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CENTRIFUGAL OIL CLEANERS

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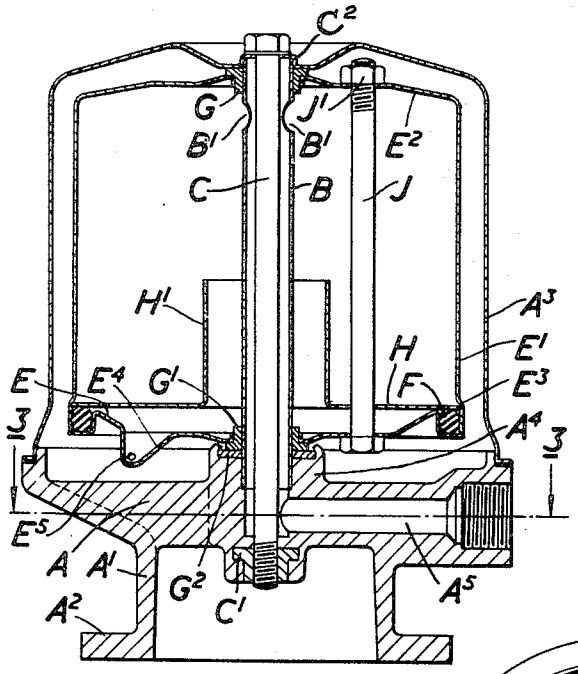


FIG. 1.

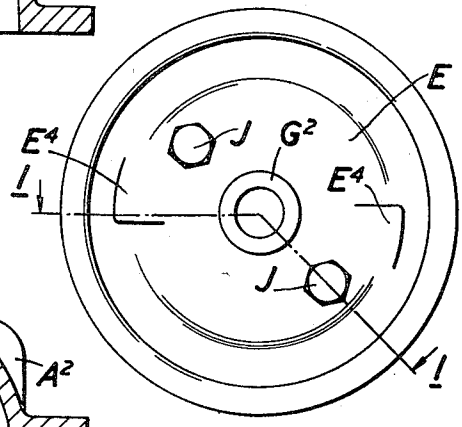


FIG. 2.

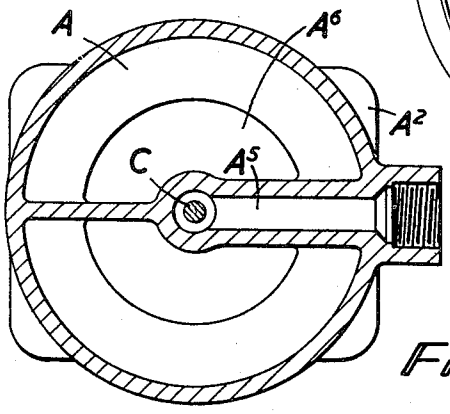


FIG. 3.

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CENTRIFUGAL OIL CLEANERS

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1 Claim. (Cl. 233—24)

This invention relates to centrifugal oil cleaners and is concerned with an improvement in or modification of oil cleaners of the kind comprising a rotary drum the interior of which constitutes a centrifuging chamber surrounded by a casing and including an oil delivery passage by which oil can be delivered to the interior of the drum, and one or more reaction nozzles mounted on the drum and through which oil is ejected from the drum, the direction of the jet or jets of oil from the nozzle or nozzles having a tangential component so that they constitute reaction jets by which the drum is caused to rotate.

In one previously proposed form of centrifugal oil cleaner of the kind referred to the entry and exit openings by which oil respectively enters the interior of the centrifuging chamber and passes from such chamber to the jet or jets are arranged so that the bulk of the circulating oil travels within the chamber by a relatively short route between the entry and exit openings, during which the liquid is subjected to a primary cleaning operation by which the larger solid particles are separated by the centrifugal action, while at the same time permitting a slow interchange of oil between the main oil stream and the comparatively stagnant oil in other zones of the chamber whereby a proportion of the oil is subjected for a relatively prolonged time to a high centrifugal separating force.

It is an object of the present invention to provide an improved arrangement also having the above general characteristics.

A centrifugal oil cleaner of the general kind referred to according to the present invention comprises concentric inner and outer entry and exit passages for the oil respectively entering and leaving the centrifuging chamber, arranged coaxially with the drum and leading respectively from an oil delivery passage and to the nozzle or nozzles, and communicating with the interior of the centrifuging chamber by entry and exit openings respectively lying adjacent to one end of this chamber and lying at a point intermediate in the length of the chamber and displaced by a substantial distance both from the entry opening or openings and from the other end of the chamber.

In a preferred embodiment the oil entry opening is situated near the top of the centrifuging chamber while the oil exit opening is situated at a point lying between one third and one half of the distance between the bottom of the centrifuging chamber and the entry opening.

Generally the nozzle or nozzles will be disposed in or adjacent to the base of the drum and the entry opening or openings will be arranged near the top of the centrifuging chamber while the end of the exit passage opens directly into the centrifuging chamber thus providing a single annular exit opening constituted by the annular gap between the edge of the exit passage and the wall of the entry passage, this opening lying at a point substantially downwardly displaced from the entry

opening or openings but appreciably above the lower end of the chamber.

One construction of a centrifugal oil cleaner according to the invention is illustrated by way of example in the accompanying drawings in which

Figure 1 is a sectional elevation the section being taken partly in each of two planes as indicated by the line I—I in Figure 2,

Figure 2 is an underneath view of the drum embodied in the cleaner shown in Figure 1 and

Figure 3 is a cross-section on the line 3—3 of Figure 1.

In the construction illustrated in the accompanying drawings the centrifugal oil cleaner comprises a stationary casing consisting of a base member A of generally disc like form from which projects downwardly a tubular foot A^1 provided with a circumferential flange A^2 by which the foot can be secured to a facing surrounding an opening leading to the oil sump of an engine or other apparatus with which the oil cleaner is to be used, and a hollow dome like part A^3 the lower edge of which engages the circumferential portion of the base A in an oil tight manner. Formed on the upper surface of the base A is a hollow boss A^4 the bore of which communicates directly with an oil inlet passage A^5 in the base. Rigidly secured to the boss A^4 and projecting upwardly therefrom is a tubular member B the interior of which thus communicates with the inlet passage A^5, and extending through this tubular member is a bolt C the lower end of which engages a trapped nut C^1 lying in a recess in the base member A while its head bears through a thrust washer C^2 on the upper end of the dome-like part A^3 so as to secure the latter in position with its lower edge in fluid tight engagement with the base A. The interior of the foot A^1 is open to the interior of the casing through an aperture A^6.

Mounted to rotate upon the tubular member B is a rotary drum comprising a disc-like lower wall E the edge of which is formed as a channel to receive a sealing ring F and an upper part comprising a circumferential wall E^1 and an upper wall E^2 formed integral therewith. Mounted in the centre of the upper wall E^2 and in the centre of the lower wall E are bearings G, G^1 rotatable upon the tubular member B the lower bearing G^1 having a flange which rests upon a thrust member G^2 located in the upper end of the boss A^4. The lower edge portion of the circumferential wall E^1 is slightly enlarged in diameter to provide a shoulder E^3 and between this shoulder and the sealing ring F is the edge of an annular disc H forming a partition which extends across the interior of the drum and is provided at its centre with an upward tubular projection H^1.

Formed in the tubular member B adjacent to its upper end are ports B^1 constituting oil entry openings while the lower wall E of the drum is provided with pressed out portions E^4 in each of which is formed a nozzle hole E^5 through which oil can be ejected in a tangential direction into the surrounding casing so that the pressed out portions E^4 constitute nozzles.

The upper and lower parts of the drum are held together by a pair of bolts J extending between them as shown so that by removing the nuts J1 from these bolts J the two parts of the drum can be separated from one another for the purpose of enabling solid matter which may have accumulated within the drum to be removed.

As will be apparent from the drawings the member A^3 forming the upper wall and the circumferential wall of the casing can be formed of sheet metal as can the two principle parts E and E^1, E^2 of the drum and the disc and tubular projection H, H^1.

The tubular projection H^1 constitutes the exit passage for oil from the drum and in the construction shown extends upwards to a level of about two fifths of the way

up the drum. It will be seen that this exit passage communicates at its lower end with a chamber formed between the disc H and the lower wall E of the drum, from which chamber the nozzle holes E^5 lead. Thus, during operation the oil delivered through the inlet passage A^5 passes up through the tubular member B and through the entry openings B^1 into the interior of the drum so as to fill such drum after which it flows out through the tubular projection H^1 constituting the exit passage and thence through the nozzle holes E^5 the reaction from the jets of oil from which causes the drum to rotate.

It will moreover be apparent that during operation, the larger proportion of the oil entering the drum will flow comparatively rapidly from the entry openings B^1 into the exit opening at the upper end of the exit passage H^1 and thence through the exit passage H^1 and nozzle holes E^5 so as to be ejected after remaining in the drum for only a comparatively short period, sufficient however for any large particles of foreign matter to be removed therefrom by the centrifugal force. A smaller proportion of the oil will remain in the circumferential parts of the upper portion of the drum for a longer period before entering the upper end of the exit passage H^1 thus enabling smaller particles of foreign matter to be removed therefrom by centrifugal force. A still smaller proportion of the oil which enters the drum will pass into the lower part of the drum around the exit passage H^1 where the oil will be relatively stagnant and will thus remain in the drum for a still longer period before passing into the upper end of the exit passage H^1.

It will be further seen that by varying the length of the upward tubular projection constituting the exit passage H^1 it is readily possible to vary the volume of oil which is relatively stagnant and thus obtain the most satisfactory degree of dirt extraction for given conditions.

In addition by varying the diameter of the exit passage H^1 it is possible to vary the percentage of dirt particles which pass into the exit passage since for the average period of time during which fluid remains in the chamber these particles will migrate under the action of centrifugal force towards the outer circumference of the chamber. For a given area of exit opening therefore at the upper end of the exit passage the arrangement of this opening as near to the axis of the rotor as possible tends to increase the separating efficiency as compared with other arrangements embodying exit openings situated further from the axis of the chamber. It will further be apparent that with the arrangement according to the present invention the exit passage does not reduce separating capacity materially by occupying any substantial space within the centrifugal chamber where a substantial measure of separating centrifugal force is operative.

What I claim as my invention and desire to secure by Letters Patent is:

A centrifugal oil filter comprising a stationary casing and a centrifugal drum rotatably mounted therein, said casing comprising a circular base plate and a dome shaped housing mounted on said base plate, said housing comprising a cylindrical side wall and a circular end wall opposite said base plate, said drum comprising a cylindrical side wall coaxial with and spaced apart from said cylindrical side wall of said housing, a circular end wall adjacent to and spaced apart from said end wall of said housing and a circular end wall adjacent to and spaced apart from said base plate, a reaction nozzle in said end wall of said drum adjacent to said base plate and adapted to discharge oil into the space between said base plate and the end wall of said drum adjacent thereto, an oil inlet tube mounted on said base plate and extending through said end wall of said drum adjacent to said base plate and coaxially with said cylindrical side walls to said end wall of said drum adjacent to said end wall of said housing, an oil discharge opening in said tube adjacent the end thereof remote from said base plate, an oil discharge opening in said base plate communicating with the space between said base plate and the end wall of said drum adjacent thereto, an oil supply conduit extending through said base plate and communicating with said tube, an annular disc mounted in said drum parallel and adjacent to but spaced apart from said end wall of said drum which is adjacent to said base plate, said disc having a circular opening the edge of which is concentric with and spaced apart from said tube, a tubular projection connected at one end to said edge of said opening and extending toward the end of said drum which is remote from said base plate, said tubular projection extending about two fifths of the distance from said annular disc to the opposite end of said drum.

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