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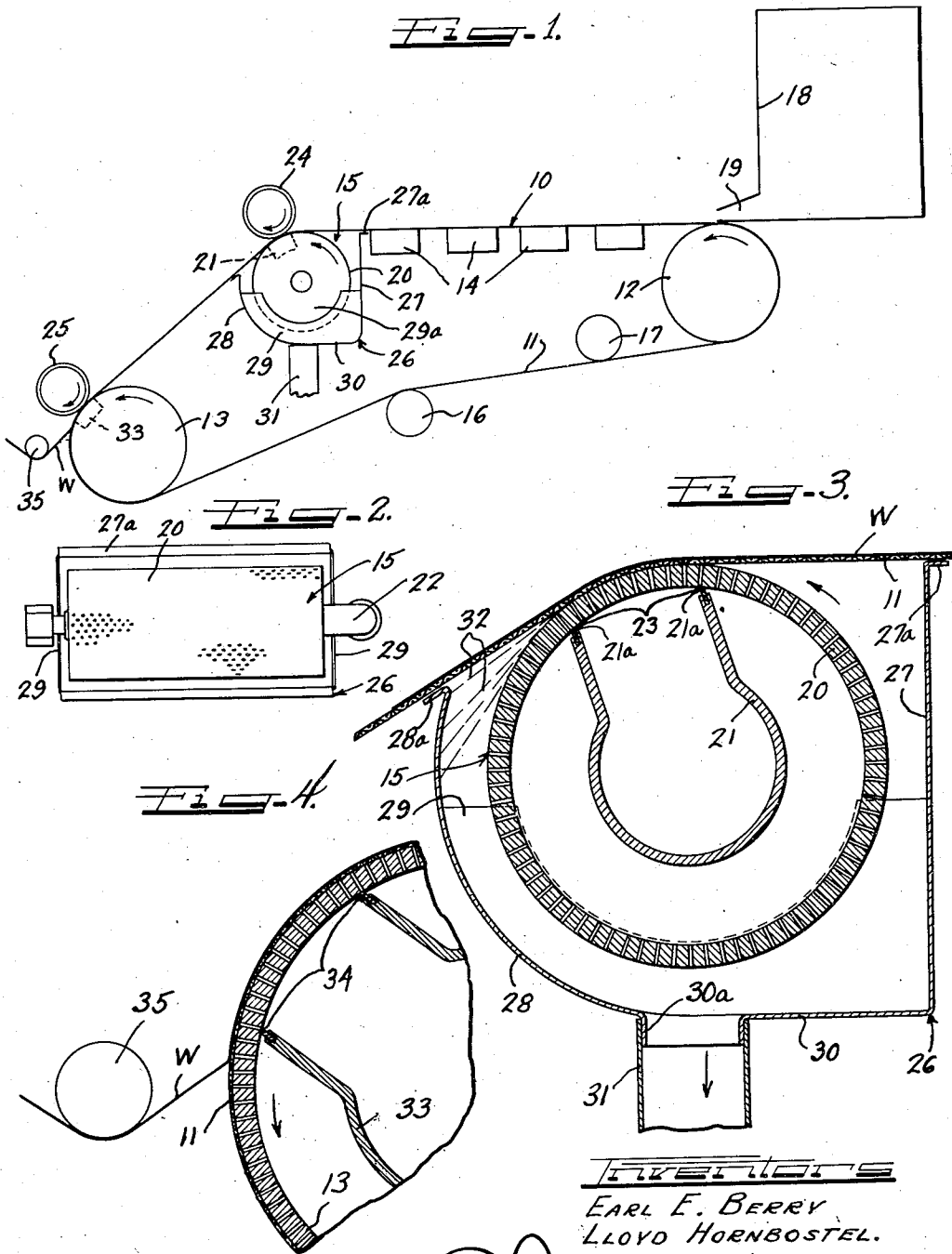
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2,369,653

MULTICOUGH ROLL PAPER MAKING MACHINE

Filed June 8, 1942

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 5.

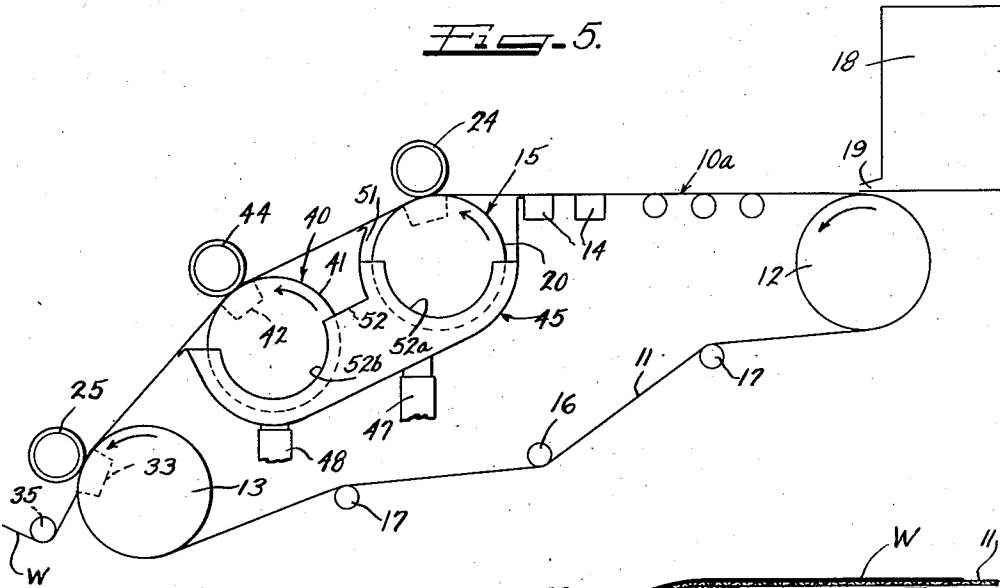
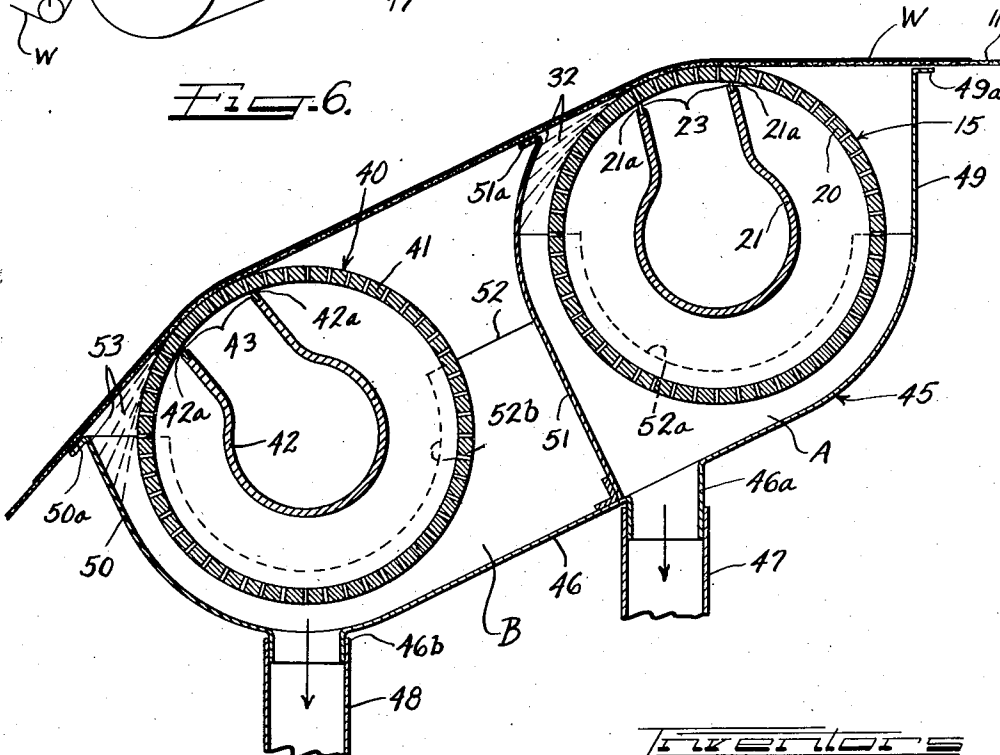


Fig. 6.



WITNESSES
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UNITED STATES PATENT OFFICE

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MULTICOUCH ROLL PAPERMAKING MACHINE

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Application June 8, 1942, Serial No. 446,180

2 Claims. (Cl. 92-44)

This invention relates to paper making machines having primary suction couch rolls acting on the web of paper being formed in advance of the usual couch roll of the machine.

More specifically the invention relates to the provision of one or more auxiliary suction rolls within the loop of a paper machine forming wire to eliminate wear on the wire such as occurred with the use of the heretofore necessary stationary suction boxes and to decrease or eliminate rewetting of the paper web with liquids that have been removed from the web.

In the conventional endless band or Fourdrinier type paper making machine, water is removed from stock on the upper run of the band or wire by passing the wire over a series of stationary suction boxes. As the stock becomes more dehydrated due to drainage of water therefrom, there is less water available to lubricate the wire as it passes over the stationary suction boxes. As a result, those suction boxes which are positioned adjacent the couch roll end of the wire act through the wire on a drier web of stock than those boxes which are positioned closer to the breast roll end of the wire. In order to be effective the suction boxes adjacent the couch roll end of the wire must carry a relatively high vacuum to draw additional water out of the partially dehydrated web of stock and they thereby tightly pull the wire against their stationary covers. Since only small amounts of water are available at these points to lubricate the wire, a great frictional drag is created on the wire. This drag not only necessitates greater power input to drive the wire, but also wears away the wire and materially shortens its useful life. It has, accordingly, been heretofore necessary to frequently change forming wires on Fourdrinier type paper making machines.

In accordance with the present invention, however, the frictional drag imparted to the wire by suction boxes adjacent the couch roll end of the wire is decreased and the useful wire life is materially increased. At the same time this invention makes possible increased dehydration of the stock on the wire before it reaches the couch roll end of the wire. Since the frictional drag on the wire is reduced the invention further decreases the necessary power input for driving the wire.

In accordance with this invention one or more primary suction couch rolls are mounted in the loop of a forming wire on a Fourdrinier type paper making machine in advance of the couch roll of such a machine to replace the heretofore

necessary stationary suction boxes at this point. The primary suction couch roll or rolls can be operated at high vacuum to draw even more water out of the web of paper stock on the wire than the stationary suction boxes heretofore used and, at the same time, have no frictional dragging effect on the wire.

The primary suction couch roll or rolls are mounted under the upper run of the Fourdrinier wire in advance of the main suction couch roll to supply the main suction couch roll with a web of stock that is at least as dry as the web supplied to such a roll from the heretofore used stationary suction boxes. The primary suction couch rolls are arranged within the loop of the Fourdrinier wire in a manner so that the wire and web thereon is removed from the rotating shell of the primary couch roll before vacuum is completely broken in the holes of the shell. A save-all tank or trough is preferably mounted around the shells of the primary suction couch rolls to receive water discharged by centrifugal force out of the holes of the shell to thereby prevent a rewetting of the web of paper.

As water is drawn from a web by the stationary gland or suction box in the rotating shell of a suction roll, some of this water will remain in the holes of the shell and will, unless precautions are taken, be thrown back into the web as the web leaves the suction area of the roll. However, this rewetting of the web is eliminated by arranging the primary suction couch of this invention with respect to the Fourdrinier wire so that water discharging from the holes of the rotating shell cannot recontact the web.

It is, then, an object of the present invention to provide a primary suction couch roll in advance of the usual couch roll on an endless band type paper making machine.

A further object of the invention is to provide a Fourdrinier type paper making machine with a plurality of suction couch rolls.

A still further object of the invention is to replace the conventional stationary suction boxes at the couch roll end of a Fourdrinier wire with one or more rotating suction rolls.

Another object of the invention is to increase the usual life of paper machine forming wires.

A still further object of the invention is to decrease the necessary power input to a paper making machine.

A still further object of the invention is to decrease or eliminate the rewetting of paper stock on the forming wire of a paper making machine.

A specific object of the invention is to provide one or more primary suction couch rolls in the loop of a Fourdrinier forming wire to act on stock deposited on the wire for dehydrating the stock and to so arrange each primary couch roll that it will not effect a rewetting of the paper stock.

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 a preferred examples, illustrate two embodiments of the invention.

On the drawings:

Figure 1 is a side elevational diagrammatic view of the forming end of a Fourdrinier type paper making machine equipped with a primary suction couch roll in accordance with this invention.

Figure 2 is a top plan view, in somewhat diagrammatic form, illustrating the primary suction couch roll surrounded by a save-all trough or tank.

Figure 3 is an enlarged vertical cross-sectional view taken through the forming wire, primary suction couch roll and save-all tank of this invention.

Figure 4 is a fragmentary vertical cross-sectional view of the main couch roll end of the paper machine shown in Figure 1.

Figure 5 is a view similar to Figure 1 but illustrating the forming end of a Fourdrinier type paper making machine equipped with two primary suction couch rolls in accordance with this invention.

Figure 6 is a view similar to Figure 3 but illustrating the two primary suction couch rolls of Figure 5 in vertical cross section.

As shown on the drawings:

In Figure 1 the reference numeral 10 designates generally an endless band or Fourdrinier type paper making machine including a looped forming wire 11 trained between a breast roll 12 and a suction couch roll 13. Stationary suction boxes 14 are mounted within the loop of the wire 11 under the upper run of the wire. In accordance with this invention, a primary suction couch roll assembly designated generally by the reference numeral 15 is mounted in the loop of the wire after the last suction box 14 and in advance of the suction couch roll 13. The wire thus has a substantially horizontal upper run between the breast roll 12 and the primary suction couch roll assembly 15. The wire then slopes downwardly to the main couch roll 13 and is trained around this couch roll and thence upwardly over a wire roll 16 and under another wire roll 17 back to the under side of the breast roll 12. The roll 16 can be a tensioning roll to maintain the loop in a taut condition.

A head box 18 supplies paper stock to the stock inlet or nozzle 19 which discharges onto the upper run of the forming wire at the breast roll end thereof. A paper web is formed on the wire 11 from the stock discharged thereon out of the inlet 19. Water and other liquids from the stock are drained by gravity through the open mesh wire 11 and this gravity drainage is assisted by suction effect from the boxes 14 so that, by the time the stock has advanced to the primary suction couch roll assembly 15, it is formed into a loosely matted web W as shown in Figure 3.

As shown in Figures 1 to 3 the primary suction couch assembly 15 includes a rotatably mounted perforated cylindrical shell 20 rotating around

a stationary suction gland 21 connected to a source of suction through a trunnion or pipe arrangement such as 22 (Fig. 2). The suction gland 21 has oncoming and offgoing seals 21a acting on the shell 20 to define a localized suction area 23 (Fig. 3) on the rotating shell 20. This area 23 is preferably entirely covered by the wire 11 and web W so that any air entering the gland 21 must be drawn through the web to effect extraction of water from the web. However, to prevent rewetting of the web with liquid drawn into the holes of the shell, the wire is removed from the shell before the vacuum in the holes is completely broken to release the water from the holes. As the holes pass beyond the offgoing seal 21a the vacuum therein is broken and the water therein can be discharged outwardly thereof by centrifugal force. According to this invention the wire is removed from the shell at the offgoing seal so that the centrifugally discharged water from the holes cannot re-enter the web W.

As shown in Figure 1, a rubber-covered top couch roll 24 can cooperate with the primary suction couch roll at the suction area thereof. This rubber-covered roll 24 engages the web W on the wire 11 and may act as a lump breaker roll to break up any lumps of stock in the web W. A similar rubber-covered roll 25 can cooperate with the main suction couch 13.

A save-all trough or tank 26 surrounds the shell 20 of the primary suction couch roll. This tank or trough includes a vertical front end wall 27 facing the breast roll end of the machine and having a horizontal flange or lip 27a in closely spaced relation under the upper run of the forming wire 11. An arcuate rear end wall 28 surrounds the offgoing side of the shell 20 and has an outturned flange or lip 28a in closely spaced relation from the wire 11 along the downward sloping path of the wire. Front and rear side walls 29 terminate below the tops of the front and rear end walls 27 and 28. These walls 29 may have cut-out sections 29a so as not to obstruct the suction pipe 22 or the axle support for the roll. The side walls 29 however extend above the bottom of the shell 20. A bottom wall 30 connects the front and rear end walls 27 and 28 as well as the front and rear side walls 29. This bottom wall 30 can have a collared aperture 30a receiving a drain pipe 31.

As best shown in Figure 3, any water drawn into the holes of the shell 20 from the web W as it passes over the suction area 23 will, of course, be released from the suction effect as soon as the shell passes beyond the suction area. This water will be discharged from the holes by centrifugal action in streams 32 tangential to the direction of rotation of the shell. However, since the wire 11 is removed from the shell 20 just before it passes beyond the offgoing edge of the offgoing seal 21a, the tangential streams of water 32 from the holes in the shell will not be thrown back through the wire so as to rewet the web W but, on the other hand, they will be projected against the wall 28 of the tank. The water will then drain into the bottom of the tank and out of the drain outlet 31. In this manner the web W will not be rewet by water extracted therefrom. The path of the wire 11 is arranged over the suction area 23 so that the wire and web will be removed from the shell 20 before tangential discharge of water from the shell takes place. The trough 26 is so arranged that it will inter-

cept the water thrown out of the holes and prevent this water from re-entering the web.

As shown in Figures 1 and 4, the main suction couch 13 has a suction gland 33 defining a suction area 34 receiving the wire 11 and web W thereover. The web W is removed from the wire 11 after passage over the suction area 34 and is directed under a paper roll 35.

In Figure 5, parts identical with parts described in Figure 1 have been marked with the same reference numerals. However, in Figure 5 the paper machine 10a has, in addition to the primary suction couch roll assembly 15, a second primary couch roll assembly 40 within the loop of the wire 11 between the assembly 15 and the main couch 13. This primary couch assembly 40 includes a rotating perforated shell 41, a stationary suction gland 42 within the shell 41, seals 42a on the gland acting against the interior of the shell 41 to define a localized suction area 43 on the shell 41, and a rubber covered lump breaker roll 44 disposed above the suction area 43 and acting on the paper web W.

A single trough 45 can be used to receive water from both assemblies 15 and 40. This trough 45 has a sloping bottom 46 extending beneath both shells 20 and 41. Collars 46a and 46b on the bottom 46 receive drain pipes 47 and 48 respectively to drain water out of the trough.

The front end of the bottom 46 has an up-turned vertical front end wall 49 with a horizontal flange 49a at the upper end thereof underlying the wire 11 in closely spaced relation therewith.

The lower end of the bottom 46 has a rear end wall 50 in closely spaced relation from the shell 41 and having an outturned flange 50a underlying the wire 11.

A partition wall 51 extends from the bottom 46 intermediate the front and rear walls 49 and 50 of the trough in closely spaced relation around the shell 20 and has a flange 51a underlying the wire 11 in closely spaced relation.

Front and rear side walls 52 cover the ends of the shells and have cut-out portions 52a and 52b for the shells 20 and 41.

The trough 45 thus has a compartment A surrounding the shell 20 and drained by the drain line 47, and a compartment B surrounding the shell 41 and drained by the drain line 48.

As best shown in Figure 6, the shell 41 is arranged so that it will guide the wire 11 off of the roll 20 before the vacuum in the holes of the shell 20 is released. The baffle wall 51 will intercept the streams of water 32 discharged from the holes in the shell 20 when the vacuum is released from these holes. This water will impinge against the baffle 51 and be drained out of the compartment A of the trough. As also shown in Figure 6, and as indicated in Figure 5, the wire 11 is directed over the suction area 43 of the roll assembly 40 and the couch roll 13 will remove this wire from the shell 41 before the vacuum in the holes of the shell is completely broken. Streams of water 53 discharged from the holes in the shell 41 after the vacuum in the holes is broken will impinge against the wall 50 of the trough to drain out of the compartment B of the trough through the drain line 48.

Figures 5 and 6 therefore illustrate an embodiment of the invention utilizing a plurality of primary suction couch rolls in advance of the main couch roll 13. It should also be understood that three or more primary couch roll assemblies could be used if desired.

The primary suction couch roll assembly 15, or 15 and 40, will therefore extract at least as much water from the web W as was extracted by the heretofore used suction boxes which were positioned at the couch roll end of the wire. However, the primary suction couch roll assemblies will not exert a frictional drag on the wire such as was heretofore encountered with the use of stationary suction boxes. As a result of this, the wire life is materially increased and power input necessary to drive the wire is materially decreased. By the use of the primary suction couch roll assemblies of this invention, wire life has been greatly increased.

The primary suction couches of this invention also make possible greater dehydration of a paper web on its forming wire than was heretofore possible with the heretofore known stationary suction boxes and suction couch roll arrangements.

It will, of course, be understood that various details of the invention 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. In a Fourdrinier paper making machine comprising a breast roll, a first primary suction couch roll in spaced lateral relation from said breast roll, a second primary suction couch roll in spaced relation from said first primary suction couch roll at a level below said first roll, a main couch roll spaced from said second primary couch roll at a lower level than said second roll, a looped forming wire trained around all of said rolls and having an upper run extending substantially horizontally from said breast roll to said first primary suction couch roll and then sloping generally downward over said second primary couch roll and around said main couch roll, each of said couch rolls having a perforated cylinder receiving the wire thereover and a suction gland in said cylinder having spaced opposed on-coming and off-going seals defining a suction area therebetween, said second primary suction couch roll directing the wire off of said first primary suction couch roll at the off-going seal of said first roll before vacuum in the holes of the cylinder of the first roll has been released, said main couch roll directing the wire off of said second couch roll at the off-going seal thereof before the vacuum in the holes of the cylinder of said second couch roll is released, and a save-all trough surrounding said first and second primary suction couch rolls and having a baffle wall therein between said rolls extending into closely spaced relation from the sloping portion of the upper run of said wire to intercept water discharge from said first roll before it contacts said second roll, and said trough being effective for intercepting water from said second roll before it contacts the main couch roll.

2. In a Fourdrinier paper making machine including a breast roll, a main suction couch roll, and a forming wire trained around said rolls, the improvements of a first primary suction couch roll within the loop of said wire between the breast roll and the main couch roll at substantially the same level as the breast roll and above the main couch roll, a second primary suction couch roll within the loop of said wire between the first primary couch roll and the main couch roll at a level intermediate said

couch rolls having a perforate cylinder receiving the wire thereover and a suction gland in said cylinder having spaced opposed off-going and on-coming seals defining a suction area therebetween, said second primary roll directing the wire off of said first primary roll at the off-going seal of said first roll before vacuum in the holes of the cylinder of the first roll has been released, said main couch roll directing the wire

off of said second primary roll at the off-going seal of said second roll before vacuum in the holes of the cylinder of the second roll has been released, and trough means in the loop of the wire partially surrounding the first and second primary rolls to collect liquids released from the rolls before the liquids can recontact the wire.

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