March 2, 1965 R. H. HART ETAL 3,171,776

BEARING EXTRACTION DEVICE FOR A SUCTION PRESS ROLL

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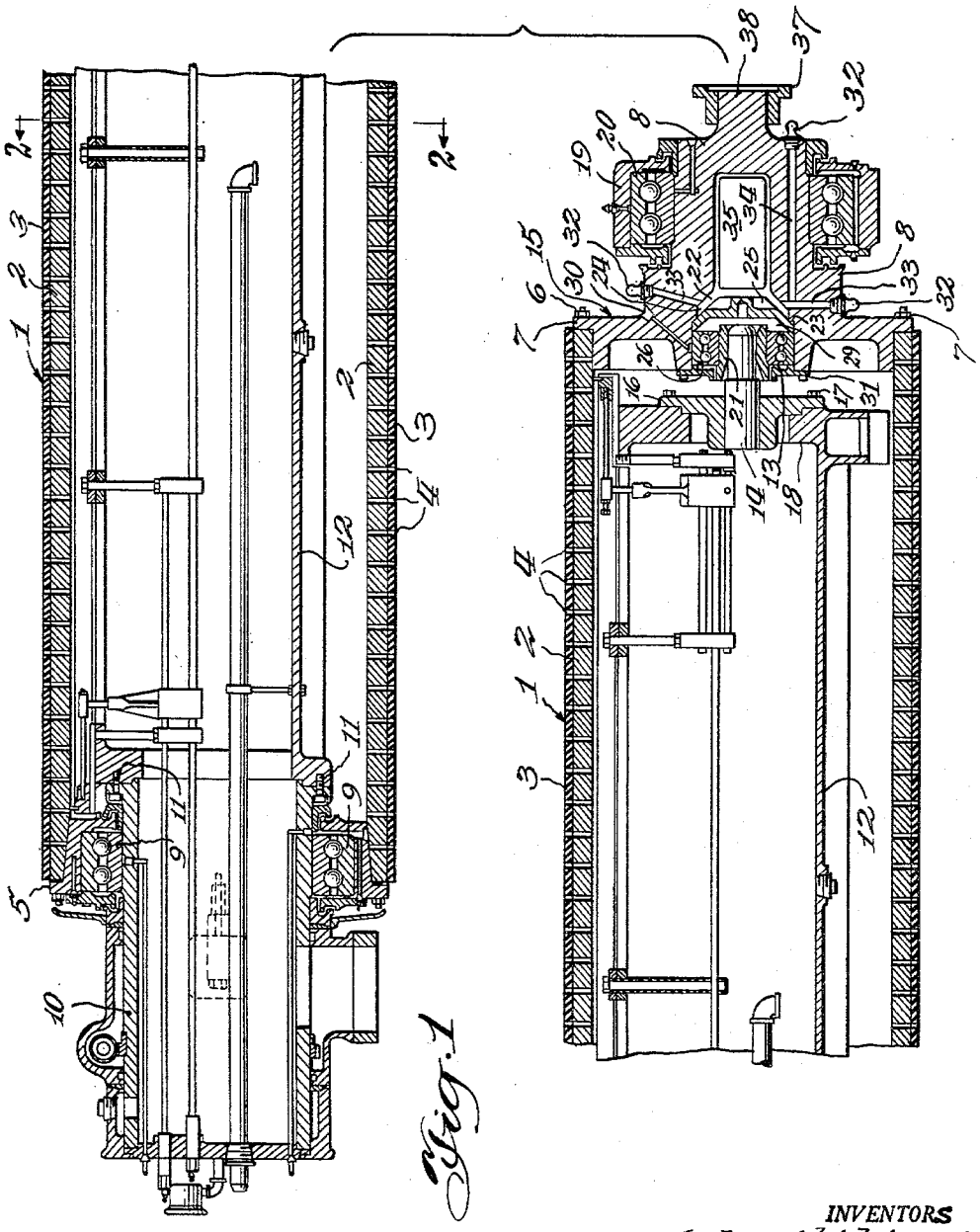


Fig. 1

INVENTORS
Robert H. Hart
& Paul E. VanHorn
By Henry Powers
Attorney

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Fig. 3

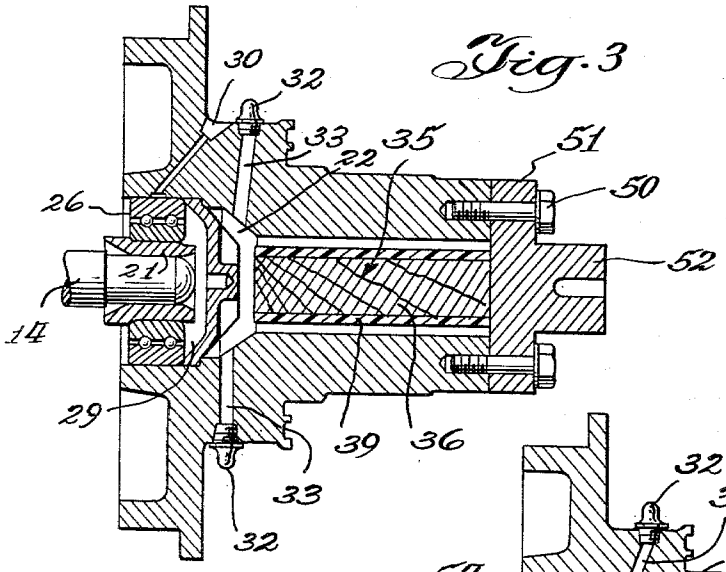
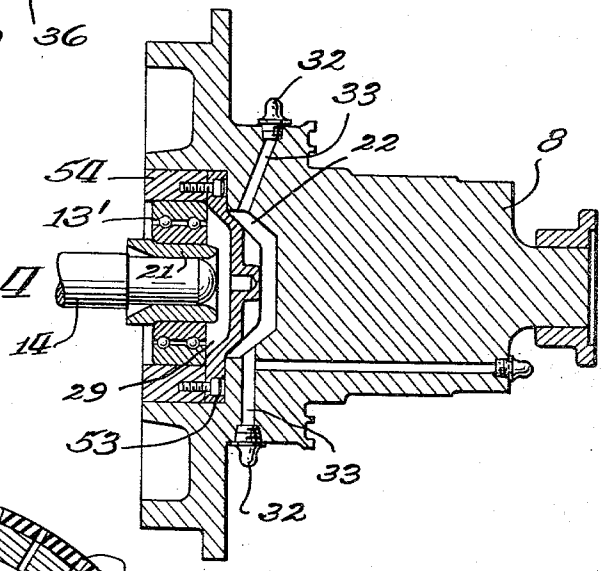


Fig. 4



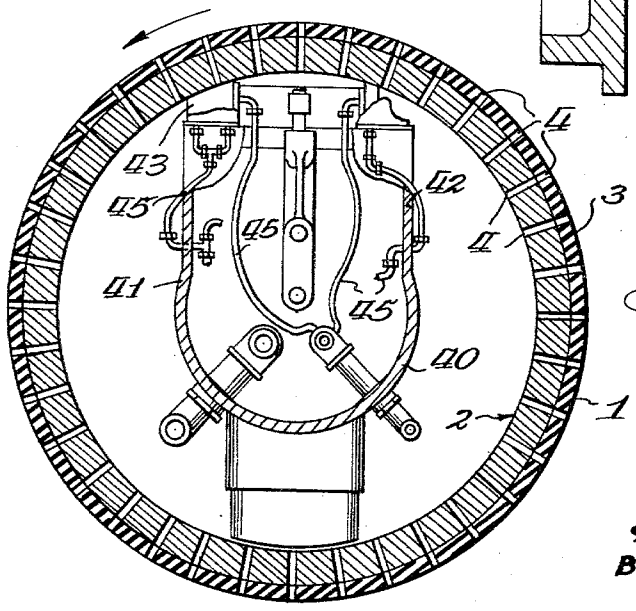


Fig. 2

INVENTORS.
Robert H. Hart
& Paul E. VanHorn
BY Henry Powers
Attorney

United States Patent Office 3,171,776 Patented Mar. 2, 1965

3,171,776

BEARING EXTRACTION DEVICE FOR A SUCTION PRESS ROLL

Robert H. Hart and Paul E. Van Horn, Beloit, Wis., assignors to Beloit Corporation, a corporation of Wisconsin

Filed Dec. 12, 1962, Ser. No. 244,043
4 Claims. (Cl. 162—369)

This invenion relates to anti-friction bearing means, and more particularly to an improvement for the removal of bearings in suction rolls used in paper making machinery.

As is well known, conventional suction rolls used in paper making machinery range in length frame 90 inches to 320 inches and comprise a perforate rotating cylinder or shell containing internally therein a relatively stationary suction box co-acting against the inner surface of the shell. In operation, a relatively high vacuum is maintained in the suction box, which vacuum is communicated to a sheet of pulp carried on the shell through perforations in the shell to thereby extract water from the sheet and compact the same. Depending upon their particular location in the paper machine, the suction rolls are formed of metal, as for example stainless steel and bronze, and may vary in diameter from about sixteen inches (16") to as much as about sixty inches (60"). Rolls of this type are generally very heavy and expensive in construction, and are normally driven at high rates of speed, at which speeds the bearings frequently become severely damaged from use requiring their renewal.

Typical suction rolls are described in U.S. Patent No. 1,799,775, granted to E. E. Berry, and in U.S. Patent No. 2,714,342, granted to E. D. Beachler. As described in these patents, the front extension of the suction box is supported against rotation at its outer end on a hollow sectional pedestal which is provided with a suitable means of communications between the interior of the suction box and a suitable source of vacuum. At the rear end of the suction box, the suction box is provided with a stub shaft or journal for mounting in an anti-friction bearing assembly which in turn is frictionally fitted within a hollow journal depending from an adjacent head of the shell. The hollow journal of the head forms a housing for the bearing assembly, and is presently designed to be an integral part of the head assembly so as to reduce the number of parts and machining operations. As can be appreciated, the removal of anti-friction bearings from the integral housing of the head can become quite difficult particularly where the construction of the head impedes and obstructs access to the bearing, and often requires torch cutting with possible flame damage to the surrounding housing. This, of course, is not only expensive but prolongs the down time of the equipment by keeping the roll out of operation during the repairing and renewal of the bearings.

Accordingly, it is an object of this invention to eliminate disadvantages of the prior art.

Another object of this invention is to provide a novel arrangement for the removal of anti-friction bearings.

It is a further object of this invention to provide a novel extraction means for the removal of anti-friction bearing means from their housings.

A still further object fo this invention is to provide a novel hydraulically actuated extraction means for the removal of anti-friction bearing means from their housings.

It is also an object of this invention to provide an improved suction roll comprising a perforate shell provided with heads at the ends thereof, with one of the heads having a hollow extended journal forming a housing for a bearing assembly in which is mounted a shaft of a suction box adapted to contact the interior of the roll and to confine an area thereof, with the said hollow journal containing within its chamber a fluid driven piston means for the removal of the bearing from the hollow journal.

Other objects and advantages of this invention become more apparent from the following description and drawings in which;

FIGURE 1 is a broken, longitudinal sectional view of a suction roll illustrating one embodiment of this invention;

FIGURE 2 is a sectional view taken along lines II—II of FIGURE 1;

FIGURE 3 is a sectional view of a suction roll head illustrating another embodiment of this invention; and

FIGURE 4 is a sectional view of another suction roll head illustrating a still further embodiment of this invention.

Generally speaking, this invention comprehends a suction roll which includes a rotatable perforated cylindrical shells, the shell having provided internally thereof a suction box which co-acts with the shell and also has provided thereon a journal mounted in an end-wall of the shell, with the suction box adapted to contact the interior of the shell and to confine an area thereof. To adapt the shell for rotation about the suction box a conventional anti-friction bearing means is interposed between the suction box journal and the end-wall of the shell, with the bearing means frictionally fitted in the end-wall. To facilitate removal of the bearing means an axially movable piston means is mounted in the referred to shell end-wall opposite to and in sealing relationship to the bearing means with the piston means disposed externally of the bearing means and adapted for actual movement together with the bearing means toward the interior of the shell. Movement of the piston means, together with the bearing means, is accomplished by suitable hydraulic means which is operatively connected with the piston in a manner adapted to actuate the piston in movement toward the interior of the shell structure.

More specifically, by reference to the drawings as shown in FIGURE 1, the suction roll structure 1 consists of a cylindrical outer shell 2 peripherally enclosed within a rubber casing or lining 3, with both the shell and the casing being radially perforated as at 4 to provide a perforated drum construction. One open end of the roll shell structure has secured to it an angular shell ring 5 and the other open end of the shell has secured to it, by means of bolts 6, a rear shell head 15 provided with a radial flange 7 formed upon a hollow journal or hub 8.

The shell is adapted for rotation by providing at the inner end of shell ring 5 bearing assembly 9 which is mounted on a suction gland sleeve 10 in turn fixedly secured as by bolts 11 to an open end of a suction box 12. The outer end of the sleeve 10 is suitably mounted within any convenient roll supporting structure or stand, not shown. As can be seen the shell structure is adapted by the bearing elements 9 for rotation about the fixed gland sleeve 10.

The shell structure is also rotatably mounted upon the suction box at its other end by a bearing assembly 13 which is interposed between the shell structure head 15 and a fixed suction box stub shaft or axle 14 carried by a suction box closure plate 16 fixedly secured by means of bolts 17 to a suction box end plate 18. The hollow journal 8 is mounted within a journal housing 19 and adapted for rotation by means of a bearing assembly 20 interposed between the journal and the housing. Rotation of the shell structure is accomplished by means of a coupling 37 mounted on a shell driving shaft 38 and connected to a suitable drive means, not shown.

The stub shaft 14, of the suction box closure plate 16, is mounted in the anti-friction bearing means 13 by

means of a sleeve **21** which is mounted on the stub shaft **14** with a light fit so as to afford easy removal of the stub shaft **14** from the sleeve **21**. The bearing means **13** is mounted in shell head **15** within a chamber **22** defined by the hollow of the journal **8**. As shown in drawings, the annular chamber **22** decreases outwardly in diameter and extends outwardly into the journal **8** wherein it is contained by the solid portions at the end of the journal **8**. Mounted within the annular chamber **22** against an annular shoulder **23** is a piston **24** of concave configuration suitably reinforced by webs **25**. The piston is positioned immediately behind the bearing assembly **13** in contact with the outer race **26** thereof. The piston **24** thus serves as a positive stop for the bearing assembly **13** and thus determines the bearing position with respect to the shell head **15**. This portion of the concave configurate piston **24** defines a compartment **29** for containing lubricating oil therein supplied to the bearing assembly **13** by means of an inlet **30**. The oil reservoir **29** is closed by means of a cover plate **31** provided at the other side of the bearing assembly and disposed in sealing relationship with sleeve **21**.

Fluid communication with the journal chamber **24** is effected by means of quick-disconnect fittings or nipples **32**, as for example ordinary grease vents, or other suitable fittings, mounted at the ends of ports **33** and **34** extending to the chamber **22**. If desired the volume of chamber **24** can be decreased by means of a filler plug **35** formed of a suitable material, for example a wooden plug **36** enclosed within a synthetic plastic envelope or lining, as for example any suitable epoxy mixture which is illustrated in FIGURE 3. The suction box **12**, in accordance with conventional construction, comprises a substantially cylindrical body portion **40** open at the top, adjacent to the inner wall of the shell, and provided with spaced vertical walls **41** and **42**. Sealing between the suction box and the inner surface of the shell structure is accomplished by means of packing **43** mounted along the top surface of the suction box side walls **41** and **42**, with the sealing facilitated and lubrication of the packing accomplished by means of water conduits **45**. In this manner, during rotation of the shell structure around the packing box, the packing side walls **41** and **42** together with their associated packing confine an area along a longitudinal portion of the shell within which suction may applied to a web of pulp traveling over said shell through the perforations of the shell.

For disassembling the roll, the front head of the shell structure is detached from the shell, and the head together with the suction box **12** is rolled out of the shell structure.

In order to remove the bearing **13** with liquid pressures, any one of the lowermost air escape vents or ports **33** is maintained closed while the uppermost air escape line **33** is open. A liquid under pressure is then applied to chamber **22**, of the hollow journal **8**, by means of fluid lines, not shown, and external valving suitably connected either through port **34** or through the lowermost port **33**. The fluid is injected into the chamber until substantially all of the air has been vented through the open port. Thereafter, the open port is closed and application of the liquid continued to increase the pressure in the chamber **22**, until the magnitude of the pressure is reached sufficient to move the piston **24** with sufficient force against the bearing assembly **13** to axially move the bearing assembly out of annular chamber **22**. The liquid or fluid pressure applied to chamber **22** may be applied by any convenient means such as a hand pump or ordinary grease pump. It will be appreciated that the desired number and placement of the air escape vents or ports **33** may be provided in the hollow journal **8** to the chamber **22** governed solely by the convenience desired for access in attaching the pressure lines or piping to the fittings **32**. In this manner the chamber **22** of the journal may be conveniently vented and fluid injected therein regardless of the relative position the roll comes to when stopping after rotation.

Although a specific embodiment has been described above, it is to be understood that various other embodiments may also be employed. For example, as shown in FIGURE 3, the hollow of the journal **8** may be open-ended with the ends of the journal having fixedly secured thereto by bolts **50** an end enclosure plate **51** having provided thereon a shell driving shaft **52** for connection to a suitable drive means for rotation of the shell.

In similar fashion, as shown in the embodiment of FIGURE 4, the major portion of shell journal **8** may be substantially solid with the piston thereof secured and integrated, as by bolts **53**, to the bearing assembly **13¹** as for example with the bolts mounted in a bearing sub-housing **54**. In this manner, the position and the bearing assembly will move together as a unit during removal of the bearing means from the shell journal **8**.

Although the invention has been described with reference to specific materials, embodiments and details, various modifications and changes, within the scope of this invention, will be apparent to one skilled in the art and are contemplated to be embraced within the invention.

What is claimed is:

1. A suction roll comprising,
a rotable perforated cylindrical shell,
an end wall mounted on said shell having an axially extending cylindrical bore formed therein opening at one end thereof to the inner face of said end wall and closed at the other end thereof,
a suction box co-acting with said shell and adapted to contact the interior of said shell to confine an area thereof,
a journal fixedly mounted on said box and extending into said bore,
anti-friction bearing means interposed between said journal and the wall of said bore and comprising an outer race frictionally fitted in the wall of said bore and an inner race receiving said journal,
axially movable piston means slidably carried in said bore between said bearing means and the closed end of said bore and engageable with said bearing means,
said piston means having an outer peripheral wall being in fluid sealing relationship with the wall of said bore, and
hydraulic means communicating with said bore between said piston means and the closed end of said bore to pressurize said bore and to move said piston means into abutting engagement with said bearing means to urge said bearing means out of said bore.

2. A suction roll comprising,
a rotatable perforated cylindrical shell,
an end wall mounted on said shell having an axially extending cylindrical bore formed therein opening at one end thereof to the inner face of said end wall and closed at the other end thereof,
a suction box co-acting with said shell and adapted to contact the interior of said shell to confine an area thereof,
a journal fixedly mounted on said box and extending into said bore,
anti-friction bearing means interposed between said journal and the wall of said bore and comprising an outer race having an outer peripheral wall shaped complementarily to the wall of said bore and frictionally fitted in said bore and an inner race receiving said journal,
axially movable piston means slidably carried in said bore between said bearing means and the closed end of said bore and engageable with said bearing means,
said piston means having an outer peripheral wall being in fluid sealing relationship with the wall of said bore, and
hydraulic means communicating with said bore between

said piston means and the closed end of said bore to pressurize said bore and to move said piston means into abutting engagement with said bearing means to urge said bearing means out of said bore.

3. The structure of claim 2 wherein said journal is removably received in said inner race.

4. A suction roll comprising,

a rotatable perforated cylindrical shell,

an end wall mounted on said shell having an axially extending cylindrical bore formed therein opening at one end thereof to the inner face of said end wall and closed at the other end thereof,

a suction box co-acting with said shell and adapted to contact the interior of said shell to confine an area thereof,

a journal fixedly mounted on said box and extending into said bore,

anti-friction bearing means interposed between said journal and the wall of said bore and comprising an outer race frictionally fitted in the wall of said bore and an inner race receiving said journal,

axially movable piston means slidably carried in said bore between said bearing means and the closed end of said bore and engageable with said bearing means, said piston means having an outer peripheral wall

being in fluid sealing relationship with the wall of said bore, and

hydraulic means comprising first and second conduits in said end wall and communicating with said bore between said piston means and the closed end of said bore,

said first conduit means adapted for connection to a source of pressurized fluid to supply such fluid to said bore to move said piston means into abutting engagement with said bearing means to urge said bearing means out of said bore, and

said second conduit means communicating said bore to atmosphere and including manually operable means effective to open said bore to atmosphere when such fluid is filling said bore and thereafter to close said bore to develop pressure therein.

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