CENTRIFUGE FOR CONTINUOUSLY SEPARATING A LUBRICATING LIQUID FROM METAL SHAVINGS OR THE LIKE

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ABSTRACT OF THE DISCLOSURE

A centrifuge for continuously separating a lubricating liquid from metal shavings or the like. This centrifuge includes first and second collecting means and means for imparting vibrations to these collecting means.

The present invention relates to a centrifuge for continuously separating a lubricating liquid from metal shavings or the like.

It is one object of the present invention to provide for a centrifuge for the aforementioned purpose and in such a manner that the liquid separated from the metal shavings will remain therein while the latter are discharged from the centrifuge at an elevation to permit easy transportation of the discharged materials to a place of further use.

It is an additional object of the present invention to provide for a centrifuge for the aforementioned purpose which has a relatively small height so that the liquid may be conveniently fed thereto and so that the space requirements of the centrifuge are relatively small.

It is an additional object of the present invention to provide for a centrifuge for the aforementioned purpose which is composed of relatively few and simple parts so that the centrifuge may be manufactured at reasonable cost and will stand up trouble-free under extended use.

With these objects in view, the centrifuge according to the present invention for continuously separating a lubricating liquid from metal shavings or the like mainly comprises support means, a motor having a drive shaft, elastic mounting means mounting the motor on the support means with the drive shaft extending in substantially vertical direction and permitting the motor to vibrate transverse to its axis, a substantially bell-shaped centrifugal drum having an upwardly widening conical portion and a substantially cylindrical portion upwardly projecting therefrom and being formed at a junction of the aforementioned portions with openings for discharge of the lubricating liquid therefrom, feeding means extending from the top toward but short of the bottom of the drum for supplying shavings to the interior of the latter, first collecting means surrounding the aforementioned openings for collecting the liquid emanating from the latter and for discharging the same from the centrifuge, second collecting means surrounding the upper edge of the cylindrical portion of the drum radially outwardly spaced therefrom for collecting the shavings discharged by centrifugal action from the drum and for discharging the same from the centrifuge, and means for imparting vibrations to the first and second collecting means.

The feeding means preferably include a funnel ar-
which the centrifuge is mounted so that a conveyor belt may be arranged below the outlet end of the chute for conveniently transporting the shavings separated from the oil to a place of further use.

Likewise the lubricating liquid is discharged at a relatively high elevation so that the same can be conveniently discharged in a container arranged on the side of the centrifuge.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method for operating, together with additional objects and advantages thereof, will best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is an axial cross section through one embodiment of a centrifuge according to the present invention; and

FIG. 2 is an axial cross section through a second embodiment.

Referring now to the drawing, and more specifically to FIG. 1 of the same, it will be seen that the centrifuge according to the present invention comprises a motor 2 having a substantially vertical drive shaft 3, an outlet end of which a substantially bell-shaped centrifugal drum 43 is connected for rotation with the drive shaft. Elastic mounting means are provided for mounting the motor with the drive shaft extending in substantially vertical direction and permitting the motor to vibrate transversely to its axis. The elastic mounting means may include an angle 14 fixed to the lower end of the motor 2, a second angle 16 coaxially arranged with respect thereto and fixed thereto in any convenient manner and carrying flexibly connected thereto a downwardly projecting central stud shaft 6 surrounded by a plurality of rubber rings 7 which are housed in a socket mounted in the base 8 of the centrifuge. The rubber rings 7 can be compressed by means of a clamping flange 9 screwed into the upper end of the socket in which the rubber rings are housed.

The end of the drive shaft 1 projecting upwardly beyond the motor 2 preferably tapers slightly in upward direction and the free end thereof is provided with an outer screw thread. An internally threaded cup 10 located in a central cavity of the bottom wall 32 of the drum 3 is screwed onto the threaded end of the shaft so as to press a tubular extension downwardly from the bottom wall of the drum onto the tapering shaft portion and to hold the drum 3 on the shaft 1 for rotation therewith. The cup 10 has an upper horizontal surface which forms the central portion of the bottom 32 of the drum. The drum bottom 32 curves outwardly and upwardly along a radius of relatively large curvature to blend into the lower end of the conical portion 33 of the drum. The conical portion 33 has a cone angle between 20 and 40 degrees. A substantially cylindrical drum portion 11 projects upwardly from the upper edge of the conical portion 33 and a plurality of openings 12 are arranged at the junction of the two portions to permit discharge of the lubricating liquid to be separated from metal shavings in the drum from the interior of the latter. An annular flange 14 projects radially outwardly from the upper edge of the conical portion 33 and a plurality of openings 12 are provided on the lower edge of the cylindrical portion 11 and a plurality of annular spacer discs 15 of small diameter are placed angularly spaced from each other between the flanges 13 and 14, and screw bolts extending through the spacer discs 15 connect the flanges 13 and 14 fixedly to each other so that the aforementioned openings are constituted between the flanges 13 and 14 held separated from each other by the spacer discs 15.

An annular sheet metal strip 16 formed with a great number of small openings therethrough is arranged in a corresponding groove formed in the inner surface of the drum so that the inner surface of the strip 16 is substantially flush with the inner drum surface covers the gap 12 to prevent escape of shavings by centrifugal action through this gap.

The cylindrical drum portion 11 is provided along its upper edge likewise with an outwardly projecting annular flange 17 which the shavings separated from the oil will be discharged by centrifugal action.

The liquid discharged through the openings or the gap 12 will be collected by first collecting means or casing 20, preferably constituted by a casing wall 22 surrounding the drum outwardly spaced therefrom and provided with a bottom 23 which is slightly inclined toward a discharge conduit 21 communicating with the interior of the casing 20. The casing wall 22 is connected through the bottom 23 and through a plurality of angularly displaced straps 24 to a cylindrical member 25 surrounding the motor 2 and connected thereto for vibration therewith by members 26. A radially inwardly extending flange 19 is fixed to the upper end of the casing wall 22 and the inner edge of the flange 19 is preferably located slightly inwardly of the outer edge of the flange 17 to prevent any shaving passing over the flange 17 to drop into the casing wall 22. Second collecting means surround the upper edge of the cylindrical portion 11 of the drum 3 radial outwardly spaced therefrom for collecting the shavings discharged by centrifugal action over the flange 17. The second collecting means preferably include an annular baffle plate 26 extending upwardly beyond the flange 17 and beyond the upper edge of the casing 20 radially outwardly spaced from the latter and steeply inclined chute means 27 extending downwardly from the baffle plate 26 toward a laterally arranged discharge opening 28. The annular baffle plate 26 is connected thereto radially extending annular flange 29 to the wall 22 of the casing 20 so as to be likewise carried by the elastic mounting of the motor. The baffle plate 26 is preferably reinforced in the region of the elevation of the flange 17 by an exchangeable annular insert 30.

A cover 31 is fixed in any convenient manner to the upper edge of the baffle plate 26. The cover 31 is formed with a central opening through which feeding means in the form of a funnel 32 extend for feeding material into the interior of the drum 3. The funnel 32 is preferably arranged coaxially with the drum and has an upper edge upwardly spaced from the upper edge of the cylindrical drum portion 11 and a lower end adjacent to the bottom 32 of the drum upwardly spaced therefrom. The funnel 32 is connected to the cover 31 by resilient means 33 for instance by three spring elements angularly spaced from each other so that vibrations imparted to the cover 31 will be transmitted in amped manner to the funnel 32.

A grating 34 extends transversely through the funnel 32 in the upper region of the latter to prevent entrance of large parts into the funnel. A central insert 35 having preferably a conical upper end is arranged in the lower part of the funnel 32 connected by a plurality of angularly displaced passages 36 transversely extending the funnel and to provide a substantially uniform distribution of the shavings at the lower funnel end. The amount of shavings which may pass through the funnel 32 may be further limited by placing correspondingly shaped caps on the insert 35. The centrifugal drum 3 may be suitably positioned between the flanges 13 and 14 held separated from each other by the spacer discs 15 and to the desired degree of separating the lubricating liquid from the shavings by exchanging the cylindrical portion 11 of the drum by cylindrical portions of different height. The parts of the centrifuge which are carried by the elastic mounting means 6, 7 and 9 and are surrounded by an outer casing 20 are suitably fixed to the base not quite up to the cover 31 and the upper end portion 37 of the casing wall 22 is surrounded by a downwardly extending annular flange 38 connected to the
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peripheral edge of the cover 31. An insert 40 of elastic material, for instance foam rubber, is located between the baffle plate 26 and the wall 36 of the outer casing which has preferably a square cross section. The elastic insert will dampen the vibrations of the baffle plate 26 and the elements connected thereto and at the same time prevent rotation of the baffle plate 26 and the elements fixed thereto.

To assure sufficient vibration of the baffle plate 26 and the chute means 27 connected thereto as well as the funnel 32, an unbalancing weight 41 may be connected to the flange 14 of the drum 3. The unbalancing weight 41 is preferably exchangeably connected to the flange, for instance by being screwed thereto, and by exchanging the unbalancing weight 41 against weights having a greater or smaller mass it is possible to obtain a vibration which will assure optimum discharge of the shavings. On the other hand, to prevent excessive vibrations of the drum 3 and the elements connected thereto, a lever 42 is fixed to the flange 5 radially projecting therefrom and the lever 42 carries at its outer end an adjustable contact member adapted to cooperate with the switch 43 mounted on the base 8 and connected in the circuit of the motor 2 to switch off the latter when the switch 43 is actuated by the contact member on the arm 42.

A conveyor belt is arranged above the upper end of the funnel 32 for continuously feeding shavings impregnated with lubricating liquid into the latter and another conveyor belt may be located beneath the outlet opening 28 of the chute means to transport the shavings separated from lubricating fluid away from the centrifuge.

The embodiment illustrated in FIG. 2 differs from the above described embodiment in that the cover 31' is not carried by the vibrating baffle plate 26, but in this embodiment the cover 31' is fixedly connected to the peripheral edge of the outer casing wall 36. Furthermore, in this embodiment, the funnel 32' extends through the central opening of the cover 31' fixedly connected thereto for instance by being welded thereto along the upper edge thereof. Furthermore, a feed screw 50 extends through the funnel 32' up to the lower end 51' of the latter. The diameter of the lower funnel 51 is substantially equal to the diameter of the feed screw 50. The drive motor 52 for the feed screw 50 is preferably carried by a bracket 53 fixed to and projecting upwardly from the cover 31'. The feed screw 50 may be inclined to the axis of the funnel 32' in the manner as shown in FIG. 2. Otherwise, the construction of the embodiment shown in FIG. 2 is substantially the same as the embodiment described above in connection with FIG. 1.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of centrifuges differing from the types described above.

While the invention has been illustrated and described as embodied in a centrifuge for continuously separating a lubricating liquid from metal shavings or the like, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art fairly constitute essential characteristics of the generic or specific aspects of this invention and therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalents of the claims included herewith.
through the opening in said cover into said drum and having a lower end adjacent to the bottom of said drum upwardly spaced therefrom, and including resilient means mounting said funnel on said cover so that said funnel may vibrate relative to said cover.

10. A centrifuge as set forth in claim 8, and including a cover extending transversely over the upper edge of said outer casing fixed thereto, said cover being formed with a central opening, wherein said feeding means include a funnel arranged substantially coaxially with said drum and having an upper edge fixed to said cover about said opening and a lower end adjacent to the bottom of said drum upwardly spaced therefrom, and a feed screw carried by said cover and extending longitudinally through said funnel.

11. A centrifuge as set forth in claim 6, and including a cover fixed to and extending over said baffle plate abutting against the upper edge of the latter, said cover being formed with a central opening, and wherein said feeding means include a funnel arranged substantially coaxially with the drum and having an upper edge substantially at the elevation of said cover and a lower end adjacent to the bottom of said drum upwardly spaced therefrom, said funnel extending through said opening in said cover.

12. A centrifuge as set forth in claim 11, wherein said funnel extends with clearance through said opening in said cover, and including resilient mounting means mounting said funnel on said cover so that said funnel may vibrate relative to said cover.

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