Nov. 22, 1932. C. SCHMITZ 1,888,475

LIQUID EXCLUDER FOR THE BEARINGS OF CENTRIFUGAL SEPARATORS

Filed Nov. 25, 1929

Fig. 1

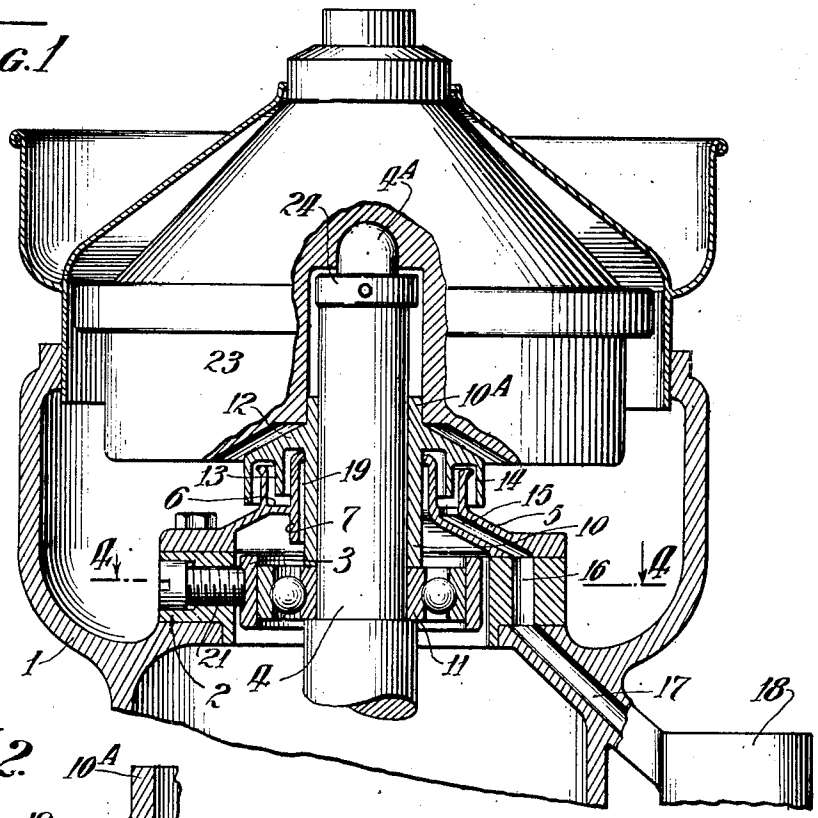


Fig. 2.

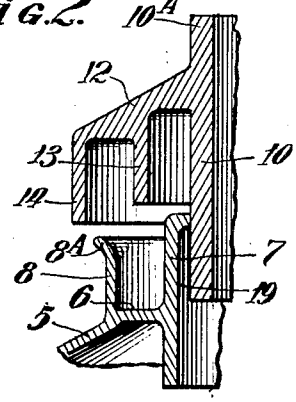


Fig. 3.

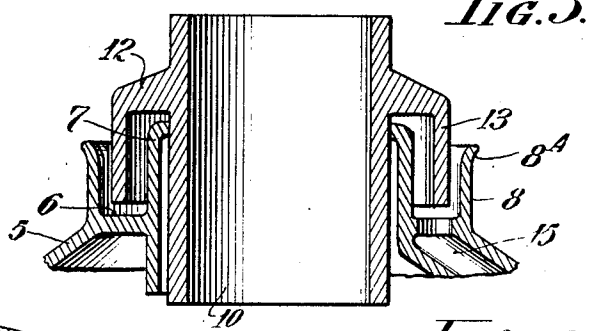
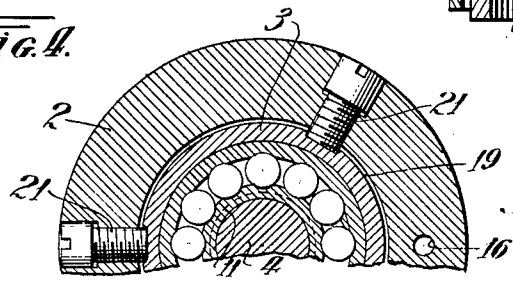


Fig. 4.



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UNITED STATES PATENT OFFICE

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LIQUID EXCLUDER FOR THE BEARINGS OF CENTRIFUGAL SEPARATORS

Application filed November 25, 1929, Serial No. 409,732, and in Germany November 5, 1929.

My invention relates to centrifugal separators having vertical spindles, and in its general objects aims to provide simple and effective means for guiding air past certain parts of the mechanism to cool these parts, and for excluding the indrawn air (together with the dust and moisture contents of the air) from the upper bearings for the spindles and from the gearing below these portions.

In the usual constructions of centrifugal separators, as for example those employed by creameries and by lacquer manufacturers, the rotation of the centrifugal drum causes air currents which draw some of the surrounding liquid material into the casing surrounding the drum. Owing to these air currents, air intermingled with some of the liquid is also drawn into the usual neck bearing and into the gear chamber below this bearing. Likewise, if the separator is used in connection with hot lacquers or varnishes, some of the hot lacquer or varnish vapors (which are present under pressure in the catch chamber of the separator, owing to the evaporating of the finely divided lacquer) are drawn into the so called neck bearing.

In certain other types of centrifugal separators, the drums are arranged to produce a suction which creates a partial vacuum in the mechanism chamber, thereby drawing air from outside the separator into this chamber through the bearings and through various passages and openings. Since the indrawn air commonly also contains dust and moisture, the moisture condenses both in the neck bearing in the mist of oil which is present in the gear chamber, thereby introducing dirt with this moisture into the neck bearing and the gear chamber.

Consequently, the rapidly rotating driving mechanism and particularly the neck bearing suffers materially and is often subject to stoppages, to say nothing of the loss of valuable liquid material such as the lacquer reducers.

Attempts have heretofore been made to obviate these difficulties and losses by providing caps for excluding air and other materials, but these have not sufficed (particularly at a high operating load rate for the separator) for affording a good closure between the drum casing and the mechanism. A particular objection has been the entrance of moisture when the separator is not running, since cleaning water may dribble in, whereby even the daily additions of quite small quantities of water which enter in this manner may cause decided trouble. Moreover, it is well known that no moisture whatever should be permitted in the mechanism of separators which are equipped with ball bearings.

It has also been proposed to interpose an air chamber between the neck bearing and the mechanism chamber, and to connect this interposed chamber with the outer air, but this has likewise proven insufficient since it does not permit the neck bearing to be included in the scope of the air exclusion.

According to my present invention, I provide an annular chamber ahead of the cap or hood over the neck bearing, so that this chamber affords a trough for catching the dripping water when the separator is stopped and will produce a liquid closure, the arrangement being such that the liquid will again be tossed off from the trough when the separator is started, thereby increasing the exclusion of air and the like from the mechanism.

More particularly, I aim to provide an arrangement which will obviate the defects of the previous constructions and which will keep both the neck bearing and the mechanism chamber uninfluenced by room air, by dust, or by mists of the liquids in connection with which the separator is used.

Still further and also more detailed objects of my invention will appear from the following specification and from the accompanying drawing, in which

Fig. 1 is a central and vertical section through portions of a centrifugal separator equipped with my invention.

Fig. 2 is an enlargement of a portion of Fig. 1, with the hood member raised somewhat out of its normal position.

Fig. 3 is a similar enlargement showing a modification in which the outer depending

web on the dust and vapor excluding hood is omitted.

Fig. 4 is a fragmentary horizontal section, taken along the line 4—4 of Fig. 1.

In the drawing, the drum casing 1 supports the usual top bearing collar 2 carrying the outer raceway 3 for a ball bearing in which the vertical spindle 4 is journaled. This collar 2 also supports a top bearing cover 5 which has its upper end formed to afford an upwardly open annular catch groove or trough 6 bordered by an inner riser wall 7 and an outer riser wall 8.

Slidably fitted upon the spindle 4 is a hood member which has a tubular shank 10 extending downwards freely through the bore of the inner trough wall 7, this shank 10 resting at its inner end on the inner raceway 11 of the said ball bearing.

This hood member also includes a hood 12 which is freely spaced from the catch trough, and which includes a tubular web 13 extending downwardly into the said trough, and desirably also a tubular outer web 14 depending outside of the trough. Leading from the bottom of this catch trough 6 I may also provide a drain duct 15 formed in the top bearing cover, this duct being connected by a vertical bore 16 in the top bearing collar 2 to a drain outlet 17 formed in the drum casing and leading to a condensation catch basin 18.

When the separator is standing still, any rinsing water which enters over the top of the outer trough wall 8 will gather in the catch groove 6; and if the above described drain connection 17 to a condensation catch basin 18 is not provided, centrifugal action will cause the accumulated liquid in the trough to rise along the inner face of the outer trough wall 8. The upper portion 8 A of this trough wall is preferably flared upwardly, to aid the rising liquid in flowing over the top of that wall, whereupon the liquid is thrown against the inner face of the outer cover web 14 and drops by gravity into the drum casing 1.

Owing to the just described action, most of the liquid contents of the catch trough 6 will be forced out of this when the separator is running, although a small portion may still remain in the bottom of this trough, assuming that the drain duct 15 and its connections are not provided. Any such residual liquid will decrease the opening between the bottom of the inner depending cover web 13 and the bottom of the said trough, thereby affording an increased barrier both against the entrance of vapors from outside the separator and also against the emission of lubricating oil from the bearing into drum casing.

So also, vapors which enter the catch trough from the interior of the drum chamber are either intercepted by the web 13 which depends into this trough, or condensed in the trough, so that they will not reach the bearings of the separator.

When drain connections (such as the passages 15, 16 and 17 leading to the catch basin 18) are provided, any air or vapor entering the catch trough 6 will find it easier to pass down through the said drain passages than to pursue the tortuous path past the inner depending web 13 of the cover member and the two riser walls of the trough.

In practice, the rotation of the hood 12 together with the webs which depend from this hood will frictionally revolve the air between the inner groove wall 7 and the inner cover web 13, so that centrifugal action will force this air outward against the said web and will cause this air to spread vertically downward into the catch trough, where its least restricted exit is through the above described drain passages. Consequently, with the said of these passages, I secure a continuous flow of air past the bearing, as also through the spaces 19 between the bore of the bearing collar 2 and the parts of the outer raceway support 20 which are between the usual centering screws 21. This flow of air cools both the raceway and the bearing bridge, thereby permitting a greater heating and consequent reduction in velocity of the liquid mixture which is being separated, and hence improving the separation.

The cover member desirably has a portion 10 A of its tubular shank extending upwardly above the hood 12, so that the usual drum assembly (here designated simply as 23) can slidably fit this shank portion while supported by the top 4 A of the spindle 4, as shown in Fig. 1. When this drum assembly is lifted off, the cover member can be slid upwardly on the spindle 4, namely to a greater extent than shown in Fig. 2, thereby affording ready access to the catch groove and the drain passages for cleaning these. However, I desirably provide the spindle 4 near its upper end with a radially projecting stop, such as a stop ring 24 fastened to the spindle, to limit the upward sliding of the hood member on the spindle, thereby preventing the hood member from being slid off the spindle during a detaching of the centrifugal drum assembly.

However, while I have heretofore described my invention in an embodiment including numerous desirable details of construction and arrangement, I do not wish to be limited in these respects, since many changes might be made without departing either from the spirit of my invention or from the appended claims.

For example, my liquid excluder and ventilator will also operate if the outer depending web 14 of the cover member and the portion of the cover 12 radially outward of the inner depending web 13 are omitted, as shown in Fig. 4, although the length of the pre-

viously mentioned tortuous path for the air or vapors will then be somewhat reduced.

I claim as my invention:

1. In a centrifugal separator, an upright spindle, a bearing for the spindle, including a member mounted on the spindle, and a shield located above the bearing and comprising a sleeve mounted on the spindle and seated on the bearing, an annular trough surrounding the sleeve, and a hood member carried by the sleeve and including an annular web that depends into the trough.

2. In a centrifugal separator, an upright spindle, a bearing collar, a bearing for the spindle including a member mounted on the spindle and a second member surrounding the said first member and secured to the collar, an annular trough secured to the collar and surrounding the spindle in spaced relation thereto, a sleeve mounted on the spindle, said sleeve being seated on the bearing member that is mounted on the spindle and extending through the trough to a point above the same, and a hood outstanding from the upper portion of the sleeve above the trough and having an annular web depending into the trough.

3. In a centrifugal separator, an upright spindle, a bearing for the spindle below its upper end, an annular trough surrounding the spindle above the bearing, a hood overlying the trough and slidably mounted on the spindle, and a drum assembly detachably mounted on the upper end of the spindle and operating to hold the hood against upward sliding movement.

4. In a centrifugal separator, an upright spindle, a bearing for the spindle below its upper end, an annular trough surrounding the spindle above the bearing, a hood overlying the trough and including a sleeve slidably mounted on the spindle and seated on the bearing, and a drum assembly detachably mounted on the upper end of the spindle and operating to hold the hood seated on the bearing and against upward sliding movement.

5. In a centrifugal separator, an upright spindle, a collar surrounding the same, coacting bearing rings mounted on the collar and spindle respectively, an annular trough member mounted on the collar and having an opening through which the spindle extends, a sleeve mounted and longitudinally slidable on the spindle and extending through the opening of the trough member, said sleeve being seated on the bearing that is mounted on the spindle, a hood outstanding from the sleeve above the trough member and having an annular web depending into the trough of the trough member, and a drum assembly detachably mounted on the upper end of the spindle and resting on the hood to hold the sleeve seated on the bearing ring and when detached permitting the upward sliding movement of the hood to move its web out of the trough of the trough member.

Signed at Oelde in Westfalen, Germany, November 5, 1929.

CARL SCHMITZ.