July 28, 1953 J. S. ADAMS ET AL 2,646,921

DEVICE FOR SEPARATING OIL FROM WATER

Filed Aug. 31, 1951

Fig. 1

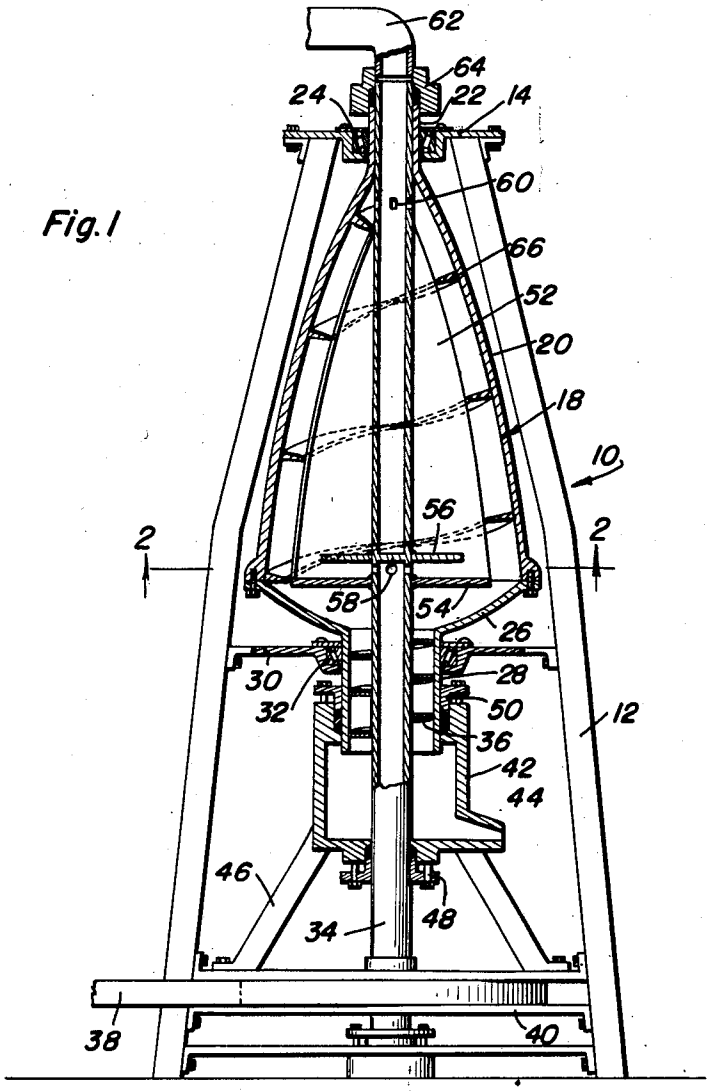
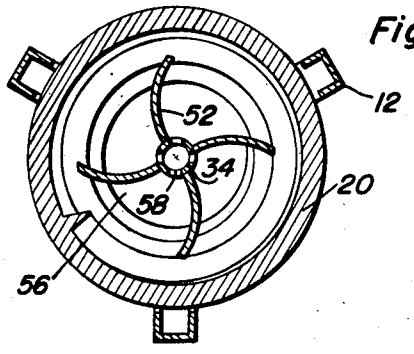


Fig. 2



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DEVICE FOR SEPARATING OIL FROM WATER

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2 Claims. (Cl. 233—1)

1

This invention relates to a device for utilizing centrifugal force for separating materials of different densities and more particularly pertains to improvements over Patent No. 1,831,473, issued November 10, 1931, and a co-pending application of James S. Adams and Paul E. Wilson, Serial No. 149,528, filed March 14, 1950.

In the centrifugal separator disclosed in the above mentioned patent and patent application, the fluid being separated was introduced into the enlarged lower end of a vertically disposed bell-shaped housing from a hollow shaft which extended axially thereof. The fluid was introduced through openings in the shaft below the lower end of the blades which were secured thereto and which imparted rotary motion to the fluid in the housing. The relatively heavier components are ejected from the lower end of the housing, while the lighter components are ejected through the shaft adjacent the upper end of the housing.

It is an important object of this invention to reduce the pressure necessary to introduce the fluid into the housing.

Another object of this invention is to enable the centrifugal separator to be operated at a higher rotative speed to thereby effecuate improved separation of the components of the fluid.

An important feature of this invention resides in the provision of a vertically disposed bell-shaped housing having a hollow shaft disposed axially thereof with impeller blades on the shaft, a pair of plates secured adjacent the lower ends of the blades and fluid inlet openings in the shaft between the blades whereby rotary motion will be imparted to entering fluid causing the same to be centrifugally actuated outwardly.

Another feature of this invention resides in the provision of a vertically disposed bell-shaped housing which is rotatably mounted for movement about its axis, a hollow shaft disposed axially of the housing and having impeller blades mounted thereon, means for introducing fluid into the housing, means for withdrawing the separated components from the housing, and means for rotating the shaft to thereby impart rotary motion to the fluid in the housing and inductively rotate the housing.

A further feature of this invention resides in the provision of a separator, in accordance with the foregoing feature which has a helical member on the shaft engaging the inner wall of the discharge duct on the lower end of the housing to maintain concentricity between the housing and shaft and for withdrawing relatively heavier components of the fluid in the housing.

2

These, together with various ancillary objects and features are obtained by this device, a preferred embodiment of which has been illustrated in the accompanying drawings, wherein:

Figure 1 is a vertical sectional view of the centrifugal separator; and

Figure 2 is a horizontal sectional view, taken on the plane of the section line 2—2 of Figure 1.

Reference is now made more specifically to the accompanying drawings, wherein the centrifugal separator is indicated generally by the numeral 10.

The separator includes a frame formed of upright members 12, the upper ends of which are convergent and connected together by means of a plate 14, while the lower ends of the members are connected by brace bars 16.

A bell-shaped housing 18 having longitudinally curved side walls 20 and the upper end 22 thereof rotatably journalled in the combined radial and thrust bearing 24 supported on the plate 14. A concavo-convex bottom wall 26 is secured to the major end of the housing, which bottom wall terminates in an axial sleeve or duct 28. A brace plate 30 is secured intermediate the ends of the members 12 and support the combined radial and thrust bearing 32 which engages the sleeve 28, whereby the housing is mounted for axial rotation.

The hollow shaft 34 extends axially of the housing and engages the upper end 22 thereof, a helical member 36 being secured to the lower end of the shaft and engaging the inner wall of the sleeve 28. The shaft is rotated by means of a belt 38 and a pulley (not shown) which is disposed between a pair of disks 40, the latter being secured to the members 12.

Disposed on the shaft 34 is a receptacle 42 having a discharge valve 44, the receptacle being non-rotatably supported by legs 46. Suitable packing glands 48 and 50 are provided for rotatably coupling the shaft and sleeve, respectively, to the receptacle, whereby the relatively heavier component of the fluid in the housing will pass through the sleeve 28 into the receptacle.

As is apparent from the drawings, a plurality of blades 52 are secured to the shaft within the housing, the lower ends of the blades being secured to a plate 54. A disk 56 is secured to the shaft 34, above the plate 54, and extends therethrough closing communication between the opposite ends of the shaft. The shaft 34 is provided with fluid inlet openings 58 between the plate 54 and disk 56 whereby fluid entering the shaft from the lower end thereof is introduced into the housing, the blades 52 imparting rotary mo-

tion thereto whereby the fluid is centrifugally actuated outwardly. Discharge openings **60** are formed in the shaft adjacent the upper end of the housing, whereby the lighter components of the fluid in the housing may be withdrawn through the shaft **34** and conduit **62** which is coupled thereto by means of a gland **64**.

A spiral track **66** extends from the upper end of the housing to a point adjacent the plate **54** and is secured to the inner wall of the housing. It will be noted that the inner edges of the track are spaced from the free edges of the blades **52**, the purpose of the spiral track being to act, in conjunction with the downwardly converging wall **20** to force material that is rotating in the housing **20** adjacent the wall thereof downwardly toward the bottom **26**.

In operation, a mixture of materials of different densities is pumped from the conduits **34**, through the inlet openings **58** into the housing where the impeller blades impart rotary motion thereto to cause the fluid to be centrifugally actuated outwardly. This action reduces the pressure which must be applied to the fluid to force it into the housing, in opposition to the back pressure created by the downwardly moving relatively heavy components of the fluid. Additionally, the space plate **54** and disk **56** serve to prevent turbulence and non-mingling of the freshly inducted fluid, and the centrifugally separated components which exist adjacent the zone into which the fluid is introduced, as is fully set forth in the co-pending application No. 149,528.

The housing **18** which is rotatably mounted serves to not only brace the shaft **34**, and prevent vibration of the latter, particularly at high speed. The housing, in the preferred form of the invention is inductively rotated due to the fluid coupling which exists between the shaft and the impeller blade and the housing, but may, alternatively, be directly coupled to the shaft for rotation therewith. The helical member **36**, in addition to functioning to withdraw the heavier components from the housing, also serves to retain the housing and shaft in concentric relation, thereby permitting high speed operation of the separator with consequent improved separation.

The relatively lighter materials assume positions relatively close to the shaft and are withdrawn, in a manner clearly set forth in the Patent 1,831,478, through the discharge opening **60**, adjacent the upper end of the housing.

It will thus be appreciated that the mounting of the housing for rotation about its axis, with the housing maintained in proper concentric relation with the shaft by the helical screw member, permits high speed operation of the separator since vibration and consequent wear on the journal and stuffing boxes is reduced. Additionally, the higher back pressures introduced by high speed operation are overcome, to a major

extent, by the introduction of the fluid being separated between the plate **54** and disk **56**, above the lower end of the impeller blades, since the latter imparts rotational velocity thereto which centrifugally urges the fluid outwardly.

In view of the foregoing description taken in conjunction with the accompanying drawings it is believed that a clear understanding of the device will be quite apparent to those skilled in this art. A more detailed description is accordingly deemed unnecessary.

It is to be understood, however, that even though there is herein shown and described a preferred embodiment of the invention the same is susceptible to certain changes fully comprehended by the spirit of the invention as herein described and the scope of the appended claims.

Having described the invention, what is claimed as new is:

1. In a centrifugal separator, a support, an elongated vertically disposed housing mounted in said support for rotation about its axis, said housing having longitudinally curved downwardly diverging sides and a bottom, a hollow shaft extending axially through said housing, a plurality of impeller blades in said shaft spaced from said bottom, fluid inlet ports in said shaft adjacent the enlarged lower end of said housing, discharge openings in said shaft adjacent the upper end of said housing for educting the lighter components of the fluid being separated, a discharge duct on said bottom concentric of said shaft for discharging the heavier components of said fluid being separated, and means for rotating said shaft, and a helical member secured to said shaft and engaging said duct for retaining said housing concentric on said shaft and for withdrawing the heavier components of said fluid being separated, a plate secured to the lower ends of said blades, a disk secured to said shaft and extending therethrough above said blades, said discharge openings being between said plate and disk whereby the fluid introduced into said housing is rotationally accelerated by said blades and centrifugally urged outwardly.

2. The combination of claim 1 wherein said support includes upper and lower annular plates through which said housing is rotatably journaled, bearings supported on said plates and engaging said housing at its upper and lower ends.

JAMES S. ADAMS.
PAUL E. WILSON.

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