

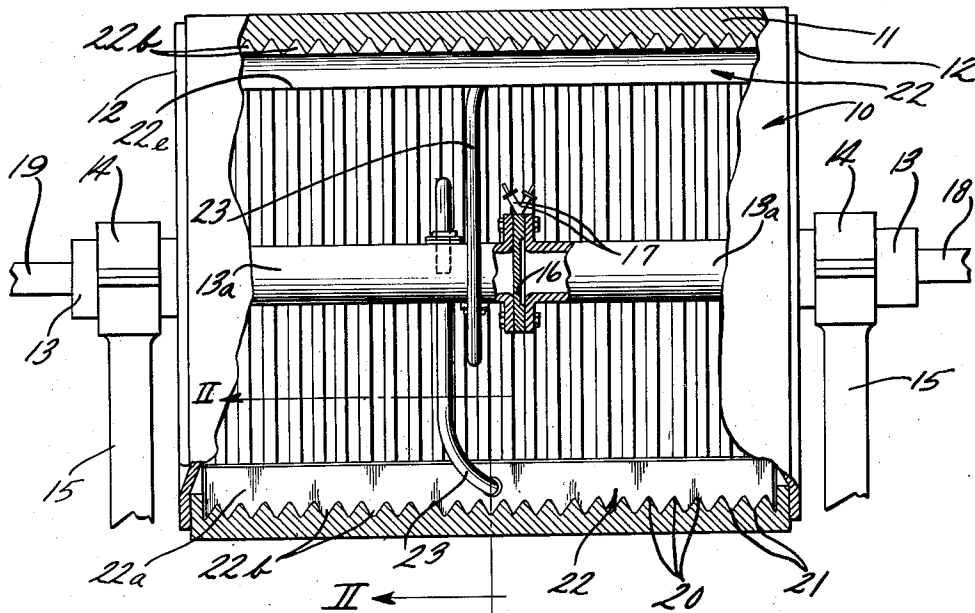
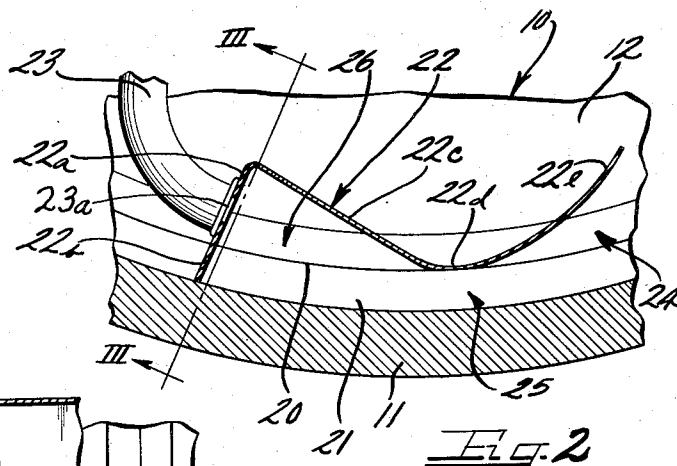
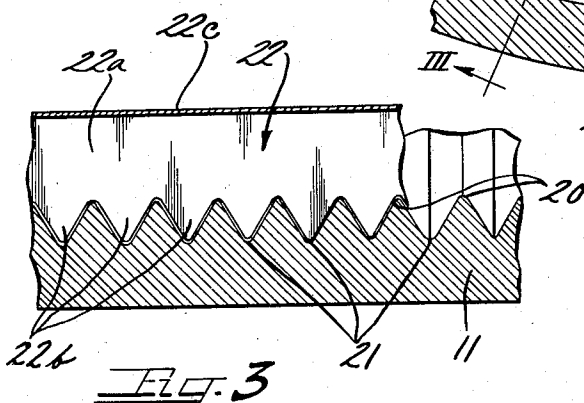
Sept. 5, 1950

L. HORNOSTEL ET AL
DIPPER FOR GROOVED DRIER DRUMS

2,521,371

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2 Sheets-Sheet 1



Inventors

LLOYD HORNOSTEL

JOHN E. GOODWILLIE

by *The Firm of Charles H. Hill* Attys.

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2 Sheets-Sheet 2

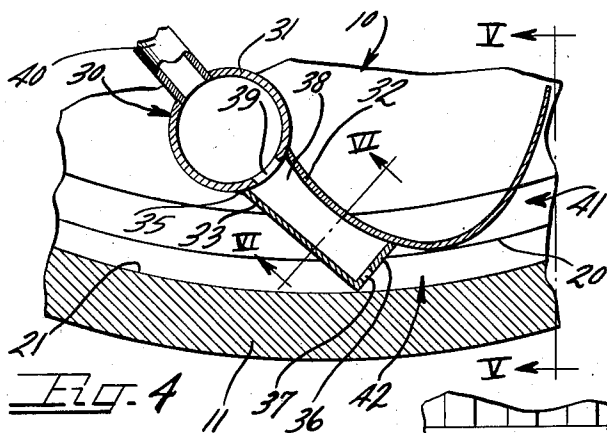
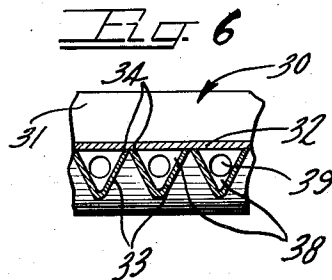


Fig. 5

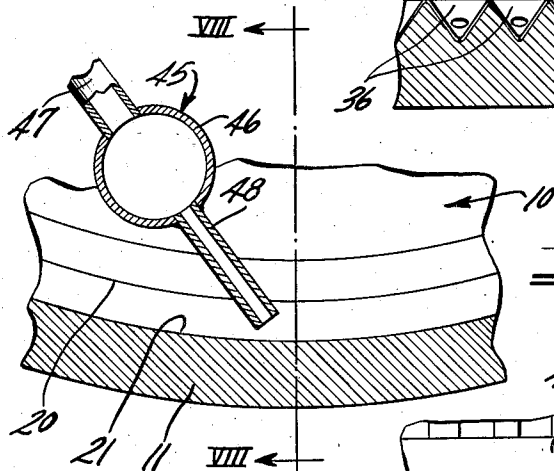
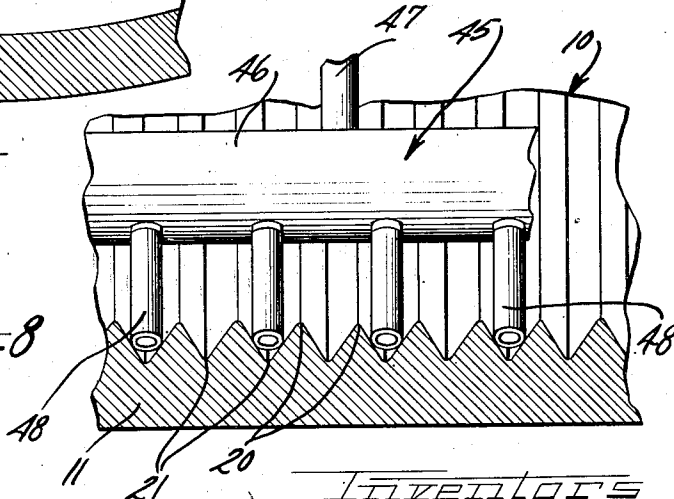


Fig. 7

Fig. 8



INVENTORS
LLOYD HORNBOSTEL

JOHN E. GOODWILLIE

By *The Firm of Charles H. Hill* Attys.

UNITED STATES PATENT OFFICE

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DIPPER FOR GROOVED DRIER DRUMS

Lloyd Hornbostel and John E. Goodwillie, Beloit,
Wis., assignors to Beloit Iron Works, Beloit,
Wis., a corporation of Wisconsin

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6 Claims. (Cl. 34—125)

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This invention relates to drier drum constructions adapted for withstanding high internal pressures and equipped with efficient condensate removal devices. Specifically the invention deals with dippers for internally grooved drier drums.

According to this invention drier drums or cylinders are internally grooved to provide a plurality of inwardly projecting circular ribs separated by troughs or grooves. The body of the cylinder is rigidified by the ribs and can be quite thin at the valley portions between the ribs so as to efficiently conduct heat from steam or other heating fluid in the cylinder to the exterior drying surface of the cylinder. The grooved drum or cylinder construction makes possible production of relatively lightweight thin walled heat conducting drums that are sufficiently strong to withstand high internal pressures of steam or other heating fluid. As a result of this drum construction high steam pressures can be used in the drum to more efficiently heat the cylinder surface of the drum.

Removal of steam or other heating fluid condensate from the interior of the grooved drum to prevent formation of insulating layers or pools of condensate in the grooves is made possible, according to this invention, by dipper devices which extend lengthwise in the cylinder and have projections extending into the valleys or grooves. In a first illustrated embodiment of the invention, these projections take the form of teeth or groove fitting tabs on the back wall of a scoop which has a top wall overlying the ribs and providing an inlet nozzle to a chamber closed by the toothed or tab equipped back wall. A drain line is provided for exhausting the interior of the scoop. In a second illustrated embodiment of the invention, a header pipe extends lengthwise of the cylinder interior and has a lip member projecting forwardly therefrom to overlie the ribs. Angle members define troughs under the lip between the header and apertured front walls seated in the grooves. Fluid passes through the apertures in these front walls under the lip into and through the troughs into the header. In a third illustrated embodiment of the invention, the header pipe is equipped with forwardly projecting tubes which extend into the grooves. In some instances only some of the grooves or troughs in the cylinder receive fluid conducting tubes or conduit devices. For example in the illustrated third embodiment of the invention the tubes only extend into alternate grooves.

It is then an object of this invention to provide a heating cylinder or drying drum construc-

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tion having an internally grooved shell and a dipper or condensate removal device extending into the grooves of the shell.

A further object of the invention is to provide an internally grooved drier drum with a dipper having local portions extending into the grooves of the shell to remove fluid therefrom.

A still further object of the invention is to provide a dipper construction for internally grooved drier drums or heating cylinders.

A still further object of the invention is to provide a drier drum construction for paper machines and the like which has an internally ribbed drier shell and a dipper extending into valleys between the ribs for removing steam condensate or the like from the shell.

Other and further objects of the invention will be apparent to those skilled in the art from the following detailed description of the annexed sheets of drawings which, by way of preferred example only illustrate several embodiments of the invention.

On the drawings:

Figure 1 is a side elevational view, with parts in vertical cross section, illustrating an internally grooved drier drum equipped with one form of dipper construction according to this invention.

Figure 2 is a transverse fragmentary cross sectional view, with parts in end elevation, taken along the line II—II of Fig. 1.

Figure 3 is a fragmentary longitudinal cross sectional view, with parts in side elevation, taken along the line III—III of Fig. 2.

Figure 4 is a view similar to Fig. 2 but illustrating a first modified embodiment of the invention.

Figure 5 is a longitudinal cross sectional view, with parts in side elevation, taken along the line V—V of Fig. 4.

Figure 6 is a longitudinal cross sectional view, with parts in elevation, taken along the line VI—VI of Fig. 4.

Figure 7 is a view similar to Fig. 2 but illustrating a third embodiment of the invention.

Figure 8 is a longitudinal cross sectional view, with parts in side elevation, taken along the line VIII—VIII of Fig. 7.

As shown on the drawings:

In Fig. 1 the reference numeral 10 designates generally a drier drum construction having a cylindrical shell 11 closed at its ends by end heads 12, 12 carrying axles 13, 13 which are rotatably mounted in bearings 14 on support stands 15.

The axles 13 have portions 13a extending into

the shell 11 from the heads or ends 12 and receiving a separating plate 16 between their proximate inner ends. The plate 16 is clamped between outturned flanges of the axle portions 13a and is held in position by bolts extended through these portions and the plate. Nozzles 17 extend from the plate 16 and communicate with the interior of the axle portion 13a on one side of the plate 16. A steam feed pipe 18 extends through the axle portion 13 to supply steam to the interior of the portion 13a for feeding steam into the shell 11 through the nozzles 17. The axle portion 13a on the other side of the plate 16 has a condensate drain line 19 communicating with the interior thereof to remove condensate from the interior of the shell 11. Therefore steam is introduced into the interior of the drum construction 10 through the axle 13a on one side of the plate 16 and condensate is removed from the interior of the drum through the axle portion 13a on the other side of the plate 16.

The cylinder 11 is grooved around the inner face thereof to provide circular ribs 20 around the inside of the cylinder between the heads 12. These ribs 20 are separated by valleys or grooves 21. The valleys and ribs can have any desired cross sectional shape. As illustrated in Fig. 1 a substantially V-shaped cross section is utilized.

Dippers 22 are mounted in the drum 10 in diametrically opposed relation and extend lengthwise of the shell 11 between the end heads 12 of the drum. Each dipper 22 is connected through a drain tube or pipe 23 with the interior of the axle portion 13a on the drain side of the partition plate 16. Condensate from the dippers 22 is thereby removed through this axle portion 13a into the drain line 19.

Each dipper 22 has a back wall 22a as shown in Figs. 1 to 3 extending along the full length of the cylinder 11 and equipped with a scalloped or tabbed free end portion 22b with recesses receiving the ribs 20 and tabs projecting into the bottoms of the grooves 21. A top wall 22c extends forwardly in the direction of rotation of the cylinder from the top end of the back wall 22a and slopes downwardly to a portion 22d resting on top of the ribs 20. The top wall then extends inwardly along a sweeping path toward the central portion of the cylinder to provide a scoop-like lip 22e.

The dipper cooperates with the ribbed interior of the cylinder 11 to provide an inlet mouth 24 having an appreciable width at its inlet end along the entire length of the cylinder 11 and converging to a throat portion 25 best shown in Fig. 2 which is divided into individual passages by the ribs 20. The throat 25 is only as wide as the depth of the grooves 21. The throat 25 then discharges into an enlarged chamber 26 backed by the back wall 22a. This chamber 26 is emptied through an aperture 23a into the pipe 23 on the back wall 22a.

The dippers 22 are affixed to and rotate with the cylinder or shell 11.

In operation, condensate from the heating fluid introduced into the drum by the nozzles 17 is scooped through the mouth portion 24 of a dipper 22 and through the individual throats 25 between the ribs 20 into the chamber 26 of the dipper. The liquid cannot flow out of the chamber 26 because the back wall 22a of the dipper extends down into the grooves and either snugly engages the shell or has close clearance relationship therewith. As the drum rotates the dipper

to levels above the drain line 23, the fluid in the chamber 26 will drain through the line 23 into the axle 13a and then out through the drain line 19.

The dippers are effective for removing ponds of condensate at the bottom of the shell as well as for removing films of condensate held by centrifugal force against the grooved interior of the shell provided of course that there films are thick enough to be retained by the tab portions 22b on the back wall of the dipper. If desired the tabs can have a predetermined spaced relationship with the grooves defining walls of the shell so that films of desired thickness can remain in the grooves.

In the embodiment of the invention, shown in Figs. 4 to 6, the internally grooved drier drum 10 is equipped with a modified arrangement of dippers 30. These dippers 30 each include a header pipe 31 extending along the length of the cylinder 11. A forwardly projecting curved lip plate 32 is welded to the forward lower portion of the pipe 31 along the full length of the pipe. A series of angle members 33 are welded to the underface of the lip 32 and to the header pipe 31 to project from the pipe into the grooves 21. Thus the angle members 33 are welded along the longitudinal edges of their side walls at 34 to the lip 32 as shown in Fig. 6 and are welded at their back ends as at 35 to the pipe 31 as shown in Fig. 4.

The front ends of the angle members 33 are covered with triangular shaped plates 36 which are welded thereto. These plates 36 are also welded to the underface of the lip 32 and extend from the lip into the grooves 21 to closely fit alongside of the ribs 20 as shown in Fig. 4. The plates 36 have orifices or apertures 37 therein near their lower edges.

A series of chambers 38 are thereby provided under the lip 32 for receiving condensate from the grooves 21 through the apertures 37 in their leading lower front faces. The rear ends of these chambers 38 communicate through apertures 39 with the interior of the header pipe or tube 31. The tube 31 is drained by drain line 40 in the same manner as the dippers 22.

The lip 32 projects forwardly from the tube 31 into contact with the apices of the ribs 20 and then curves inwardly toward the center of the cylinder 11 to provide a wide inlet mouth 41 converging to inlet throats 42 in the grooves 21 which are backed by the plates 36 and are drained through the orifices 37.

Two dippers 30 in diametrically opposed relation are used in the drum 10 in the same manner as the dippers 22 shown in Fig. 1.

The modified dipper arrangement of Figs. 4 to 6 operates in the same manner as the dipper of Figs. 1 to 3 but includes individual passageways from the grooves of the drier cylinder to a common header pipe. As in the case of the dipper shown in Figs. 1 to 3, the modified dipper of Figs. 4 to 6 rotates with the drum to scoop condensate from the interior of the drum including the condensate contained in the grooves of the drum cylinder.

In the embodiment shown in Figs. 7 and 8 the condensate in the interior of the drum is removed by another form of dipper arrangement 45 also used in diametrically opposed pairs as shown in Fig. 1.

Each dipper 45 includes a longitudinally extending header pipe or tube 46 drained by a drain line 47 and having a series of nozzle tubes 48 projecting forwardly therefrom as shown. The

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nozzle tubes 48 extend into some of the grooves 21 of the cylinder 11 and have open forward ends arranged for scooping fluid contained in the grooves into the header 46. As shown in Fig. 7 only alternate grooves 21 contain the tubes 48. Fluid in the grooves not containing the tubes 48 can be removed by overflowing these grooves or by providing communicating passageways between the grooves (not shown).

In all embodiments of the invention the dipper extends across the full length of the grooved cylinder and has means arranged for extending into the grooves of the cylinder to scoop condensate or other fluid contained in these grooves into a drain line. The dippers rotate with the cylinder and can be securely affixed to the cylinder to prevent development of loose parts and scraping action such as occurs with the use of stationary dippers in a rotating cylinder.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

We claim as our invention:

1. A dipper construction for use in an internally grooved drying drum having a plurality of spaced parallel, circumferential grooves around the inner face thereof separated by circular ribs, said dipper construction comprising an elongated fluid conduit for overlying the ribs of the drum along the length of the drum and having an apertured back wall carrying projections for extending into the bottoms of the grooves of said drum, a forwardly extending wall on said conduit for contacting the tops of said ribs of the drum and a turned out lip on the forward end of said forwardly extending wall for forming an enlarged inlet entrance mouth to the chamber formed between said forwardly extending wall and said drum for directing fluid into the conduit while said projections dam off flow of the fluid in the grooves beyond the back wall.

2. A dipper for use in an internally grooved drying drum having a plurality of spaced circumferential grooves around the inner faces thereof and separated by circular ribs, said dipper comprising an elongated fluid conduit extending along the length of said inner faces and having a back wall having an aperture therein and carrying projections for extending into the grooves of said drum to prevent the flow of fluid in the grooves beyond the back wall, a forwardly extending wall on said conduit for contacting the ribs of said drum, said forwardly extending wall terminating in a turned out lip defining an enlarged entrance mouth to the inlet chamber formed by said forwardly extending wall, and the inner face of said drum.

3. A dipper for use in an internally grooved drier drum having a plurality of spaced parallel circumferential grooves around the inner faces thereof and separated by circular ribs, said dipper construction comprising a back wall portion having an aperture therein and a scalloped free lower edge arranged for closely fitting alternate grooves and ribs of the drum, a top wall portion extending forwardly from the upper edge of said back wall in spaced relation to said scalloped free lower edge, and a raised lip on the forward end of said top wall for overlying said ribs in contact therewith to define an enlarged inlet mouth.

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4. A dipper construction for use in an internally grooved drier drum having a plurality of spaced parallel circumferential grooves on the inner face thereof separated by circular ribs, said dipper construction comprising an elongated header pipe, a lip plate extending forwardly from said header pipe along the length thereof and having an upturned terminal lip extending forwardly from the upper free edge thereof, a plurality of V-shaped angle members along the length of the pipe beneath said plate to define back wall portions, said angle members cooperating to define a scalloped free lower edge arranged for closely fitting alternate grooves and ribs of the drum and cooperating with said lip plate to define a plurality of troughs underlying said lip plate, apertured front walls under the lip plate and cooperating with said angle members and said lip plate to define front walls for said troughs, and said header pipe having apertures therein joining the troughs with the interior of said header pipe.

5. In an internally grooved drier drum having a plurality of spaced parallel grooves around the inner faces thereof and separated by circular ribs, a dipper for removing condensate from said drum comprising an elongated back wall extending axially of the drum and having an aperture therein together with depending lower projections extending edgewise into said grooves, said projections damming off the free flow of fluid in the grooves, without covering an extended area of the cylinder wall, and an upper turned out lip extending forwardly of said back wall and contacting the ribs of said drum beyond the dipper, and said turned out lip directing fluid from said grooves against said projections and into said dipper, and a chamber defined by said back wall in cooperation with said projections and said lip for receiving fluid scooped into the dipper by said projections.

6. A drier drum assembly comprising a rotatably mounted drum having a cylindrical shell with alternate grooves and ribs extending around the inner face of the drum along the length thereof, a pair of diametrically opposed dippers in said shell extending along substantially the axial length of said shell, each of said dippers having an apertured back wall provided with lower depending projections extending into said troughs to dam off the free flow of fluid in said grooves beyond said dippers without covering an appreciable area of the cylinder wall, and each of said dippers having a forwardly projecting outturned lip extending from the upper edge of said back wall and contacting said ribs for directing fluid into the dipper associated therewith, and drain lines from said dippers for emptying condensate therefrom.

LLOYD HORNBOSTEL.
JOHN E. GOODWILLIE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,108,077	Kilberry	Aug. 18, 1914
1,248,589	Wyld	Dec. 4, 1917
1,483,343	Gladin	Feb. 12, 1924
1,670,113	Harrison	May 15, 1928
1,837,562	Mayer	Dec. 22, 1931
1,919,416	Cram	July 25, 1933