April 29, 1941. H. O. LINDGREN 2,240,141

CENTRIFUGE

Filed July 12, 1938

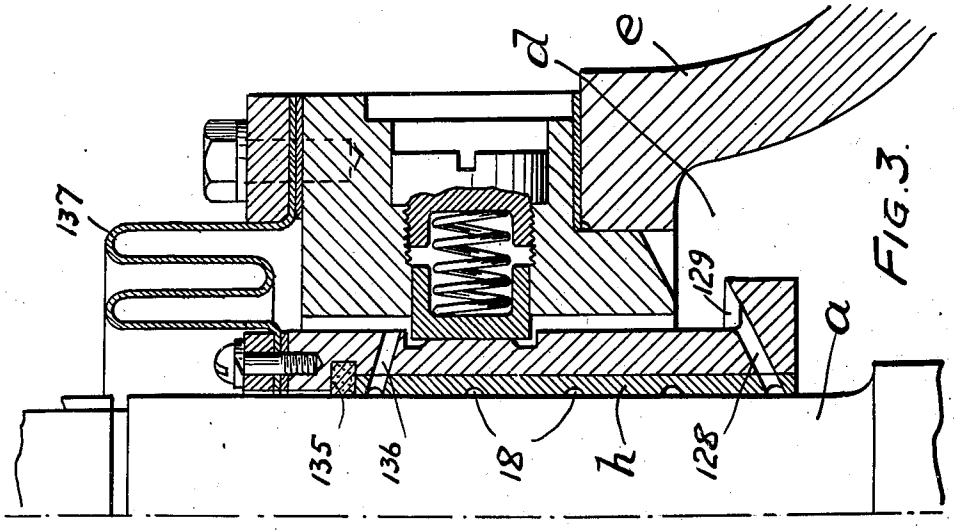

FIG. 3.

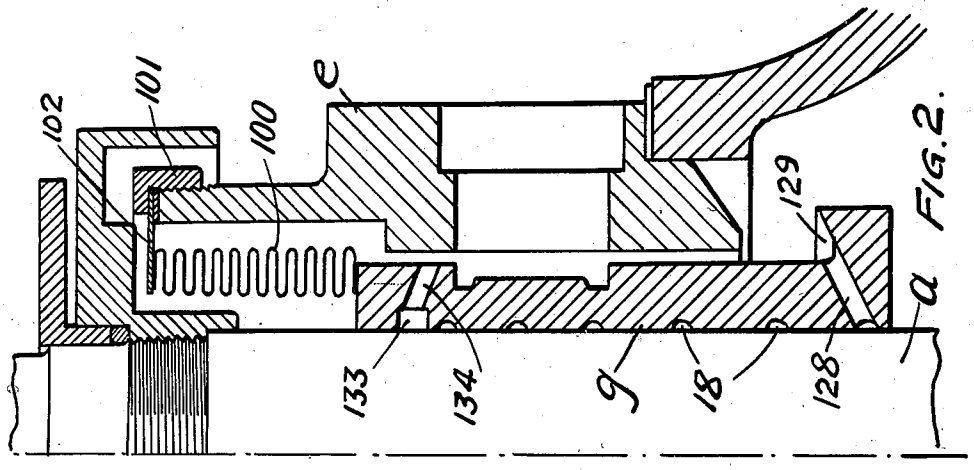

FIG. 2.

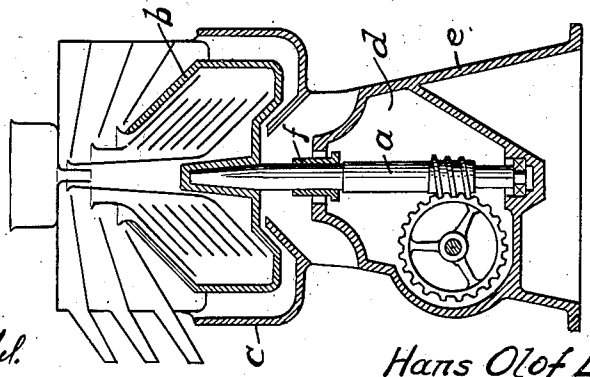

FIG. 1.

WITNESS:

Robt. R. Mitchell.

INVENTOR

Hans Olof Lindgren

BY Bruesch and Harding

ATTORNEYS.

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UNITED STATES PATENT OFFICE

2,240,141

CENTRIFUGE

Hans Olof Lindgren, Appelviken, Sweden, assignor to The De Laval Separator Company, New York, N. Y., a corporation of New Jersey

Application July 12, 1938, Serial No. 218,747
In Sweden January 18, 1938

5 Claims. (Cl. 308—36.1)

Centrifugal separating machines of the ordinary type comprise, in addition to the centrifuge itself and its driving mechanism, a stationary frame carrying the bowl spindle bearings, a lower housing for the driving mechanism, an upper housing which surrounds the lower part of the revolving separator and two or more collecting vessels into which the separated liquids are thrown and collected when they leave the separator bowl. If a volatile liquid or a liquid containing volatile constituents is separated in a separator of this type, a considerable formation of vapor often occurs when the liquid is thrown out into a collecting vessel, which for several reasons is objectionable. Some of the liquid under treatment is lost, and vapors from such liquid enter the bowl casing and thence penetrate into that part of the frame which encloses the driving mechanism and which is under a lower pressure than the bowl casing, the lubricating oil thereby being contaminated and diluted by the escaping fluids.

The first mentioned objection, that is, the loss of liquid, may be avoided by making the frame and the collecting vessels hermetically tight and providing an ordinary packing box around the driving shaft of the separator where it extends through the wall of the frame. The driving shaft is usually horizontal and coupled to the vertical bowl spindle by means of a worm gear having a relatively great ratio of gearing. The spindle is so highly geared to the horizontal shaft that the number of revolutions of the latter is rather low, and it is therefore not very difficult to arrange a reliable packing between it and the enclosing frame.

The arrangement just described, however, does not avoid the other objection, namely, the penetration of fumes of separated liquid or its volatile constituents to the driving mechanism.

In an application filed March 19, 1938 by Andersson and Jung, Serial No. 196,838, are set forth various devices embodying gas-tight packings below the bowl housing and above the chamber for the driving mechanism, which devices prevent any penetration of fluids, gaseous or otherwise, from the former to the latter and at the same time permit the necessary mobility of the spindle in relation to the frame.

The object of the present invention is, generally speaking, the same as that of Andersson and Jung. It comprises, however, improved means for accomplishing such purpose, such means having certain advantages which will be more readily understood from their description and accompanying explanations. Five embodiments of the invention are disclosed.

Fig. 1 is a vertical sectional view of a centrifugal separator including the bowl casing, gear casing and spindle bearing with which my improvements are combined, from which the location of the improvements and the purpose of the invention may be more readily understood.

Figs. 2 and 3, inclusive, are views, in vertical section, illustrating different embodiments of my invention.

The separator bowl *b* is supported on a driving spindle *a*, which has one bearing at its lower extremity and another (upper) bearing *f* below the bowl. The bowl is surrounded by a stationary housing *c*, supported on the machine frame, which is necessarily in open communication with the annular space inside the stationary receiving vessels into which the constituents that are separated in the bowl are separately discharged. My improvements are associated with this upper bearing and are intended and adapted primarily to prevent any fluids, particularly gases and vapors, evolved from or carried along with the separated liquids and entering the bowl housing *c*, from penetrating into that part of the chamber *d*, forming part of the machine frame *e*, that encloses the driving mechanism for the spindle. The improvements are adapted to function as above specified and still allow the necessary elasticity of the bowl spindle relative to the machine frame.

In Fig. 2 a bellows 100 is secured at one end to the top of the spindle bearing *g* and at its other end to a plate 102 which, by means of a nut 101, is clamped to the upper end of the frame *e* (carried by the upper end of the gear housing) in tight sealing engagement therewith. Lubrication of the bearing *g* may be effected with the oil used for the worm gear. This oil, which splashes about in the gear chamber, penetrates the spindle bearing *g* and is carried up between the bearing and the spindle. Specifically, the bearing is provided with a bore 128 just above its enlarged lower end, the latter providing an inclined surface 129, which catches splashing oil. The oil thence flows through the bore 128, whence it is pumped by the thread 18 cut in the inner wall of the bearing metal to near the upper end thereof, where it enters a groove 133 and flows therefrom through holes 134 back to the gear housing. The groove 133 divides the working surface of the bearing into a long lower portion and a short upper portion. This short upper

portion has a relatively very small clearance relative to the spindle and the bearing.

In the embodiment shown in Fig. 3, the arrangement is similar to that shown in Fig. 2 in that a diaphragm or bellows 137 is secured, at one end, to the frame *e* of the machine and at its other end to the top of the bearing *h*, which is lubricated in the same way as the bearing *g* of Fig. 2. It differs therefrom in that the bearing, above the groove 18 and the holes 136 communicating with the gear housing, is provided with an internal annular groove in which is placed a packing 135 of leather or other suitable material that makes a tight joint with the spindle.

In those embodiments of the invention which include a diaphragm or equivalent non-rigid partitioning device, opposite sides of the diaphragm are in open communication respectively with the bowl housing and the driving gear housing. It will be understood, however, that the open communication between one side of the diaphragm and the gear housing is a condition which exists only if no means are provided for preventing such communication. Such means may be a safety chamber, such as disclosed in the hereinbefore mentioned application of Andersson & Jung, which may or may not be sealed against fluid communication with the gear housing. While my invention does not exclude the use of such a safety chamber, it is not herein described, since it forms no part of my invention and since the sealing means embodying my invention does not require the provision of any such safety chamber.

What I claim and desire to protect by Letters Patent is:

1. In a machine including a spindle liable to rotate eccentrically, driving mechanism engaging the lower part of the spindle and a housing therefor, means to prevent entrance of fluid to said housing comprising a bearing fitting the spindle and free to follow its movements, flexible partitioning means surrounding the spindle and whose opposite sides are respectively in and out of fluid communication with said housing and one end of which is in fluid tight relation with the housing and the other end of which is in fluid tight relation with the upper end of said bearing, there being a channel between said spindle and bearing extending from the lower end of the bearing to near its upper end through which lubricating oil may be pumped from the lower part of the housing to the upper part of and thence outside said bearing, the short part of the bearing above the terminus of said channel and to which one end of said flexible partition is secured forming a relatively tight joint between the spindle and the bearing.

2. In a machine having an oscillatable spindle and a bearing therefor, driving mechanism for said spindle and a frame including a housing therefor, means to prevent passage of fluid from the exterior into the housing comprising flexible partitioning means surrounding the spindle and whose opposite sides are respectively in and out of communication with the housing and one end of which is connected with the frame and the other end of which is connected with the bearing, there being a channel between said spindle and bearing through which lubricating oil may be pumped from one end of the bearing to near the other end, the short part of the bearing beyond the terminus of said channel and to which one end of said flexible partition is secured forming a relatively tight joint between the spindle and the bearing.

3. In a machine including a spindle liable to rotate eccentrically, driving mechanism engaging the lower part of the spindle and a housing therefor, means to prevent entrance of fluid to said housing comprising a bearing fitting the spindle and free to follow its movements, flexible partitioning means surrounding the spindle and whose opposite sides are respectively in and out of fluid communication with said housing and one end of which is in fluid tight relation with the frame and the other end of which is in fluid tight relation with the upper end of said bearing, there being a channel between said spindle and bearing extending from the lower end of the bearing to near its upper end through which lubricating oil may be pumped from the lower part of the housing to the upper part of and thence outside said bearing, and a packing ring confined against the spindle above the short part of the bearing above the terminus of said oil channel.

4. In a machine including a spindle liable to rotate eccentrically, driving mechanism engaging the lower part of the spindle and a housing therefor, means to prevent entrance of fluid to said housing comprising a bearing fitting the spindle and free to follow its movements, flexible partitioning means surrounding the spindle and whose opposite sides are respectively in and out of fluid communication with said housing and one end of which is in fluid tight relation with the housing and the other end of which is in fluid tight relation with the upper end of said bearing, there being a channel between said spindle and bearing extending from the lower end of the bearing to near its upper end through which lubricating oil may be pumped from the lower part of the housing to the upper part of and thence outside said bearing, and means, above the terminus of said channel and below the point of attachment of said flexible partitioning means, forming a tight joint between the spindle and the bearing.

5. The construction defined in claim 2, in which a packing ring is carried by the bearing and is confined against the spindle above the short part of the bearing above the terminus of said channel.

HANS OLOF LINDGREN.