Jan. 15, 1952 W. WESTPHAL 2,582,365

DRIER ROLL

Filed May 19, 1948

Fig. 1.

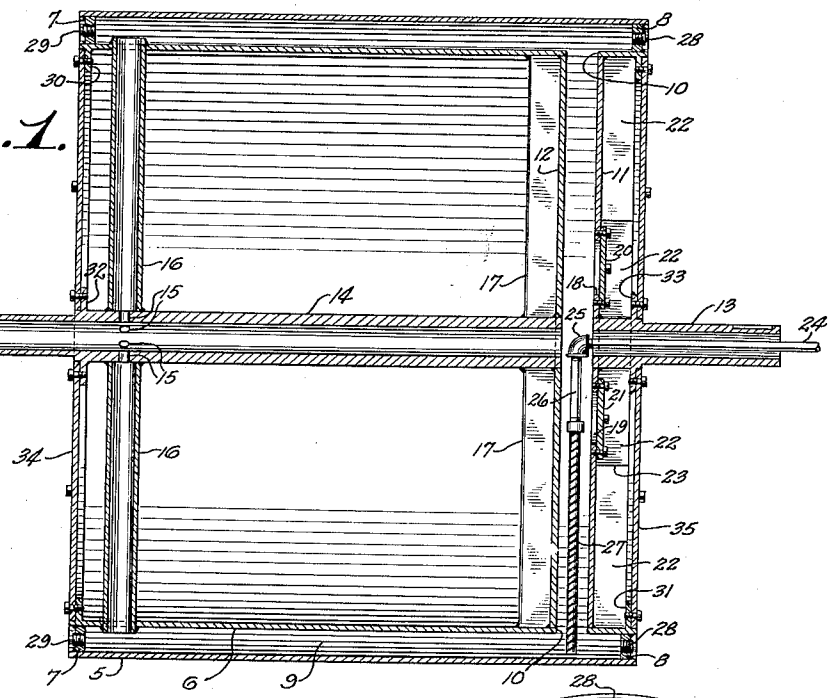
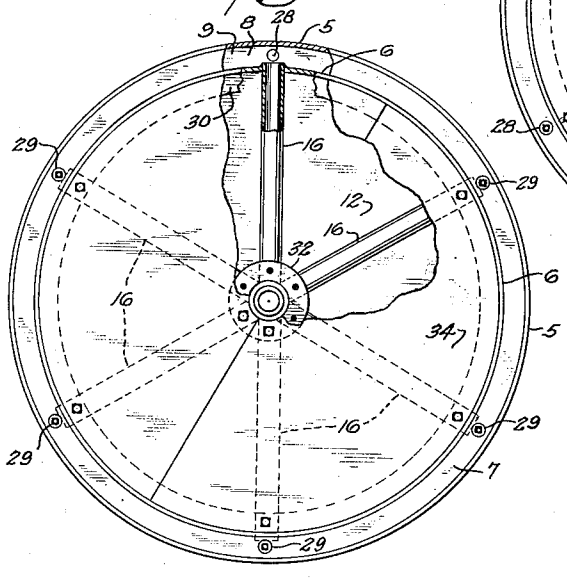


Fig. 2.



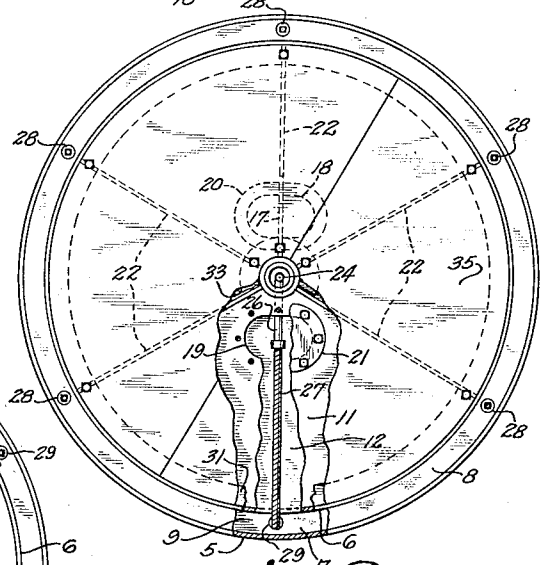


Fig. 3.

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Patented Jan. 15, 1952

2,582,365

UNITED STATES PATENT OFFICE

2,582,365

DRIER ROLL

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Application May 19, 1948, Serial No. 27,980

7 Claims. (Cl. 34—124)

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This invention relates to improvements in drier rolls, and more particularly to a jacketed drier roll having associated with the interior thereof a stationary condensate syphon pipe.

Conventional drier rolls, such as are used in the paper making and converting industries are of two general types, both of which are open to certain objections. Conventional unjacketed drier rolls have associated therewith stationary condensate syphon pipes, but such rolls, being in the form of completely enclosed metal cylinders, have relatively large capacities but are very slow in heating up and require a large amount of a gaseous or liquid heating medium. When a gaseous heating medium such as steam is used there must be objectionable weight to the material of the drum to withstand the pressure. On the other hand, should a liquid heating medium be employed, the weight of a large body of such liquid necessitates a relatively heavy cylinder plus strong supports therefor. Conventional jacketed drier rolls eliminate the objections mentioned in connection with the unjacketed type of rolls. However, it has heretofore been necessary to associate with a jacketed drier roll, a condensate syphon pipe which opens through the inner, annular wall of the roll jacket and which, consequently, turns with the roll. As a result, this type of conventional jacketed drier roll is not susceptible of efficient handling when it is to be heated unless the roll is stopped with the inner end of the syphon pipe in its lowermost position to withdraw the condensate which collected in the jacket along the bottom level of the roll. On the other hand, if the conventional jacketed roll stops with the syphon pipe end in a raised position, the applied suction in an effort to exhaust the condensate will be ineffectual. Another difficulty is that when it is desired to introduce steam into a jacket in the bottom of which a relatively large quantity of cold condensate has collected, warpage of the roll is apt to occur because of the contrasts in temperature between the portions thereof in contact with the live steam, and the portions in contact with the cold condensate.

With the above in mind, it is, therefore, a primary object of the present invention to provide a jacketed drier roll equipped with a stationary condensate syphon pipe having its inner end directed toward the lowermost portion of the roll so as to exhaust collected condensate from said lower portion of the roll jacket without regard to the position of stoppage of the roll.

A further object of the invention is to provide a drier roll wherein the annular jacket has associated therewith a hollow end head which is in communication with both the interior of said jacket and the steam supply conduit, and which also houses the stationary and downwardly directed condensate syphon pipe in a manner so as to allow the inner end of the latter to be always disposed adjacent the lowermost portion of the roll.

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A further object of the invention is to provide a drier roll which is susceptible of being heated or drained of condensate relatively rapidly, which is light and which may be provided with relatively thin walls and which, because the stationary syphon pipe assures a minimum collection and weight of condensate in the roll at all times, requires relatively small bearings and bearing supports.

A further object of the invention is to provide a jacketed drier roll which is of simple construction, is strong and durable, is efficient in operation, and is well adapted for the purposes described.

With the above and other objects in view, the invention consists of the improved drier roll, and its parts and combinations, as set forth in the claims and all equivalents thereof.

In the accompanying drawing in which the same reference characters indicate the same parts in all of the views:

Fig. 1 is a longitudinal sectional view through the improved jacketed drier roll;

Fig. 2 is a view, with portions broken away and in section, of one end of the roll, and on a smaller scale; and

Fig. 3 is a similar view, with portions broken away and in section, of the other end of the drier roll.

Referring more particularly to the drawing, the improved drier roll consists of an outer cylindrical shell 5 and an inner cylindrical shell 6 which is preferably concentric therewith and spaced therefrom by means of annular end rings 7 and 8. The latter are preferably welded in position between the shells 5 and 6 at each end thereof. The shells 5 and 6 and the end rings 7 and 8 form an annular heating chamber 9, said chamber being contained in a jacket formed by the shell 6 and the rings 7 and 8 on the inner surface of the shell 5.

The inner shell 6 is formed with a circumferential slot 10 near the end plate 8. Positioned at the margins of the slot 10 and extending transversely within the shell 6 are a pair of spaced substantially parallel centrally apertured circular plates 11 and 12 which form a transverse circular chamber. The plates 11 and 12 are preferably welded to the shell 6. A relatively short hollow shaft 13 has its inner end positioned in the central aperture of the plate 11, and said end is preferably welded to said plate as shown. The shaft 13 extends axially outwardly from the plate 11 and forms one journal for the improved roll. A relatively long hollow shaft or header 14 has its inner end positioned

in the central aperture of the plate 12 and said end is preferably welded to said plate. The shaft 14 extends axially through and beyond the other end of the shell 6, the outer end thereof forming the other journal for the improved roll.

The shaft 14 is formed with a plurality of radial apertures 15 near the outer end thereof. A plurality of equally spaced conduits 16, having their inner ends welded in position on the shaft 14 in a manner to surround the apertures 15, extend radially outwardly and communicate with the heating chamber 9 by projecting through the shell 6. The conduits 16 are preferably welded to the shell 6 as shown. The conduits 16 serve as supporting members in addition to their function of providing means for communication between the shaft 14 and the chamber 9.

A plurality of preferably equally spaced radially extending stiffening ribs 17 are disposed about the outer surface of the plate 12, being preferably welded to said plate as well as to the shell 6 and to the shaft 14. The plate 11 is provided with a pair of oppositely disposed hand holes 18 and 19 which are provided with suitable covers 20 and 21 respectively, the latter being bolted to the plate 11. Said hand holes facilitate installation, servicing and replacement of a syphon pipe or conduit, later to be described. A plurality of stiffening ribs 22 similar to the ribs 17 are disposed about the outer surface of the plate 11 and are welded to said plate, the shell 6 and the shaft 13. The hand holes 18 and 19 are so located and the design of the stiffener ribs is such that there is no mutual interference (see Figs. 1 and 2). For example, the ribs 22 which are alined with the hand holes 18 and 19 are cut away, as at 23 (see Fig. 1).

A fixed, relatively small diameter conduit 24 extends axially through the shaft 13. The outer end is connected with a suitable source of suction (not shown) and the inner end of the member 24 has connected thereto an elbow 25, from which depends a short section of conduit 26. Connected to the lower end of the conduit 26 and extending downwardly therefrom and into the lower portion of the chamber 9, is a flexible conduit 27, which is of stainless steel or other suitable material. The members 24, 26 and 27 form a fixed syphon pipe.

The outer ends of the shafts 13 and 14 which form journals are suitably mounted for rotation and shaft 13 is provided with a steam joint (not shown) which permits the introduction of live steam into the shafts while the assemblage is being rotated. The steam joint for the shaft 13 must also provide support for the fixed conduit 24. The above mentioned mountings and steam joints may be of any suitable conventional type.

The end plate 8 of the heating chamber 9 is provided with a plurality of removable clean out plugs 28, and the end plate 7 is provided with a like number of removable plugs 29 which are in alinement with the plugs 28. The shell 6 is formed with an inwardly projecting flange 30 at one end and with a like flange 31 at the other end. The shaft 14 is formed with an outwardly projecting flange 32 which is alined with the flange 30, and the shaft 13 is formed with an outwardly extending flange 33 which is alined with the flange 31. A diametrically split cover plate 34, having a central aperture, is preferably bolted to the flanges 30 and 32 as shown in Figs. 1 and 2, and a similar cover plate 35 is preferably bolted to the flanges 31 and 33 as shown in Figs. 1 and 3, thereby totally enclosing the interior of the inner shell 6.

In operation, steam is admitted through the shafts 13 and 14 and the steam travels outwardly through the conduits 16 and between the plates 11 and 12 and enters the heating chamber 9. The outer shell 5 provides the working surface for the improved roll and is heated as a result of contact with the steam in the chamber 9. After the shell 5 reaches the proper temperature, the improved roll is put into operation, and is normally continually charged with steam during such operation.

As steam condenses in the chamber 9, it will run down to the lower level thereof and will there collect unless removed. Since the conduit 27 extends down to the lower level of the chamber 9, as shown in Figs. 1 and 3, and is fixed in this position it will be effective, when suction is applied to its outer end, for continuous removal of substantially all of the condensate which forms in the chamber 9. It is to be particularly noted that continuous removal of condensate via the conduit 27 can be accomplished without regard to the position of the improved roll or to whether or not it is rotating.

Since condensate can be continuously removed from the chamber 9 of the improved roll regardless of the position or condition of operation thereof, no appreciable amount of condensate can ever collect in the chamber 9, and therefore, no loads resulting from collection of large amounts of condensate need be considered in the design of the improved roll and the gauge of the metal thereof. As a result, lighter gauge plate may be used therein, along with correspondingly smaller bearings for the mountings thereof. In addition, by eliminating the possibility of the collection of large amounts of condensate in the chamber 9, the hazard of warpage of the improved roll is minimized.

It should be understood that while steam is the preferred medium for heating the working surface of the drier roll, the invention is not to be restricted thereto as any other suitable heating fluid may be introduced into the chamber 9. While the improved drier roll is susceptible of usage in various fields it finds particular utility in the paper making and converting field.

Various changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated as will come within the scope of the claims.

What is claimed as the invention is:

1. In a revoluble drier roll: a tubular cylindrical shell having at least one open end; a jacket for said shell forming an annular heating fluid chamber on the inner surface of said shell; walls defining a transverse circular heating fluid chamber coaxial with said shell and communicating around its entire periphery with said annular fluid chamber; a heating fluid conduit entering said circular chamber axially of said shell; and a condensate exhaust conduit fixedly disposed within said circular chamber and opening into the annular fluid chamber near the bottom thereof, said exhaust conduit having a portion extending outwardly of said circular chamber through said heating fluid conduit.

2. In a revoluble drier roll: a tubular cylindrical shell open at both ends; a jacket for said shell forming a relatively shallow annular heating fluid chamber on the inner surface of said shell; walls defining a transverse circular heating fluid chamber coaxial with said shell and com-

municating at its periphery with said annular fluid chamber and closing one end of said shell; a heating fluid conduit entering the outer side of said circular chamber axially of said shell; a heating fluid header extending axially within said shell and entering the inner side of said hollow head; heating fluid conduits communicating between said header and said fluid chamber adjacent the open end of said shell; and a condensate exhaust conduit fixedly disposed within said circular chamber and opening into the annular fluid chamber near the bottom thereof, said exhaust conduit having a portion extending outwardly of said circular chamber through said axial heating fluid conduit.

3. In a revoluble drier roll: a tubular cylindrical shell open at both ends; a jacket for said shell forming a relatively shallow annular heating fluid chamber on the inner surface of said shell; walls defining a transverse circular heating fluid chamber communicating with said annular fluid chamber; a heating fluid conduit entering one side of said circular chamber axially of said shell; a heating fluid header extending axially of said shell and entering the other side of said circular chamber; radially extending heating fluid conduits spaced from said circular chamber and communicating between said header and said fluid chamber; and a condensate exhaust conduit fixedly disposed within said circular chamber and opening into the annular fluid chamber near the bottom thereof, said exhaust conduit having a portion extending outwardly of said circular chamber through said axial heating fluid conduit, and said header and said axial heating fluid conduit having portions extending axially outwardly of said shell to form journals for said drier roll.

4. In a revoluble drier roll: an outer tubular cylindrical shell; an inner tubular cylindrical shell concentric with and spaced from said outer shell; an annular ring positioned between said inner and outer shells at each end thereof to form an annular heating fluid chamber; walls defining a transverse circular heating fluid chamber communicating with said annular fluid chamber; a heating fluid conduit entering one side of said circular chamber axially of said shells; and a condensate exhaust conduit fixedly disposed within said circular chamber and opening into the annular fluid chamber near the bottom thereof, said exhaust conduit having a portion extending outwardly of said hollow head through said heating fluid conduit.

5. In a revoluble drier roll: an outer tubular cylindrical shell; an inner tubular cylindrical shell concentric with and spaced from said outer shell, said inner shell being formed with a circumferential slot; an annular ring positioned between said inner and outer shells at each end thereof to form an annular heating fluid chamber; a pair of spaced circular plates each having its periphery sealingly fixed to said inner shell adjacent one margin of said slot to form a transverse circular heating fluid chamber communicating with said annular fluid chamber; a heating fluid conduit entering one side of said circular chamber axially of said shells; and a condensate exhaust conduit fixedly disposed within said circular chamber and opening into the annular fluid chamber near the bottom thereof, said exhaust conduit having a portion extending outwardly of said circular chamber through said heating fluid conduit.

6. In a revoluble drier roll: an outer tubular cylindrical shell; an inner tubular cylindrical shell concentric with and spaced from said outer shell; an annular ring positioned between said inner and outer shells at each end thereof to form an annular heating fluid chamber; walls defining a transverse circular heating fluid chamber communicating with said annular fluid chamber and closing one end of said inner shell; a heating fluid conduit entering the outer side of said circular chamber axially of said shell; a heating fluid header extending axially within said shells and entering the inner side of said circular chamber; heating fluid conduits adjacent the open end of said inner shell communicating between said header and said fluid chamber; and a condensate exhaust conduit fixedly disposed within said circular chamber and opening into the annular fluid chamber near the bottom thereof, said exhaust conduit having a portion extending outwardly of said circular chamber through said heating fluid conduit.

7. In a revoluble drier roll: an outer tubular cylindrical shell; an inner tubular cylindrical shell concentric with and spaced from said outer shell, said inner shell being formed with a circumferential slot at one end thereof; an annular ring positioned between said inner and outer shells at each end thereof to form an annular heating fluid chamber; a pair of spaced circular plates each having its periphery sealingly fixed to said inner shell adjacent one margin of said slot to form a transverse circular heating fluid chamber communicating with said annular fluid chamber and closing one end of said inner shell; a heating fluid conduit entering the outer side of said circular chamber axially of said shell; a heating fluid header extending axially within said shells and entering the inner side of said head; radially extending heating fluid conduits communicating between said header and said fluid chamber adjacent the open end of said inner shell; and a condensate exhaust conduit fixedly disposed within said hollow head and opening into the annular fluid chamber near the bottom thereof, said exhaust conduit having a portion extending outwardly of said circular chamber through said heating fluid conduit, and said header and axial heating fluid conduit each having portions extending axially outwardly of said shells to form journals for said drier roll.

WALTER WESTPHAL.

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