

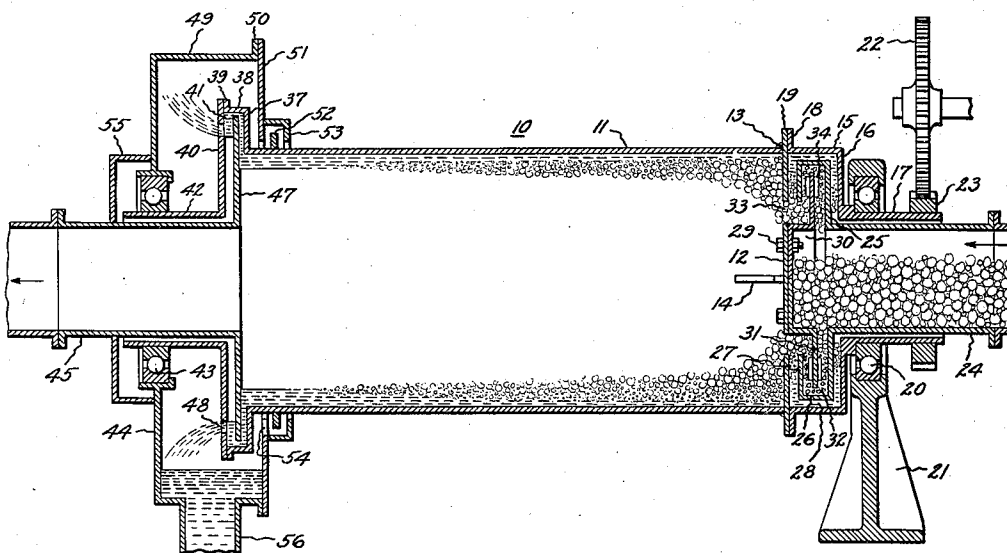
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APPARATUS FOR SEPARATING FLUIDS

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APPARATUS FOR SEPARATING FLUIDS

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5 Claims. (Cl. 233-21)

The present invention relates to apparatus for separating fluids and more particularly to apparatus for separating hydrogen gas from lubricating oils.

Hydrogen gas is frequently used in the cooling of rotating electrical machinery, such as generators. Some of the gas becomes admixed with the lubricating oil circulated through the bearings of the machine. The oil discharged from the bearings is generally in the form of a froth due to the large amount of hydrogen contained therein. Before the lubricating oil can be recirculated, the hydrogen gas must be separated therefrom. Because of the expense and the attendant dangers, it is undesirable to release the gas to atmosphere after it is extracted but to re-introduce it into the cooling system.

It is an object of the present invention to provide an extremely simple and efficient apparatus for separating admixed gases from oils.

For a consideration of what I believe to be novel and my invention, attention is directed to the following description and the claims appended thereto taken in connection with the accompanying drawing.

The single figure of the drawing is a cross-sectional view through the separating apparatus embodying my invention, in which 10 is a horizontally disposed rotatable element within which the separation of the mixture takes place. The rotatable element comprises a central tubular member or drum 11, the right end or inlet thereof being provided with a diametrically extending wall 12 secured to the member 11 as by welds 13 and brackets 14. The closure for the inlet end of the rotatable element includes a cylindrical portion 15, an end wall 16 and an axially extending sleeve portion 17. This end unit is suitably secured by a flange 18 to an outwardly extending portion 19 of the wall 12. This end of the rotatable element is supported in a suitable bearing 20 provided between the sleeve 17 and the stationary support 21. A prime mover (not shown) is arranged for driving the rotatable element through a gear 22 mounted for engagement with a pinion or gear 23 fixed on the end of the sleeve 17. The mixture to be separated is introduced into the rotatable element through the conduit 24 axially centered within the sleeve 17 substantially as indicated. The end of the conduit 24 is provided with an outwardly extending flange portion 25, a cylindrical portion 26 and an inwardly extending rim 27, all spaced slightly from the adjacent portions 16, 15 and 12 respectively of the rotatable element and forming an

annular chamber 28 therebetween. Secured to the wall 12 as by bolts 29 is a member 30 having an offset and outwardly extending disk portion 31 which extends into the annular channel 32 formed by the portions 25, 26 and 27 of the stationary admission conduit 24. The member 30 may be sectored as indicated to facilitate the assembly thereof. The mixture to be separated, flowing through conduit 24, passes into the annular channel 32 and around the peripheral edge of the disk 31. The mixture overflowing the inner edge of the rim 27, fills the annular chamber 28, and due to the speed of rotation of the member 10 the mixture is retained therein, effecting a liquid seal between the interior of the separator and the atmosphere. The wall 12 is provided with a series of openings 33 through which the mixture may pass into the interior of drum 11. The openings 33 are so spaced in the wall 12 inwardly from the wall of the drum 11 for limiting the depth of liquid in the chamber 28 so that no liquid or mixture will escape through the clearance between the conduit 24 and the sleeve 17 during the operation of the separator. The rotating disk 31 will maintain the entire channel 32 filled with the mixture to effect a substantially gas tight seal between the interior of the conduit 24 and the interior of the drum 11. Depending upon the consistency of the mixture, it may be desirable to provide fins 34 on the disk surfaces to assist in carrying mixture into the upper portion of the channel 32. The mixture spilling into the interior of the drum through the openings 33 is caught by the brackets 14 which, acting as vanes, insure the mixture being given a rotational velocity equal to that of the drum. The mixture spreads itself over the inner surface of the drum and, due to the centrifugal force, is compressed thereagainst and the occluded gas expelled from the mixture.

Means are provided for separately withdrawing the liquid and gaseous components of the mixture from the rotatable element. The left or outlet end of the tubular member 11 is provided with an outwardly extending wall portion 37, a cylindrical portion 38 having a flange 39 to which is secured the end wall 40. The portions 38, 39 and the end wall 40 define an annular chamber 41 having a diameter somewhat larger than that of the drum 11. The end wall is provided with a central aperture and an outwardly extending sleeve 42 concentric with the axis of rotation. This end of the rotatable member is suitably supported as by bearing 43 mounted in the stationary housing wall 44. The conduit 45, axially ar-

ranged within the sleeve 42, extends into the rotatable element and is provided with an outwardly extending disk or flange portion 47, the periphery of which extends into the chamber 41. The end wall 40 is provided with a plurality of outlet openings 48 through which the liquid is discharged into the surrounding receiver or housing. The openings are spaced uniformly inwardly with regard to the outer wall of the chamber 41 so that a substantial portion of the chamber is maintained filled with liquid during the rotation of the drum. Since the outer edge of the disk 47 extends into the liquid filled chamber to a depth below the openings 48, a substantially gas tight liquid seal is effected between the interior and exterior of the drum at this end as well as at the inlet end. A suitable vacuum pump (not shown) may be connected to the conduit 45 for removing the gas from the separator drum and returning it to the storage reservoir. By maintaining the pressure within the cylinder less than atmospheric, the vacuum pump materially aids in extracting the hydrogen from the liquid.

The stationary housing surrounding the left end of the rotatable unit comprises, in addition to the wall 44, a second wall 49 which is flanged as at 50 and to which is suitably secured a third wall 51. For precluding leakage of oil between the wall 51 and the drum 11, a slinger 52 is arranged within a surrounding catcher 53 which is drained through the opening 54 into the lower portion of the housing. The collar 55 secured around the conduit 45 and to the housing wall 44 precludes the leakage of liquid past the bearing 43 to atmosphere. The liquid is drained from the housing through conduit 56 which is in communication with the lower portion of the housing.

With the arrangement described, it will be noted that no other packings are required for preventing the leakage of either of the mixture constituents to atmosphere. The mixture or the liquid flowing through the inlet and outlet passages effects substantially gas tight seals between the atmosphere and the interior of the drum. The arrangement, due to the lack of solid packings, is very free running and requires but a relatively small driving motor.

While I have shown the extraction drum as being mounted for rotation about a horizontal axis, it is obvious that it may be arranged for vertical operation, or at any other suitable angle.

Thus, with my invention I have provided an improved apparatus for separating a mixture of gas and liquid. My invention is especially advantageous as a liquid de-gasifying apparatus. The apparatus as described above broadly includes a rotatable drum 11 with an end portion 17 reduced in diameter. A stationary supply conduit 24 projects into the end portion of the drum and carries a sealing cup 25, 26, 27 which is located in an annular chamber formed by the inlet portion of the drum. A deflector 31 secured to the drum 11 projects into the sealing cup. Brackets 14 are secured to the inner surface of the drum near the deflector and impart rotary motion to the liquid supplied to the drum. This rotary motion together with the centrifugal action to which the liquid is subjected during rotation of the drum causes gases entrapped in the liquid to be freed. These gases escape towards the central portion of the drum.

Having described the principle of operation of my invention together with the apparatus which I now consider to represent the best embodiment thereof, I desire to have it understood that the

apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. Apparatus for separating the component elements of a mixture having gaseous and liquid constituents which apparatus comprises a horizontally disposed cylindrical element, bearings for rotatably supporting said element, a pair of spaced apart walls at the inlet end of said element, the outer of said walls having a centrally disposed aperture therein, an axially arranged conduit extending through said aperture for introducing the mixture into said cylindrical element, passages through the inner of said pair of walls spaced diametrically greater than the diameter of said outer wall aperture and less than the diameter of said cylindrical element, a member defining an annular channel secured to the end of said conduit extending into the space between said pair of walls, the outer diameter of said channel being slightly less than the inner diameter of said cylindrical element whereby the mixture being introduced into said cylindrical element fills the space between said channel and said pair of walls to the depth of said passages forming a gas tight seal between the interior of said element and the exterior thereof, a disk secured to said inner wall and extending into said annular channel whereby a substantially gas tight seal is formed closing off the interior of said element from said conduit.

2. Apparatus for separating the component elements of a mixture having gaseous and liquid constituents which apparatus comprises a hollow rotatable body, a partition within said body, means for rotating said body, a stationary conduit extending axially into one end of said body for introducing the mixture into said body, means including an element secured to the conduit and forming an annular groove and a vane secured to the body and projecting into the groove for retaining some liquid of the mixture introduced into said body between the element and the vane to effect a substantially gas tight seal between the interior of the body and the interior of said stationary conduit, said element being in spaced relation to said drum and said partition to form a second gas tight seal, a stationary conduit extending axially into the other end of said body for withdrawing the gaseous constituent therefrom, means for withdrawing the liquid constituent from said body, and means associated with the last named means to form a gas tight seal between the interior of said body and the atmosphere.

3. Liquid de-gasifying apparatus comprising a hollow rotatable drum having an end portion reduced in diameter, a partition within said drum, a stationary supply conduit projecting centrally into the end portion, a sealing cup forming an annular groove being secured to the supply conduit, a deflector secured to said drum, said sealing cup being in spaced relation to said drum and partition and also to said deflector to form a double seal.

4. Liquid de-gasifying apparatus comprising a hollow rotatable drum having an end portion reduced in diameter, a partition within said drum, a stationary supply conduit projecting centrally into the end portion, a sealing cup forming an annular groove being secured to the supply conduit, a deflector secured to said drum and projecting into the groove of the sealing cup, means adjacent the deflector and secured to the drum

to impart rotary motion to the liquid supplied to the drum, the sealing cup and the deflector forming an annular liquid seal during operation and the sealing cup being in spaced relation to the drum and the partition to form another annular liquid seal during operation.

5 5. Liquid de-gasifying apparatus comprising a hollow rotatable drum having an inlet portion defining an annular chamber with a wall having
10 openings radially spaced from the inner surface

of the drum, a stationary supply conduit with a sealing cup forming an annular groove being located in the annular chamber, and a deflector secured to the central portion of the wall and projecting into the groove of the sealing cup, the cup and the deflector forming a liquid seal during operation and the cup and the adjacent wall of the chamber forming another liquid seal during operation.

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