrical shape. The centrifuge rotor 108 which consists of a lower pan-shaped member 134 and a cover 136 has a cylindrical external form and is positioned in the cavity 106 with suitable clearance all around. The rotor 108 is rotatably mounted by hollow trunnions 110 formed integrally with and at the center of both the upper and lower faces of the rotor. The trunnions are made hollow to provide fluid inlet and outlet passages to the rotor. The lower trunnion 110 is journaled in a bearing 112 which is located in the lower inlet passage portion 114 of the centrifuge housing 96. The upper trunnion 110 is journaled in a bearing 116 (see Fig. 8) which is located in bore 118 in the intermediate housing portion 64. The bore 118 is concentric with the lower bearing 62 for the lower journal 60 and the gear 58. The lower journal 60 has a splined extension 120 which engages the splines 122 on the internal surface of the upper trunnion 110. These splines connect the driven pump gear 58 with the centrifuge rotor 108 to rotate it at the same speed as the driven pump gear. Annular thrust bearings 124 are located around the upper trunnion 110 to maintain the upper surface of the rotor spaced from the intermediate housing 64 and around the lower trunnion 110 to maintain a lower surface of the rotor spaced from the centrifuge housing.

The centrifuge rotor 108 has a round centrally located distributor plate structure or circular flow divider 126 illustrated in cross section in Figure 3. It will be noted that this plate is specially formed to provide streamlined flow through the unit. There is a conical formation 128 formed coaxially with the inlet to distribute the incoming fluid substantially uniformly and radially over the plate and at the outlet to guide the fluid to converge substantially uniformly and enter the outlet passage. At the peripheral edge of the plate, there is an annular bulbous portion 130 which provides an axially elongated peripheral portion to the plate. Thus the oil is held at the periphery for a longer period in order to obtain improved separation of the impurities. The plate structure 126, as best shown in Figure 2, has a plurality of radial vanes 132 integral therewith or secured thereto. The vanes 132 extend above and below the plate and extend radially beyond the bulbous portion 130 of the plate. The plate and rotor assembly shown in Figure 7 illustrates that the vanes 132 fill the entire internal cross section of the rotor 108. The rotor 108 is formed of a lower pan or cup-shaped portion 134 having a disc-shaped base and a cylindical side wall and an upper disc-shaped cover portion 136. The cup portion 134 and the cover portion 136 of the rotor 108 are clamped together by screws 137 and clamp the plate and vane assembly in position in the rotor. The pan-shaped portion has an outwardly sloping annular wall 138 adjacent the cylindrical side wall which divides the centrifuge rotor into a central oil passage portion and a peripheral dirt chamber portion or blind internal dirt pocket. The wall 138 is suitably slotted so that the ends of the vanes 132 divide the annular space into a plurality of separate dirt pockets.

When this centrifuge is employed on an internal combustion engine which is in a service requiring high rates of acceleration and deceleration, a centrifuge rotor 108 having a high inertia effect will create serious drive problems. Thus it may be desirable to reduce the mass of the rotor especially adjacent the periphery. This may be done by employing an aluminum or other light weight metal construction and reducing the section or thickness of the rotor parts such as the cup portion 134, the cover portion 136, the annular wall 138 and the plate assembly 126. The greatest reduction in mass can be obtained by eliminating the bulbous portion 130 of the plate 126. A very fine fluid guide which will guide the fluid radially and axially substantially the same as the bulbous portion 130 may be made of a thin wall plate portion 131 illustrated in Figure 4 having the same contour as the lower and outer surface of the bulbous portion. This plate and rotor structure due to its reduced cross section has a much lower inertia effect. Thus the strength and weight of the centrifuge drive gearing may be reduced and less power will be employed to drive the centrifuge.

Referring to Figure 3, the oil after it is drawn in through the floating screen 48 passes through the intake pipe 46 and enters the horizontal intake passage 140 and the vertical intake passage 142 in the centrifuge housing 96. The intake passage 142 then connects with the horizontal intake passage 144 in the intermediate housing 64. As best shown in Figure 8, the horizontal intake passage 144 connects through an aperture 146 in the lower pump cover 68 with the pump inlet chamber 74. The pump outlet chamber 76 is connected by the aperture 148 in the lower pump cover to the horizontal outlet passage 150 in the intermediate housing 64. The horizontal passage 150 extends outwardly just beyond the centrifuge rotor 108 and at that point is connected by a vertical outlet passage 152 to another horizontal outlet passage 154 located at the lower side of the centrifuge housing 96. The pump outlet passage 154 connects to the centrifuge inlet passage 114 which conducts the fluid into the centrifuge rotor 108. The fluid leaves the centrifuge rotor through the upper hollow trunnion 110 and enters the passage 66 through the driven pump gear 58. The passage 66 connects at the top of gear 58 with the outlet passage 30.

In the lower portion of the oil centrifuge cavity 106, there is a sump 156 (Fig. 8) to collect leakage oil which may collect in the cavity 106 of the housing 96 and create a fluid friction drag between the rotor and housing. The

sump 156 is connected by a horizontal sump passage 158 (Fig. 6) which extends across the bottom of the centrifuge unit 44 to the vertical sump passage 160 (Figs. 6 and 7). The vertical sump passage 160 is then connected to a horizontal sump passage 162 (Fig. 6) which connects the sump with the intake chamber 92 of the scavenger pump. The outlet chamber 94 of the scavenger pump is connected by a horizontal passage 164 to a vertical passage 166 (Figs. 5, 6) from which the oil may be returned to the crankcase by means of a suitable pipe not shown.

The combination oil pump and centrifuge unit 44 is designed to be substituted for the conventional lubricating oil pump now located in the crankcase of internal combustion engines. In the usual installation the oil level in the crankcase sump will cover the centrifuge portion of the unit 44 and the pump portion 28 will extend above the oil level. The oil is drawn in through a floating screen 48 and led through an intake pipe 46 which is pivotally mounted in the usual manner so that the intake screen 48 may float and move with changes in the oil level. The intake pipe 46 connects with passages 140, 142 and 144 which conduct the oil to the lubricating oil pump inlet chamber 74. The pump delivers the oil under pressure to the outlet chamber 76 from which the oil is conducted by the outlet passages 150, 152 and 154 to the centrifuge inlet 114. The centrifuge which generally consists of a hollow cylindrical rotor 108 is rotatably mounted in a centrifuge housing 96 and is driven through the spline connection 120—122 with the trunnion 60 of gear 58. The gear 58 of the gear pump is made with substantially half the number of teeth so that it will rotate at approximately twice the pump speed. This increases the centrifuge speed and provides improved dirt separation in the centrifuge.

When the fluid enters the centrifuge under pump pressure through the passage 114 it is directed by the conical member 128 on the inlet side of the plate 126 to uniformly flow radially outwardly in the space between the plate 126 and the pan portion 134 of the centrifuge. When the fluid moves radially outward between the guide vanes 132 in the centrifuge rotor, it has the same rotational velocity as that portion of the centrifuge rotor. The large increase in the rotational velocity of the fluid requires considerable power input. The plate 126 has an elongated or bulbous end 130 so that the fluid will flow through a long path in the peripheral dirt separation region of the centrifuge. The peripheral wall 138 of the rotor has a conical surface concentric with the rotor axis. This wall 138 preferably should make at least a minimum angle of 30° with the axis of the centrifuge rotor. Thus by the time the fluid approaches the end of the portion 130 and the end of wall 138, the dirt has been moved toward the peripheral surface and is close to wall 138 so that it will easily move through the inlet or small entrance passage 139 to the dirt chambers or pockets. The entrance passage is small to prevent turbulence and fluid flow during operation between the main chamber and the dirt chamber of the centrifuge in excess of that necessary due to the displacement of fluid by the accumulated dirt. The dirt chamber formed between the pan portion 134 and the annular wall 138 is divided into a plurality of chambers by the vanes 132 to rotate the fluid in the dirt chamber with the rotor and to prevent turbulent flow in the dirt chamber. Due to the fact that the vanes extend into the dirt chamber, the fluid in the passage within the wall 138 and fluid in the dirt chamber have the same angular velocity. Thus it will be easier for the dirt to move radially outwardly and into the dirt chamber and to prevent turbulence occuring between the fluid in the two sections of the centrifuge which would remove dirt from the dirt chamber.

The fluid then moves radially inwardly and is directed by the upper conical member 128 in substantial streamline flow into the outlet passage in the hollow trunnion 110. It will be noted that the vanes 132 are also located on the outlet side of plate 126 where they recover a large portion of the power input. The vanes act as turbine blades on the outlet side and reduce the velocity of the fluid and thus absorb energy from the fluid that was put in the fluid by vanes 132 on the inlet side. Since the hollow trunnion 110 is coaxially arranged with the trunnion 60 of the gear 58, the fluid continues to flow through the passage 66 in the gear 58 and out through the outlet passage 30 where it is connected to the engine lubricating oil passage 36.

In order to minimize the fluid friction that would occur if the centrifuge rotor 108 would rotate with its outer surfaces in contact with the fluid, a centrifuge housing 96 is provided around the rotor 108 and is maintained dry by a scavenger pump. The centrifuge housing 96 has a sump 156 (Figs. 6 and 8) located in the bottom of the housing at the lowest side in the position in which the unit is located in the engine as shown in Figure 1. The sump 156 is connected by suitable passages 158, 160 and 162 to the scavenging pump inlet chamber 92. The scavenging pump which consists of the gears 30 and 36 pumps the fluid out through the outlet chamber 94 and passages 164 and 166 to the crankcase. Since the chamber 106 is dry, there is no fluid frictional drag between rotor 108 and the fluid or housing 96.

The above embodiment is illustrative of the invention. It will be apparent to those skilled in the art that numerout modifications may be made within the scope of the invention as defined in the appended claims.

What is claimed is:

1. In a pump and centrifuge housing, a main pump chamber having an inlet port and an outlet port positioned in said housing, a gear pump in said pump chamber having a meshing drive gear and a driven gear, a centrifuge chamber in said housing, a centrifuge rotor rotatably mounted in said centrifuge chamber and driven by said driven gear, a passage connecting said pump outlet port to said centrifuge, a scavenger pump chamber having an inlet port and outlet port located in said housing between said main pump and centrifuge, a scavenger pump in said scavenger pump chamber, means to drive said main pump drive gear and said scavenger pump, a sump in the centrifuge chamber portion of said housing, and a passage connecting said sump and said scavenging pump inlet port.

2. A centrifuge rotor comprising a base portion, said base portion having a bottom and a peripheral side wall, a cover portion secured on top of said peripheral wall, means on said rotor to support the latter for rotation about the rotor axis, inlet and outlet apertures, one of said apertures being in said bottom wall and the other in said cover member, a distributor plate in said rotor arranged substantially parallel to said cover portion and having transverse vanes extending on both sides and beyond the edge of said plate, said vanes contacting said bottom, said cover and said peripheral wall to position said distributor plate in said rotor.

3. A centrifuge rotor comprising a base portion, said base portion having round disc-shaped bottom and a cylindrical side wall, a cover portion having a round disc shape and being secured on top of said cylindrical wall, means fixed to said rotor to support the latter about the axis of said cylindrical wall, inlet and outlet apertures, one of said apertures being in said bottom disc and the other being in said cover disc, a distributor plate in said rotor arranged substantially normal to said axis and having transverse radial vanes extending on both sides and beyond the edge of said plate, and said vanes being shaped to fit the inside of said rotor and continuously contacting said bottom disc, said cover disc and said cylindrical wall to position said distributor plate in said rotor.

4. In an engine lubricating system, a housing, a lubricating pump in said housing, a centrifuge rotor having a central cavity, means to support said rotor for rotation

about an axis in said housing, means to rotatably drive said rotor, said rotor having centrally located inlet and outlet apertures connected to said central cavity, distributor plate means located in said rotor cavity to direct flow from said inlet through said cavity to said outlet, said rotor having internal blind dirt pockets located radially beyond said cavity and connected to said rotor cavity by a small entrance passage, vanes extending from adjacent the center of the rotor to the periphery to rotate the fluid in said cavity, and said distributor plate having a peripheral portion extending axially along said rotor and terminating adjacent said small entrance.

5. A centrifuge comprising a rotor having a hollow interior, means attached to said rotor rotatably to drive and to support said rotor, said rotor having inlet and outlet apertures, a distributor plate located in said rotor, a peripheral wall extending into said interior in said rotor and cooperating with the latter to form an internal annular chamber, a small entrance for said internal chamber, vanes extending from adjacent the center of the rotor to the periphery to divide the rotor into a plurality of passages and to divide said annular chamber into a plurality of dirt pockets to form an annular series of dirt pockets, and said distributor plate having a peripheral portion extending axially along and spaced from said peripheral wall and terminating adjacent said small entrance.

6. A centrifuge rotor comprising a substantially cylinrical shape having an interior cavity, means connected to said rotor to rotatably drive said rotor, said rotor having centrally located inlet and outlet apertures connected to said cavity, a distributor plate centrally located in said rotor cavity to guide fluid radially outwardly from said inlet and radially inward to said outlet, a peripheral wall in said rotor cavity forming with a rotor wall a blind chamber radially beyond said distributor plate, vanes extending from adjacent the center of the rotor cavity to the periphery and having the same width as said rotor cavity to divide the rotor into a plurality of passages and to divide the chamber into a plurality of blind dirt pockets, said peripheral wall extending from a rotor side wall and terminating closely adjacent another rotor side wall to provide a small entrance to said blind dirt pockets, and said distributor plate having a peripheral portion extending axially along said peripheral wall and terminating adjacent said small entrance.

7. In an engine lubricating system, a gear type lubricating oil pump having a housing, a drive gear and a driven gear, a centrifuge housing supported with said oil pump housing, a centrifuge rotor in said housing, drive means interconnecting said driven gear and said rotor, said rotor having centrally located inlet and outlet apertures, means to separate the impurities from the oil in said rotor, said pump having an inlet, said pump having an outlet, a connecting passage between the pump outlet and said centrifuge inlet, said centrifuge outlet being connected to the engine lubricating oil system, and scavenging means connected to said centrifuge housing to keep it dry.

8. In an engine lubricating system, a gear type lubricating oil pump having a housing, a drive gear and a driven gear, a coaxial passage through said driven gear, a centrifuge housing supported with said oil pump housing, a centrifuge rotor in said housing, drive means interconnecting said driven gear and said rotor, said rotor having centrally located inlet and outlet apertures, means to separate the impurities from the oil in said rotor, said pump having an inlet, said pump having an outlet, a connecting passage between the pump outlet and said centrifuge inlet, said centrifuge outlet being connected to said coaxial passage in said driven gear, and said axial passage being connected to the engine lubricating oil system.

9. In an engine lubricating system, a gear type lubricating oil pump having a housing, a drive gear and a driven gear, a centrifuge housing supported with said oil pump housing, a centrifuge rotor in said housing, means to drive said rotor, said rotor having inlet and outlet apertures, a distributor plate centrally located in said rotor, a peripheral wall in said rotor forming an internal dirt pocket, said peripheral wall terminating closely adjacent the rotor wall to provide a small entrance to said dirt pocket, said distributor plate having a peripheral portion extending axially along said peripheral wall and terminating adjacent said small entrance, said pump having an inlet, said pump having an outlet, and a connecting passage between the pump outlet and said centrifuge inlet.

10. In a lubricating system, a gear type lubricating oil pump having a housing, a drive gear and a driven gear, a centrifuge housing supported with said oil pump housing, a centrifuge rotor in said housing, drive means interconnecting said driven gear and said rotor, said rotor having inlet and outlet apertures, a distributor plate in said rotor, a peripheral wall in said rotor forming an internal dirt pocket, said peripheral wall terminating closely adjacent the rotor wall to provide a small entrance to said dirt pocket, said distributor plate having a peripheral portion extending axially along said peripheral wall and terminating adjacent said small entrance, said pump having an inlet, said pump having an outlet, a connecting passage between the pump outlet and said centrifuge inlet, and said centrifuge outlet being connected to the lubricating oil system.

11. In a lubricating system, a gear type lubricating oil pump having a housing, a drive gear and a driven gear, an axial passage through said driven gear, a centrifuge housing supported with said oil pump housing, a centrifuge rotor in said housing, drive means interconnecting said driven gear and said rotor, said rotor having inlet and outlet apertures, a distributor plate in said rotor, a peripheral wall in said rotor forming an internal dirt pocket, said peripheral wall terminating closely adjacent the rotor wall to provide a small entrance to said dirt pocket, said distributor plate having a peripheral portion extending axially along said peripheral wall and terminating adjacent said small entrance, said pump having an inlet, said pump having an outlet, a connecting passage between the pump outlet and said centrifuge inlet, said centrifuge outlet being connected to said axial passage in said driven gear, and said axial passage being connected to the lubricating oil system.

12. In a lubricating system, a gear type lubricating oil pump having a housing, a drive gear and a driven gear, said driven gear having substantially half the number of teeth of said drive gear, an axial passage through said driven gear, a centrifuge housing supported with said oil pump housing, a centrifuge rotor having an internal cavity in said housing, drive means interconnecting said driven gear and said rotor, said rotor having inlet and outlet apertures, a distributor plate located in said rotor, a wall in said rotor cavity forming a closed internal dirt pocket, said wall terminating closely adjacent the internal rotor wall to provide a small entrance to said dirt pocket, said distributor plate having a peripheral portion extending axially along said peripheral wall and terminating adjacent said small entrance, said pump having an inlet, said pump having an outlet, a connecting passage between the pump outlet and said centrifuge inlet, said centrifuge outlet being connected to said axial passage in said driven gear, said axial passage being connected to the lubricating oil system, and scavenging means connected to said centrifuge housing to keep it dry.

13. In a lubricating system, a gear type lubricating oil pump having a housing, a drive gear and a driven gear, said driven gear having substantially half the number of teeth of said drive gear, an axial passage through said driven gear, a centrifuge housing supported with said oil pump housing, a centrifuge rotor in said housing, drive means interconnecting said driven gear and said rotor,

said rotor having centrally located inlet and outlet apertures, a distributor plate located in said rotor, a plurality of vanes extending from adjacent the center to the periphery to divide the rotor into a plurality of passages and dirt chamber into a plurality of pockets, a peripheral wall in said rotor forming an internal dirt chamber, said peripheral wall terminating closely adjacent the rotor wall to provide a small entrance to said dirt pockets, said distributor plate having a peripheral portion extending axially along said peripheral wall and terminating adjacent said small entrance, said pump having an inlet, said pump having an outlet, a connecting passage between the pump outlet and said centrifuge inlet, said centrifuge outlet being connected to said axial passage in said driven gear, said axial passage being connected to the lubricating oil system, a scavenging pump, said centrifuge housing having a sump, and said scavenging pump connected to said sump to keep it dry.

14. In a centrifuge, a rotor having a central cavity mounted for rotation about an axis, means connected to said rotor to rotate said rotor, said rotor having an inlet passage and an outlet passage connected to said cavity, a closed chamber in said rotor located radially beyond said central cavity, a small passage in said rotor connecting said cavity at the portion of said cavity remote from said axis and extending outwardly from said axis into said closed chamber and at least one radial vane dividing said closed chamber.

15. In a centrifuge, a rotor having a central cavity and mounted for rotation about an axis, means connected to said rotor to rotate said rotor, said rotor having an inlet passage and an outlet passage connected to said cavity, a plurality of closed chambers in said rotor defined by vanes and located radially beyond said central cavity, and a plurality of small passages in said rotor also defined by said vanes and connecting said cavity at the portion of said cavity most remote from said axis and extending outwardly from said axis into communication with said closed chambers.

16. In a centrifuge, a rotor having a central cavity mounted for rotation about an axis, means connected to said rotor to rotate said rotor, said rotor having an inlet passage and an outlet passage connected to said cavity, means within said cavity to direct flow from said inlet passage radially outward to the portion of said cavity remote from said axis and radially inward to said outlet passage, a plurality of closed chambers in said rotor located radially beyond said central cavity, and a plurality of small passages in said rotor connecting said cavity at said portion of said cavity remote from said axis and extending outwardly away from said axis into said closed chambers.

17. In a centrifuge, a rotor having a central cavity mounted for rotation about an axis, means connected to said rotor to rotate said rotor, said rotor having an inlet passage and an outlet passage connected to said cavity, means to direct the fluid from said inlet to a portion of said cavity remote from said axis and to rotate the fluid substantially with said rotor and to direct the fluid from said portion of the cavity to said outlet, a plurality of blind chambers in said rotor located radially beyond said central cavity, and a plurality of small passages in said rotor connecting said cavity at said portion of said cavity remote from said axis and extending outwardly from said axis into said blind chambers.

18. In a centrifuge, a rotor having a central cavity mounted for rotation about an axis, means connected to said rotor to rotate said rotor, inlet and outlet ports centrally located on opposed sides of said rotor connected to said cavity, an annular wall adjacent the periphery of said cavity extending transversely and substantially across said cavity and dividing said cavity into a separating cavity and a closed chamber, a circular divider centrally located in said separating cavity and extending outwardly adjacent said annular wall, said divider having on the inlet side a conical projection facing said inlet to guide the fluid entering the inlet radially outwardly and on the outlet side a conical projection facing said outlet to guide the radial inward flow out through the outlet, said divider having a thin intermediate portion providing a wide inlet and outlet passage portion, said divider having a bulbous peripheral portion positioned closely adjacent said annular wall to provide a flow passage of reduced volume, said annular wall having a small entrance passage to said closed chamber between said annular wall and the walls of said cavity radially beyond said annular wall, radial guide vanes in said cavity portion inside of said annular wall to rotate the fluid in said cavity and generally radial partitions in said closed chamber beyond said annular wall to form an annular series of dirt pockets.

19. In a centrifuge, a rotor having a central cylindrical cavity mounted for rotation about an axis, means connected to said rotor to rotate said rotor, said rotor having coaxial inlet and outlet ports located on opposed sides of said rotor and connected to said cavity, an annular wall adjacent the periphery of said cavity extending from one side wall transversely and outwardly to a point closely adjacent the opposite side wall, a circular divider centrally located in said cavity and extending outwardly adjacent said annular wall, said divider having on the inlet side a conical projection located coaxially and facing said inlet to guide the fluid entering the inlet radially outwardly and on the outlet side a conical projection located coaxially to guide the radial inward flow out through the outlet, said divider having a thin intermediate portion providing a wide inlet and outlet passage portion, said divider having a bulbous peripheral portion positioned closely adjacent said annular wall to provide a flow passage of reduced volume, said annular wall terminating closely adjacent said other wall to provide a small annular entrance passage to a blind space between said annular wall and the walls of said cavity radially beyond said annular wall, radial guide vanes in said cavity portion inside of said annular wall to rotate the fluid in said cavity and generally radial partitions in said cavity beyond said annular wall to form an annular series of dirt pockets.

20. A centrifuge comprising a rotor having an interior chamber defined by two opposite and substantially parallel walls, means on said rotor to support the latter for rotation about an axis, said walls extending in planes substantially normal to said axis, means arranged for rotatively driving said rotor, said rotor having inlet and outlet apertures in alignment with said axis, a distributor plate located in said chamber to guide the flow of fluid between said apertures, means adjacent the periphery of said rotor for collecting impurities and having a small entrance passage communicating with said chamber, and said distributor plate having a peripheral portion extending away from said inlet aperture and one of said walls to terminate in a free edge adjacent said small entrance.

21. In an engine lubricating system, a centrifuge housing, a centrifuge rotor enclosed within said housing, drive means connected to said rotor, said rotor having an interior chamber with inlet and outlet apertures, a distributor plate interposed between said apertures, an annular wall extending into said chamber and cooperating with walls of the rotor to define a blind pocket for impurities, said annular wall terminating closely adjacent one rotor wall in which said outlet aperture is located thereby providing an entrance to said blind pocket, said distributor plate having a peripheral portion extending along and coaxially with said annular wall, said portion terminating adjacent the said one rotor wall and entrance, a scavenging pump, said housing having a sump, and said pump being connected to said sump

to draw fluid therefrom for avoiding drag between said rotor and housing.

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