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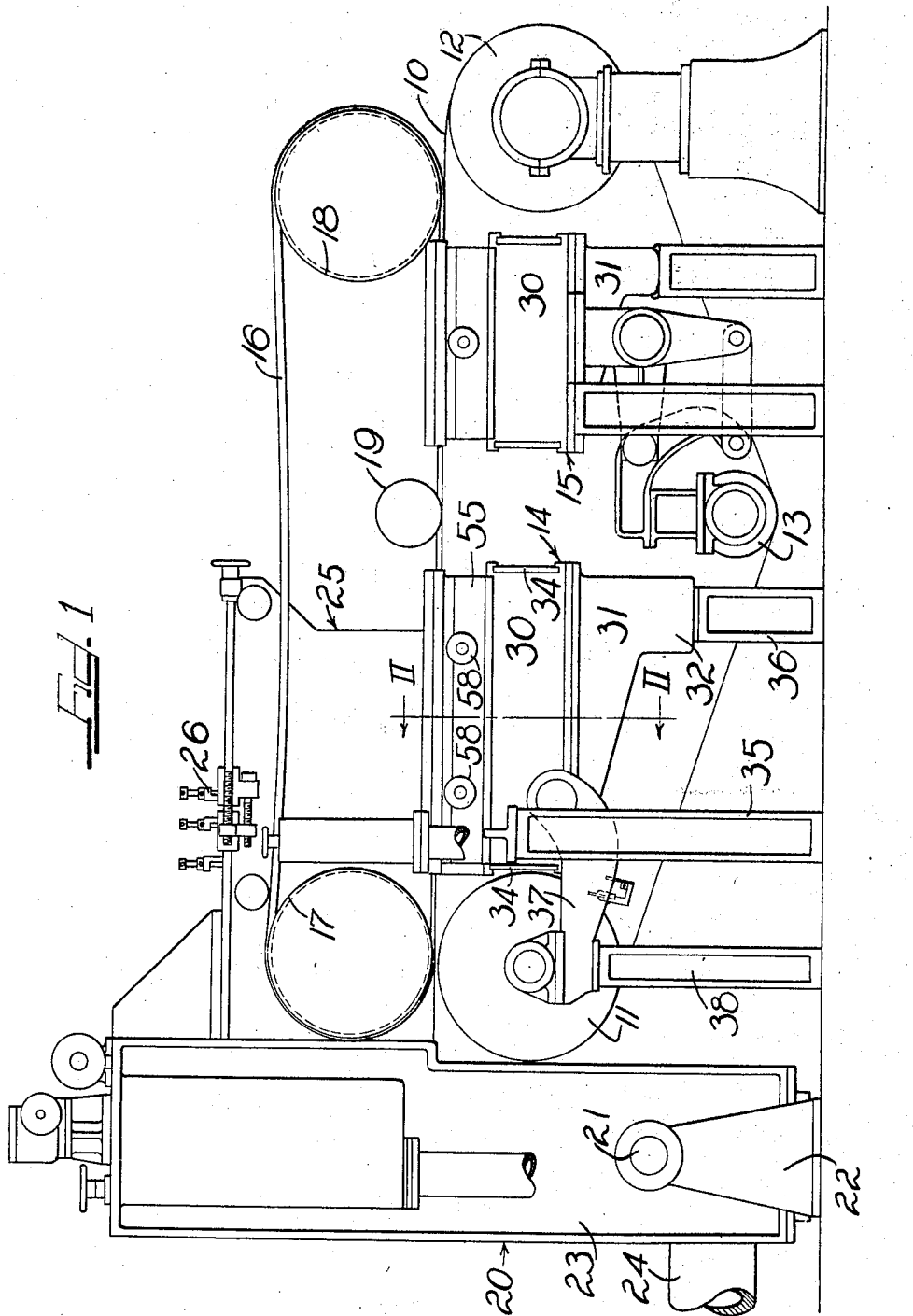
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2,274,654

DRAIN BOX FOR PAPERMAKING MACHINES

Original Filed March 27, 1936

3 Sheets-Sheet 1



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March 3, 1942.

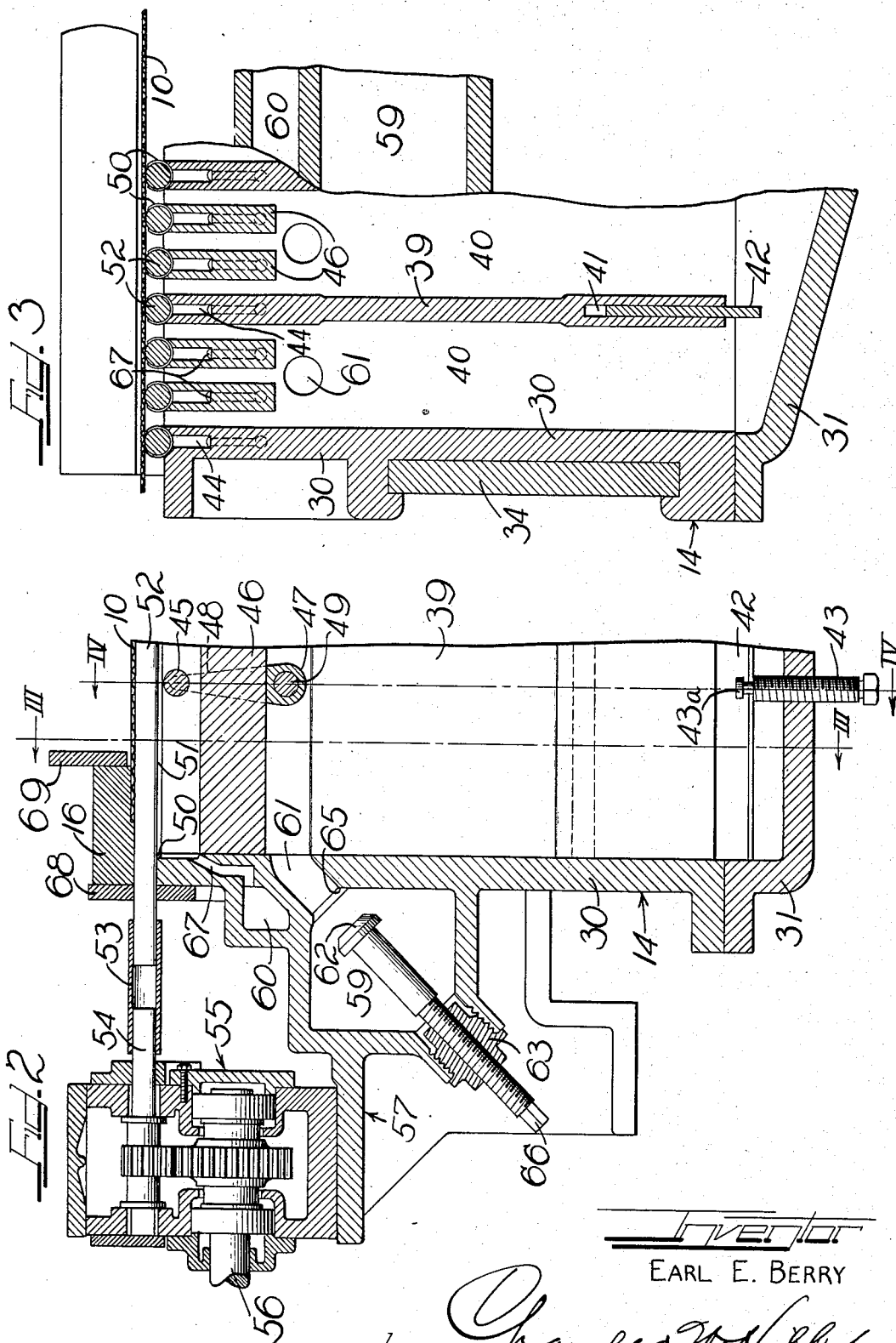
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3 Sheets-Sheet 2



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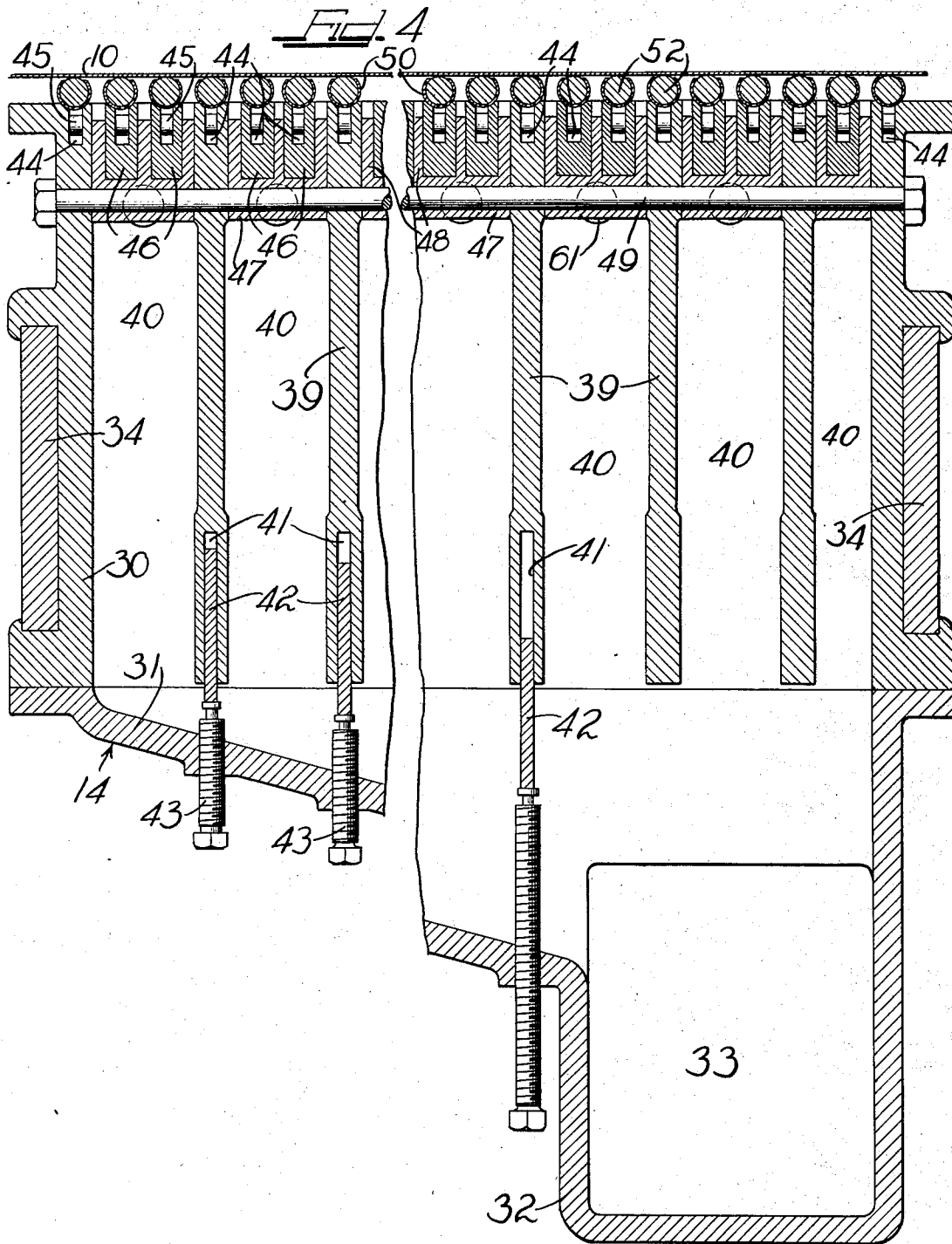
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DRAIN BOX FOR PAPERMAKING MACHINES

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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DRAIN BOX FOR PAPERMAKING MACHINES

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Original application March 27, 1936, Serial No. 71,109. Divided and this application May 3, 1937, Serial No. 140,299

12 Claims. (Cl. 92-51)

This invention relates to drain box structure for Fourdrinier type paper making machines.

More specifically this invention relates to drain boxes for mounting under the upper run of Fourdrinier wires in paper making machines to regulate drainage of liquid through the wires and to support the wires.

This application is a division of my copending application, entitled: "Pressure and vacuum forming paper making machine," Serial No. 71,109, filed March 27, 1936, which has matured into Patent No. 2,202,890.

Attempts to effect web formation on Fourdrinier wires of short lengths by forcing the drainage of white water from the paper stock on the wires have not been entirely satisfactory because the suction boxes and draining devices placed beneath the forming wires have subjected the wires to high frictional wear as they pass over the devices. The drain boxes of this invention carry at the tops thereof bearing supports for small diameter table rolls. These table rolls are supported in the bearings throughout substantially their entire lengths and by virtue of their small diameters can be mounted in close relation transversely of the upper run of the forming wire. This makes possible a more continuous support for the wire without wearing out the bottom of the wire by friction. Forced drainage of white water through the wire is obtained by controlled suction in the drain boxes without causing a frictional drag on the under side of the wire as occurred heretofore.

The drain boxes of this invention will be specifically hereinafter described in connection with a pressure and vacuum forming paper making machine forming the subject matter of Patent No. 2,202,890. It should be understood, however, that the drain devices of this invention are adapted for use on other types of dewatering machines.

The drain devices of this invention are preferably divided into a plurality of chambers extending transversely under the upper run of the forming wire. Suction from within each of the chambers can be separately controlled and drainage of white water from the chambers can also be separately controlled.

The drain boxes are slidably mounted on tracks extending through the loop of the forming wire of the paper making machine and can be conveniently moved into and out of operating position. Separate pedestals or supports can be disposed under the drain boxes for holding the same in operating position.

It is then an object of this invention to provide

drain boxes for dewatering machines having bearing sleeves across the open tops thereof for rotatably carrying small diameter table rolls to support the wire screen of such machines as they pass over the drain boxes.

A further object of this invention is to provide drain boxes with separate chambers therein and to control the vacuum in each chamber and the drainage of liquid from each chamber.

A further object of this invention is to provide improved white water draining devices for paper making machines that can be carefully regulated to effect fiber formation on the wire as desired.

Other and further objects of this invention will become apparent to those skilled in the art from the following detailed description of the annexed sheets of drawings, which disclose a preferred embodiment of the invention.

On the drawings:

Figure 1 is a side elevational view of a paper making machine equipped with drain boxes of this invention.

Figure 2 is an enlarged fragmentary vertical cross-sectional view taken substantially along the line II-II of Figure 1.

Figure 3 is a fragmentary vertical cross-sectional view taken substantially along the line III-III of Figure 2.

Figure 4 is a broken vertical cross-sectional view taken substantially along the line IV-IV of Figure 2.

As shown on the drawings:

In Figure 1, the reference numeral 10 designates the forming wire of the paper machine. The wire 10 is entrained between a breast roll 11 and a couch roll 12. A tensioning roll 13 can be mounted within the loop of the wire along the under run thereof for regulating the tension of the wire.

The drain boxes 14 and 15 of this invention are mounted under the upper run of the forming wire 10 and carry table roll structure, as will be more fully hereinafter described, for supporting the forming wire along its upper run.

A deckle strap 16 is mounted along the upper run of the forming wire 10 at each side thereof and is trained around the usual deckle pulleys 17 and 18. As will be hereinafter more fully described each deckle strap 16 rests along its bottom run, partly on the edge of the forming wire 10 and partly on the table rolls carried by the drain boxes to seal the chambers of the drain boxes and to prevent leakage of stock over the sides of the forming wire.

If desired a dandy roll or water marking roll

19 can be rotatably mounted along the upper run of the wire between the boxes 14 and 15 to mark the web on the wire.

A head box 20 for supplying stock to the forming wire is mounted behind the breast roll 11 on pivots 21 held in supports 22. The head box 20 comprises a vertical compartment 23 adapted to receive aqueous suspensions of stock from feed pipes such as 24 entering the compartment 23 near the bottom thereof. The head box also has a horizontally disposed compartment 25 which extends over the upper run of the forming wire 10 as shown. The compartment 25 has mounted therein a horizontally and vertically adjustable slice plate 26 extending transversely thereacross above the upper run of the forming wire.

Stock is metered off from the compartment 23 of the head box into a nozzle (not shown) extending into the compartment 25 of the head box. A pond of stock of desired area can be maintained above the upper run of the forming wire in the compartment 25 of the head box and the size of this pond can be regulated by horizontal adjustment of the slice plate 26. There is thus created a forming area for a paper web within the compartment 25 of the head box above the drain box 14.

The drain boxes 14 and 15 of this invention comprise frame members 30 defining rectangular open topped chambers closed at the bottom thereof by a sloping pan 31 secured thereto by means of bolts or the like securing means.

For purpose of convenience the drain box 14 only will be hereinafter described, it being understood that the box 15 is of similar construction.

The lower end of the pan 31 is enlarged as at 32 to define a sump or white water collecting trough 33 (Figure 4).

The ends of the frame 30 slidably engage horizontally disposed tracks or beams 34. These beams 34 extend for a considerable distance into the aisle alongside of the paper making machine and serve as supporting means for the boxes when the same are moved into and out of operating position. This track arrangement provides a convenient structure for removing the drain boxes from within the loop of the forming wire as when changing the wire on the machine or when it is desired to inspect or repair the boxes.

When the boxes are disposed in operating position within the loop of the wire 10 the same are supported in operative position on pedestals 35 and 36. These pedestals are removable to permit a sliding of the drain box on the tracks 34.

The drain box 14 can be pivotally connected through an arm 37 to the breast roll 11. The breast roll 11 is normally supported in operative position on a pedestal 38, but when this pedestal is removed the roll can be suspended from the drain box 14 and moved toward the couch roll when supported on the arms 37 thereby facilitating a wire changing operation on the machine.

As best shown in Figures 2 to 4, the rectangular frame structure of the box 14 is provided therein with a plurality of partition walls 39 dividing the box into a plurality of chambers 40 extending transversely under the forming wire 10.

The ends of some of the partition walls 39 are slotted as at 41 for receiving slides 42 therein to regulate the size of the spaces in the drain pan 31 under the partition walls. The slides 42 are utilized to control the amount of drainage from each chamber 40 into the sump 33. The slides 42 are raised and lowered in the slots 41

by means of screws 43 having heads 43a seated in recesses formed in the bottoms of the slides as best shown in Figure 2. The screws extend through the pan 31 where they are readily accessible for manual manipulation.

The top of each partition wall 39 together with the top of the end frame members of the box 14 are slotted as at 44 across their entire widths for defining slots extending the full width of the box. The walls defining the slots may be reinforced by core members 45 (Figure 4) cast integrally into the slots or wells.

Between each of the partition walls and between the partition walls and the ends of the frame 30 of the box 14, there are mounted bars 46 extending parallel with the walls and likewise provided with slots or wells 44 therein.

The bars 46 are held in proper spaced relation between the partition walls and the frame member 30 by bushings 47 having fingers 48 extending between the bars as best shown in Figures 2 and 4. These bushings 47 are supported by tie rods such as 49 extending therethrough and disposed at the ends thereof in the frame 30 of the box. Several such tie rods 49 and sets of bushings 47 may be provided across the width of the box for rigidly supporting the bars 46.

The rods, as shown in Figure 4, extend through the partition walls 39 and serve as bracing means for these walls.

Each bar 46, each top of a partition wall 39 and each top of the end frame member 30 of the box 14, as pointed out above, are thus provided with slots 44 extending across the full width of the box. Bearing sleeves 50 are securely seated over the tops of each of these members as by welding, brazing, or soldering. The sleeves 50 are provided with slots or openings 51 (Figure 2) in communication with the slots 44 of these members.

Small diameter table rolls 52 are loosely journaled in the bearing sleeves 50 and extend across the full width of the box for supporting the forming wire 10. Since the rolls are of small diameter and supported in bearing sleeves for substantially their full length, they are capable of being rotated at high speed and are capable of being mounted close together so as to more continuously support the forming wire 10.

The table rolls 52, as shown in Figure 2, can be coupled through flexible couplings 53 to drive shafts 54 extending from a gear box 55 containing a gear train for driving from a single shaft 56 a plurality or battery of table rolls. The gear box 55 can be mounted on a frame structure 57 (Figure 2) formed integral with the box frame structure 30. It should be understood that alternate rolls 52 can be driven from opposite ends by providing a second gear box on the other side of the drain box.

In Figure 1, there are shown two electric motors 58 for driving the gear train in a gear box. Obviously one of the motors 58 and one of the gear boxes 55 could be mounted on the other side of the box 14 if desired. Furthermore the table rolls can be driven at synchronous speed by any suitable belt or chain device actuated by any moving part of the paper machine, such as, for example, the couch roll. Furthermore, if desired, the table rolls can be driven by the forming wire 10 alone by contact therewith.

The supporting frame 57 for the gear box 55, as shown in Figure 2, defines an elongated manifold chamber 59 extending across the full length of the box 14 and a small manifold

chamber 60 located thereabove. The chamber 59 has at least one passageway or opening 61 communicating with each chamber 40 of the box 14. The manifold chamber 59 can be evacuated by a vacuum pump (not shown) to draw air from the chambers 40 through the opening 61. The chambers 40 are thus suction boxes on the under side of the forming wire 10 since air pulled through the manifold 59 to evacuate the chambers, must be drawn through the forming wire 10 between the table rolls 52 along the spaces provided between the bars.

The amount of air evacuated from each chamber 40 can be positively controlled by a stopper or plunger 62 provided for each passageway or opening 61. The stopper 62 is threaded through a boss plug 63 which in turn is threaded into the box defining the manifold chamber 59. A stopper 62 can be manually set at any desired distance from a seat 65 at the mouth of each passageway 61 by a manual turning of the head 66 on the end of the stopper.

The slots 44 formed in each of the bars 43, each of the partition walls 39 and the end frame members 30 of the box 14 communicate through individual passageways 67 (best shown in Figures 2 and 3) formed in a side of the frame member 30. The passageways 67 lead into the manifold chamber 60.

The chamber 60 is supplied with water under sufficient pressure to flow up through the passageways 67 into the slots 44 and through the openings or slots 51 of the bearing sleeves 50 for forming a lubricating film between the table rolls 52 and the bearing sleeves 50. It will be noted from Figure 3 that each slot 44 has a separate passageway 67 communicating with the manifold chamber 60. In this manner water is equally distributed to each of the slots 44 for lubricating each of the table rolls 52.

The flow of water into the bearing sleeve 50 can be controlled by hydraulic pressure of the water in the manifold chamber 60 to overbalance the weight of the table rolls and flow out of the bearing sleeves into the chambers 40 of the drain box along with the white water drained through the forming wire. Alternatively the water pressure can be adjusted to merely supply a film of water on each bearing sleeve 50 without overflowing the water out of the sleeve.

The table rolls are thus hydraulically lubricated and balanced as desired in their bearing sleeves.

Each deckle strap 16, as shown in Figure 2, rests partly on the forming wire 10 and partly on the table rolls 52. Each deckle strap is guided between a plate 68 secured on the side of the box 14 and an inner plate 69 which may extend along the full length of the upper run of the forming wire. The deckle strap thereby seals the edge of the forming wire and the aqueous suspension of stock deposited on the wire can only be drained through this wire under the controlled drainage effected by the amount of vacuum in each compartment 40 of the drain boxes.

The white water drained into the drain boxes is collected in the sump 33 thereof and pumped therefrom by means of the usual white water pump (not shown). A hydrostatic head of white water, however, can be maintained in each compartment 40 of the drain boxes by regulating the drainage from these compartments. This drainage is controlled by spacing of the slides 42 from the bottom of the pans of the boxes.

Each compartment 40 can thus be sealed from the remaining compartments and the amount of suction under the forming wire definitely controlled by the suction pump operating through the manifold chamber 59 and by the position of the stopper 62 in respect to the passageway 61 communicating with this compartment.

As best shown in Figure 4, some of the partition walls 39 are not provided with slides. These walls are spaced away from the forming area of the wire where it is desired to remove any white water from the sheet formed on the wire. As a result it is desired to have an increased vacuum at these points created by the white water pump and the vacuum pump.

If desired, mechanisms may be provided for oscillating the table rolls longitudinally to prevent any grooving of the rolls by dirt which might enter into the bearing sleeve. However, this dirt can be readily removed by an overbalanced hydraulic pressure flowing the lubricating water out of the bearing sleeve to carry the dirt therewith.

From the above descriptions it should be understood that the drain boxes of this invention carry table roll structure which supports the upper run of the forming wire in a more continuous manner than heretofore provided. As a result, higher vacuum can be maintained under the wire without the frictional wear of the under side of the wire heretofore encountered. Variable degrees of suction can be maintained under advancing increments of the wire and the web formation on the wire is thus nicely regulated. I am aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I, therefore, do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as my invention:

1. A white water drain box for paper machines adapted for mounting within the loop of the paper machine forming wire comprising an open topped box having a plurality of partition walls extending thereacross to define chambers within the box, said walls terminating above the bottom of the box, slides cooperating with the bottom portion of at least some of the partition walls to regulate the size of the open space beneath said walls, and means operable from outside of the box for raising and lowering the slides.

2. A device for controlling drainage from paper machine forming wires comprising an open topped box adapted for mounting within the loop of said forming wire and having a bottom including a sloping portion and a sump portion, a plurality of transversely extending vertical partition walls in said box defining opened top chambers therein, said walls terminating above the bottom of the box with the walls above the sloping portion having slotted ends, plates slidable in said slots for regulating the size of the openings between the chambers defined by said walls, and means for sliding said plates in said slots.

3. A drain device adapted to be mounted within the loop of the forming wire of a paper machine comprising a box for receiving white water through the forming wire of said machine, said box having a plurality of vertical partition walls above the bottom thereof defining intercommunicating chambers therein, a white water collecting sump in the bottom of said box, and gates co-

operating with said walls for controlling drainage from said chambers into said sump.

4. A white water drain device for a Fourdrinier paper machine comprising a box adapted to be mounted within the loop of the forming wire of the machine, vertical partition walls in said box terminating in spaced relation from the bottom of the box, said walls having vertically slotted bottom portions, plates slidable in said slotted portions, and screws extending through the bottom of the box for raising and lowering said plates.

5. A white water drain device for a Fourdrinier paper machine comprising a box adapted to be mounted within the looped forming wire of said machine under the upper run thereof, a bottom for said box having a downwardly sloping portion and a sump portion below the bottom of said sloping portion, vertical partition walls in said box terminating above the bottom thereof, the walls above the sloping bottom portion of the box having vertical slots in the ends thereof, plates slidable in said slots, and lift screws extending through the sloping bottom portion for raising and lowering said plates to control the rate of drainage into the sump from the chambers defined by the walls.

6. A drain device and filter band support for dewatering machines comprising a box adapted for mounting within the loop of the filter band, a plurality of partition walls in said box defining a plurality of chambers, a duct extending for substantially the full length along side of said box in communication with each of the chambers in the box near the tops thereof for receiving air therefrom, spaced bars in the top portions of the chambers extending transversely across the box parallel with the partition walls, said bars having slots therein extending across the tops of said chambers, elongated segmental cylindrical bearing sleeves secured to the tops of the bars in communication with the slots therein, table rolls rotatably mounted in said bearing sleeves for engaging the underside of the filter band to support the band, a second duct extending alongside of the box in communication with each of the slots in said bars for supplying a lubricant to the bearing sleeves, and means carried by the box for rotating said rolls.

7. In a drain device for dewatering machines including a looped liquid pervious filter band, an open topped box adapted for mounting within the loop of said band, rods extending longitudinally across said box near the top thereof, bushings on said rods having upturned arms in spaced relation, transverse bars removably mounted between said arms, said bars extending in spaced parallel relation across the top of the box thereby defining drain openings therebetween, said bars having longitudinal slots extending across the tops thereof, a wall of said box having apertures in communication with slots, a duct carried by said box for supplying water through said apertures to the slots, bearing sleeves secured to the tops of said bars adapted to receive water from the slots therein and table rollers rotatably mounted in said sleeves.

8. In a drain box for dewatering machines a plurality of partition walls defining chambers, a duct integral with a side wall of said box extending for substantially the length of said side wall, said wall having apertures therethrough joining the duct with the top portion of each chamber in the box, seats formed on the duct side of said apertures, valves in said ducts adapted to fit

into said seats, and means operable from outside of said duct for setting the position of said valves.

9. A drain device adapted to be moved as a unit into the loop of a Fourdrinier forming wire between the breast roll and couch roll ends of the wire for supporting the upper run of the wire and for controlling drainage through the wire comprising an open topped box having a bottom sloping downwardly toward the couch roll end of the forming wire, said box having a drain outlet communicating with the lowermost portion of the bottom, spaced transverse partition walls in said box extending downwardly from the top of the box to define a plurality of open topped chambers in the box, said chambers being in communication with each other at the bottom of the box, gates for restricting the amount of communication between the chambers, means operable from outside of the box for actuating said gates, spaced parallel bars between the partition walls extending transversely across the top portion of the box, an elongated bearing support extending along the top of each bar and each partition wall, and small diameter table rolls rotatably mounted in said bearing supports for carrying the forming wire.

10. A drain device adapted to be moved as a unit into the loop of a Fourdrinier forming wire for supporting the upper run of the wire and for controlling drainage through the wire comprising an open topped box having a drain outlet communicating with the bottom portion thereof, spaced transverse partition walls in said box extending downwardly from the top of the box to provide a plurality of open topped chambers in the box, said chambers being in communication with each other at the bottom of the box, gates for restricting the amount of communication between the chambers, means operable from outside of the box for actuating said gates, spaced parallel bars in the top portion of the box disposed between the partition walls and extending transversely across the box, the tops of said bars and the tops of said partition walls providing elongated bearing housings extending across the top of the box, and small diameter table rolls rotatably mounted in said bearing housings for carrying the forming wire whereby drainage through the wire into the chambers is accommodated between the spaced bars and partition walls and the amount of said drainage can be controlled by manipulation of the gates to provide variable drainage conditions along the length of the box.

11. In a Fourdrinier paper making machine having a looped forming wire, a drain box mounted within the loop of the wire and extending beyond the sides of the wire, elongated open topped bearing sleeves extending transversely across the top of the box in closely spaced parallel relation, an elongated stationary plate on the side of the box extending above the bearing sleeves, small diameter table rollers rotatably mounted in said sleeves and extending through said plate, said table rollers supporting the wire along the upper run thereof, driving means engaging the extending ends of the table rollers for driving the rollers and wire, a deckle strap at the edge of the wire along the upper run thereof, said deckle strap projecting beyond the wire edge to abut the plate, the projecting portion of the strap being directly carried by the table rollers, and an elongated stationary guide plate along the inner side of the deckle strap to hold the deckle strap against the plate whereby

the deckle strap is carried on movable supports and prevents leakage of air around the edge of the wire into the drain box.

12. In a Fourdrinier paper making machine having a looped forming wire, a suction box within the loop of said wire, a plurality of closely spaced small diameter table rollers rotatably carried in the top of said box and extending transversely under the upper run of the wire for supporting the wire, said table rollers projecting beyond an edge of the wire, an elongated stationary wall member extending along the length of said

5 box above the tops of the table rollers in spaced relation from the edge of the wire, a deckle strap abutting said wall member and carried on a portion of the table rollers projecting beyond the wire, and said deckle strap having a portion thereof extending over the edge of the wire whereby the deckle strap is directly carried at closely spaced intervals on rotatable supports and cooperates with the wall member to prevent leakage of 10 air around the edge of the wire into the suction box.

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