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REVERSE PRESS SECTION FOR PAPER MAKING MACHINES

Filed Dec. 2, 1940

4 Sheets-Sheet 1

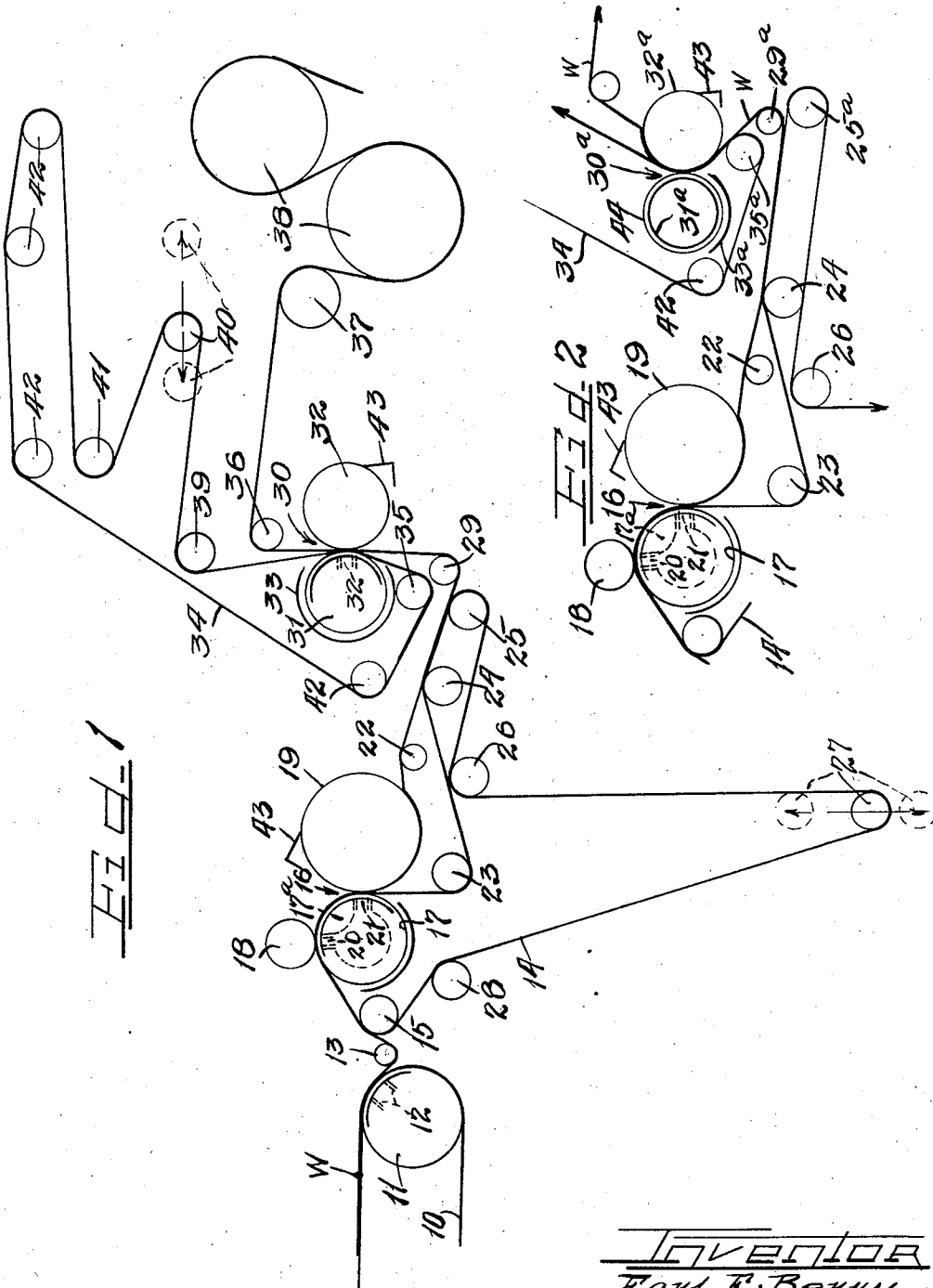


FIG. 1

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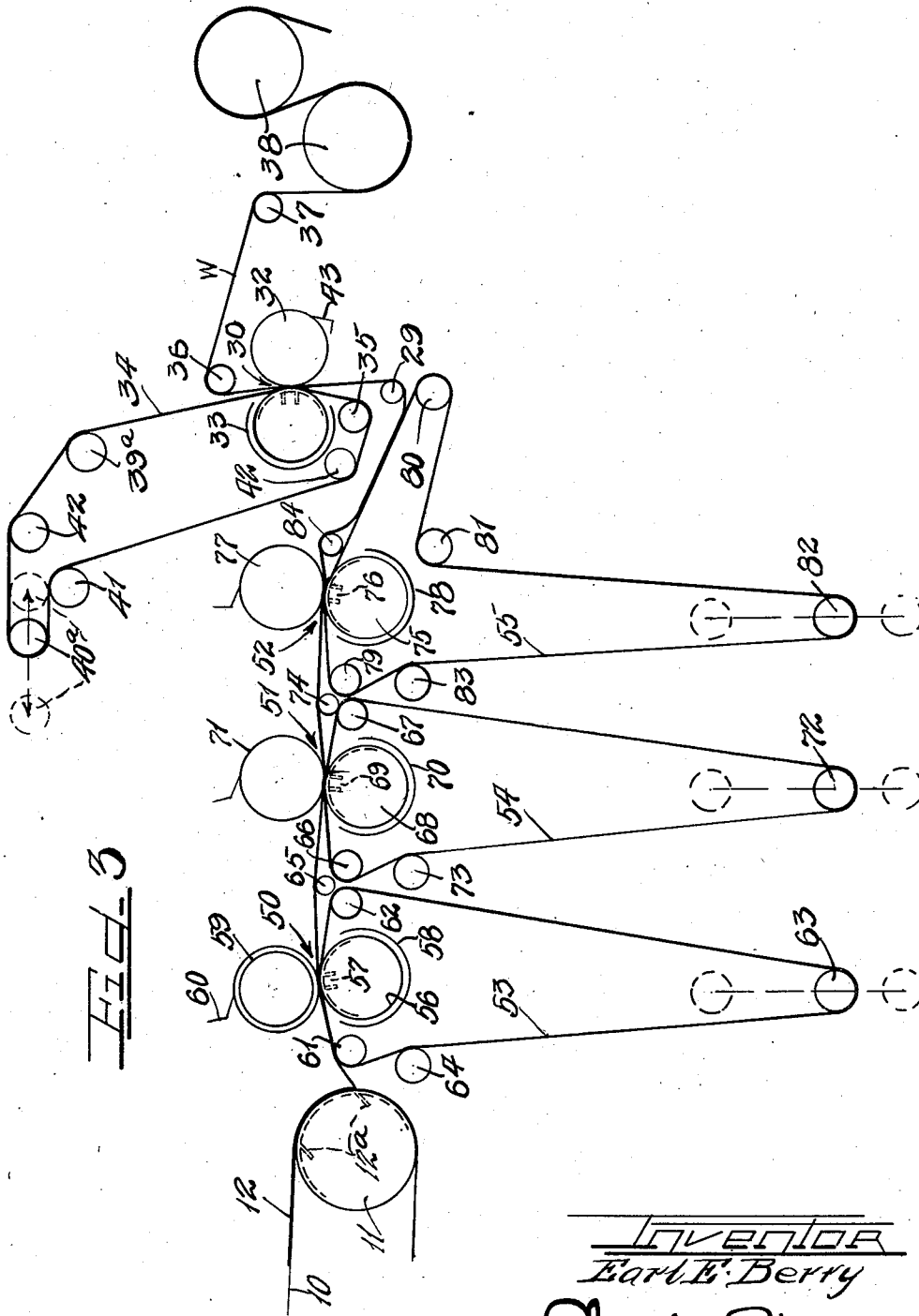


FIG. 3

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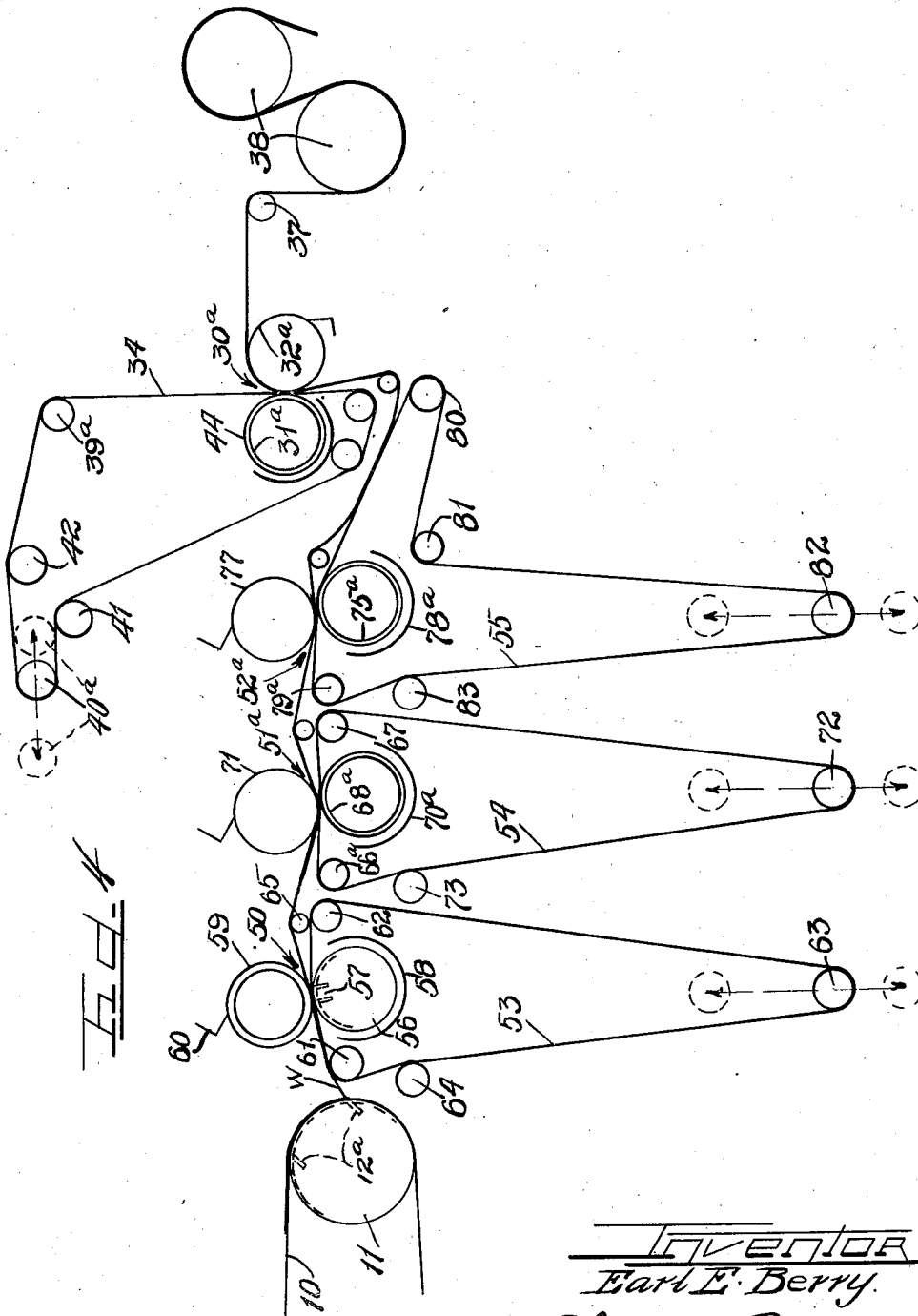
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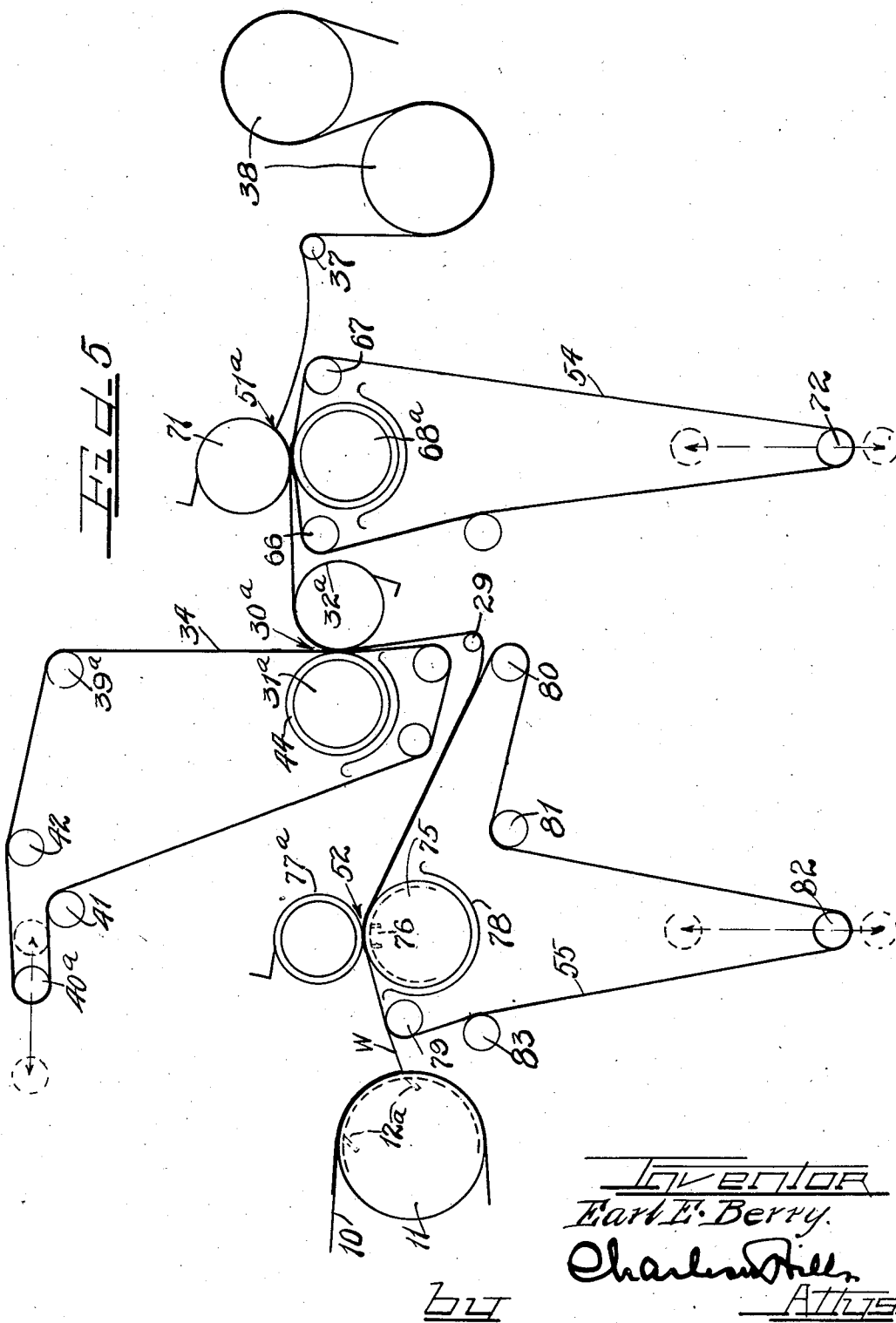
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4 Sheets-Sheet 4



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REVERSE PRESS SECTION FOR PAPER- MAKING MACHINES

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2 Claims. (Cl. 92-49)

This invention relates to reverse press sections for paper making machines.

More specifically the invention relates to a reverse press section having a plurality of sets of roll presses and cooperating felts arranged for eliminating unsupported paper web draws and for successive contact with both faces of the web to eliminate two-sided characteristics on the web.

In the conventional reverse press section for paper making machines a bottom felt is provided to engage the wire side of the newly formed wet paper web for conveying the web from the forming surface through the nip of a vertical roll press. A reverse vertical roll press next received the web and a second felt was passed through this reverse press so as to contact the top side or non-forming surface side of the web. However, in order to transfer the web from the first felt to the second felt, an exceptionally long draw of unsupported web was required because the direction of movement of the paper web had to be completely reversed in order that the second felt could contact the surface of the web opposite to the surface contacted by the first felt.

According to the present invention, the heretofore required long web draws are eliminated and felts with short web engaging runs successively receive opposite faces of the paper web thereon. The reverse roll press preferably has a vertical nip provided by rolls in horizontal alignment so that the web and second felt can pass through the nip therebetween in an upward vertical direction. This eliminates the necessity for completely reversing the direction of travel of the web and avoids the long web draw between the felts. As a result the paper web is not stretched as in the conventional reverse press section.

The reverse press sections of this invention can be operated at high speed and have great water removal capacity.

It is, then, an object of the invention to provide a reverse press section for paper making machines including a reverse roll press with an upward passage vertical nip for eliminating the heretofore necessary complete change of direction of the web.

Another object of the invention is to provide a reverse press roll section for paper making machines which eliminates long web draws thereby reducing stretching of the paper web.

A specific object of this invention is to engage the wire side of a newly formed paper sheet on top of a first conveying felt, convey this sheet through a downward passage vertical pressure nip with the top side thereof against a press roll,

contact the top side of the sheet with a second felt, and convey the web on the second felt through an upward passage vertical pressure nip with the wire side of the web against a press roll.

A further object of the invention is to successively support the wire side and the top side of a paper web on conveying felts and successively subject the exposed faces of the web to pressure against a rotating smooth surface.

Another object of the invention is to advance a web from the forming surface of a paper machine through pressure nips while supported on under felts and then direct the web upwardly through a vertical passage pressure nip while covering the previously exposed surface of the web with another felt.

Other and further objects of the invention will become apparent to those skilled in the art from the following detailed description of the annexed sheets of drawings which disclose several preferred embodiments of the invention. It should be understood, however, that disclosures are by way of example only and that the invention is not limited to the specific modifications shown in the drawings.

On the drawings:

Figure 1 is a diagrammatic side elevational view of a reverse press section according to this invention mounted between the forming part and drier section of a Fourdrinier type paper making machine.

Figure 2 is a fragmentary diagrammatic side elevational view of a reverse press roll section similar to that shown in Figure 1 but equipped with a plain horizontal reverse press.

Figure 3 is a diagrammatic side elevational view of a reverse press roll section according to this invention mounted between the forming part and drier section of a Fourdrinier type paper making machine and having a plurality of vertical suction presses successively receiving the paper web through the pressure nips thereof as the same travels between the forming part and a reverse press.

Figure 4 is a view similar to Figure 3 wherein some of the vertical presses and wherein the reverse press are composed of plain rolls and stone covered rolls.

Figure 5 is a diagrammatic side elevational view of a reverse press section having a vertical press on each side of a reverse horizontal press.

As shown on the drawings:

In Figure 1 the reference numeral 10 designates a Fourdrinier wire trained around a suction couch roll 11 having a suction head 12. A paper web W

formed on the upper run of the wire 10 is directed over the suction area of the couch roll and passed under a guide roll 13 into contact with the first or under felt 14 as it passes over a guide roll 15.

A first horizontal press roll assembly 16 composed of a suction roll 17, a top roll 18 and a horizontally aligned plain roll 19 receives the web and felt through the two nips thereof. The suction roll 17 is equipped with two suction heads 20 and 21 defining suction areas at the two nips.

As the web and felt are directed over the suction roll 17 through the nip between the rolls 17 and 18 water and air is drawn from the web through the felt by the suction head 20 while the top roll 18 exerts a light pressure against the exposed surface of the web. The web then passes in a downward vertical direction through the pressure nip between the rolls 17 and 19 and the web is subjected to an increased pressure. The exposed face of the web contacts the plain roll 17. Water and air are drawn through the felt 14 by the suction head 21 to remove water from the nip area and to assist the web dewatering process.

The web, after passage through the nip between the rolls 17 and 19, is conveyed around the under side of the roll 19 over a guide roll 22 while the felt 14 is separated from the web and is directed under a guide roll 23.

From the guide roll 23 the web is trained over another guide roll 24 where it recontacts the web W on the same side of the web previously engaged by the felt.

The felt is then trained around another guide roll 25 away from the web W, is passed over still another guide roll 26 and thence directed downwardly around a stretcher roll 27 which can assume the positions shown in dotted lines to maintain the felt in a taut condition. After passage around the stretcher roll 27 the felt is directed upwardly and thence guided by a guide roll 28 around the guide roll 15 where it recontacts the web.

After leaving the first felt 14 the web W is conveyed around a guide roll 29 while unsupported by any felt. The web then travels vertically upward through the nip of a second horizontal press roll assembly 30 composed of a suction roll 31 and a plain roll 32 in horizontal alignment. The suction roll 31 has a suction head 32 defining a suction area at the nip between the rolls. An arcuate drip pan 33 partially surrounds the suction roll 31 for collecting water sprayed out of the holes in the revolving cylinder of the roll.

A second felt 34 is trained under a guide roll 35 and thence upwardly through the nip between the rolls 31 and 32 where it contacts the top side of the web W. This side of the web was not previously engaged by a felt. The suction head 32 draws water and air from the web through the felt 34 and the felt protects the web from damage by the holes in the perforated cylinder of the suction roll. The bottom or wire side of the web directly engages the surface of the plain roll 32. This bottom side or wire side of the web was not previously engaged by a press roll.

After passage upwardly through the vertical nip provided by the rolls 31 and 32, the web is immediately separated from the felt 34 and directed over a guide roll 36. The web has now been sufficiently dewatered so that it is self-sustaining and can travel in an unsupported condition without danger of undue stretching or

tearing. The web is directed over a guide roll 37 and thence around the drier drums 38.

The felt 34, after passage through the nip between the rolls 31 and 32, is directed around a guide roll 39 and thence around a stretcher roll 40 which maintains the felt in a taut condition. After passage around the stretcher roll 34, the felt is trained around an outside guide roll 41 and over inside guide rolls 42 back to the guide roll 35.

From the above descriptions it will be understood that the web W is first supported on the under felt 14 and conveyed thereon from the forming wire 10 through the first horizontal press roll assembly 16. The felt is momentarily separated from the web as it passes under the guide roll 23 so that the web alone can travel on the roll 19 of the press roll assembly. The felt again recontacts the web and supports the same for a relatively short run. The web alone is then passed vertically upwardly through an upward passage nip of a second horizontal press roll assembly 30 where it contacts a second felt 34 which engages the top side or non-wire side of the web. The plain roll 32 of the second press assembly 30 contacts the wire side of the felt. As a result, the two sides of the paper sheet are successively contacted with felts and with plain press rolls so that they are treated in an identical manner to prevent two-sided characteristics on the sheet. At the same time, however, it is not necessary to completely reverse the direction of travel of the sheet or to use long unsupported web draws.

The roll 19 of the press assembly 16 and the roll 32 of the press assembly 30 are preferably Stonite or stone-surfaced to present desired finishing surfaces to the web without causing the web to stick to the rolls. The suction areas 20 and 21 in the assembly 16, and the suction area 32 in the assembly 30 can be maintained under a relatively high vacuum. It is also preferable to maintain the area 17a of the roll 17 between the suction heads 20 and 21 under vacuum in order to prevent remoistening of the web as it passes between the high vacuum suction areas 20 and 21. A vacuum of from two to five inches in the chamber 17a will be sufficient to prevent remoistening of the web by centrifugal discharge of water out of the holes in the revolving cylinder of the suction roll.

Scrapers or doctors such as 43 can cooperate with the Stonite-covered rolls 19 and 32 to clean the surfaces of these rolls.

In Figure 2 parts identical with parts described in Figure 1 have been marked with the same reference characters. In Figure 2, however, the second horizontal press assembly 30a is a plain press instead of a suction press. The roll 31a preferably has a rubber cover 44 therearound, but it should be understood that a plain press roll can be used. The roll 32a preferably is a Stonite-covered roll.

The guide roll 35a for the felt 34 is positioned forwardly of the vertical nip of the assembly 30a so that the felt 34 will contact the web W before the web reaches the nip between the rolls 31a and 32a. Likewise, the guide roll 29a for the web W is positioned forwardly of the guide roll 35a. This change requires a further spacing of the roll 25a for the felt 14 from the roll 24 in order that the web W will be supported on the upper run of the felt until it passes around the roll 29a. A segmental cylindrical drip pan 33a is mount-

ed around the under side of the roll 31a to prevent water from dripping on the felt 34.

In the modification shown in Figure 2, therefore, the web W is conveyed from the forming surface through the first horizontal press assembly 16 in the same manner as described in Figure 1 and the web is then conveyed on the felt 14 to a point somewhat forwardly of the point shown in Figure 1, in order that the web can be contacted by the felt 34 before it reaches the nip of the second horizontal press roll assembly 30a. This press roll assembly is a plain press and the web is guided through the nip while wrapped around the plain roll 32a so that water can drain downwardly by gravity out of the nip without contacting the web.

The web then travels through the drier section as in Figure 1.

In Figure 3, parts identical with parts described in Figure 1 have been marked with the same reference numeral. As shown in Figure 3 the suction head 12a of the suction couch roll is wider than the suction head 12 shown in Figure 1 so as to define a wider suction area for further dehydration of the web W as it passes thereover. This wide suction area will hold the web on the wire 10 as the wire revolves downwardly around the couch roll thereby eliminating the necessity for a guide roll such as 13 shown in Figure 1.

The horizontal press assembly 30 is substantially identical with the press assembly shown in Figure 1 with the exception that the felt 34 is passed upwardly from the nips of the press roll assembly 30 around an inside roll 39a instead of around an outside roll 39, as shown in Figure 1. The stretcher roll 40a is positioned between the forming part and the press roll assembly 30 instead of between the press roll assembly 30 and the drying section as shown in Figure 1.

In place of the horizontal press roll assembly 16, however, three sets of vertical suction presses 50, 51 and 52 are provided and each are equipped with separate felts 53, 54 and 55.

The first suction press 50 is composed of a suction roll 56 having a suction head 57 therein and a drip pan 58 therearound. A rubber-covered top roll 59 cooperates with the suction roll 56 at the suction area thereof to define a suction nip. A doctor 60 is provided for wiping the rubber surface of the top roll 59.

The felt 53 is trained over a guide roll 61, through the nip of the suction press 50 and around a second guide roll 62. The guide rolls 61 and 62 are mounted at a level slightly below the top of the roll 56 so that the felt will cover the entire suction area provided by the head 57. After passage around the roll 62, the felt 53 is directed around the stretcher roll 63 and thence upwardly in front of another guide roll 64 for recontacting the web W from the forming wire 10. The wire side of the web W engages the felt and the felt conveys the web through the suction nip of the first vertical suction press 50. After passing through the suction nip, the web W is immediately separated from the felt 53 and directed over a guide roll 65 into contact with the second felt 54 of the second suction press assembly 51. The felt 54 is trained around guide rolls 66 and 67 positioned at a level below the top of the suction roll 68 of the second suction press 51 so that the felt will only engage the web at the suction nip provided by the suction head 69 and so that the felt will cover the suction area. A drip pan 70 surrounds the suction roll 68 to protect the felt 54.

The press roll assembly 51 is equipped with a Stonite surfaced top roll 71 which can be cleaned by a doctor 72.

The felt 54 is trained under a stretcher roll 72 and in front of a guide roll 73 in the same manner as the felt 53.

After passage through the suction nip of the second press 51, the web is guided over a guide roll 74 and through the suction nip of the third suction press 52. The press 52 is composed of a suction roll 75 having a suction head 76, and a top press roll 77 preferably Stonite-covered. A drip pan 78 surrounds the suction roll 75 to protect the felt 55.

The felt 55 has a somewhat different run than the felts 53 and 54. As shown, the felt is trained over a guide roll 79, thence through the suction nip of the press 52 where it contacts the web W. The guide roll 80 then receives the felt therearound. This guide roll 80 is positioned under the guide roll 29 for the felt 34. After passage around the guide roll 80 the felt 55 is passed rearwardly over another guide roll 81 and thence downwardly around a stretcher roll 82. After passage around the stretcher roll the felt is guided upwardly in front of the guide roll 83 and thence around the roll 79.

After passage through the nip of the suction press 52 the web W is momentarily removed from the felt 55 and directed over a guide roll 84 as shown. The web then recontacts the felt and is conveyed to the roll 29 from which it passes unsupported to the nip of the horizontal press 30. The felt 34 then covers the top side or non-wire side of the web W as it passes through the nip of the horizontal suction press 30.

In the modification shown in Figure 3, therefore, three vertical suction presses 50, 51 and 52 are provided in place of the first horizontal suction press 16 shown in Figures 1 and 2. The suction press 50 has a rubber covered top roll while the suction presses 51 and 52 have Stonite-covered top rolls.

In the modification shown in Figure 4 parts identical with parts described in Figure 3 are marked with the same reference numeral. In Figure 4 the vertical presses 51a and 52a have Stonite-covered top rolls 71 and 77 and rubber covered plain bottom rolls 68a and 75a. The felt 54 for the press 51a is guided around a roll 66a similar to the roll 66 but at a higher level than the roll 66 so that the felt will contact the web W before it reaches the nip of the press 51a. Likewise, the guide roll 79a for the felt 55 is similar to the guide 79 shown in Figure 3 but at a higher level than the roll 79 so that the felt will contact the web W to wrap the web around the roll 77 before it reaches the pressure nip.

The horizontal press assembly 30a is similar to the press assembly 30a shown in Figure 2 and is composed of a rubber-covered plain roll 31a having a rubber cover 44 and a plain Stonite roll 32a. The guide roll 36 shown in Figure 3 can be eliminated and the web can be passed directly around the roll 32a to the guide roll 37 and thence around the drying cylinders 38.

Thus, in Figure 4, a first vertical suction press is provided followed by two plain vertical presses having rubber covered bottom rolls and Stonite-covered top rolls. The horizontal suction press 30 is replaced with a horizontal plain press 38.

In other modifications of the invention, the two presses 51a and 52a can be replaced with a single press or, as shown in Figure 5, a single vertical press can be used in advance of the horizontal

press and another vertical press can be used after the horizontal press.

In Figure 5, parts identical with parts described in Figures 3 and 4 have been marked with the same reference numerals. As shown in Figure 5, the suction press 52 of Figure 3 receives the web W directly from the forming wire 10 instead of from the suction press 51 as shown in Figure 3. In addition, the plain vertical press 51a of Figure 4 is positioned after the plain horizontal press 30a instead of before the press as shown in Figure 4.

In the reverse press section of Figure 5, the wire side of the web is supported on the felt 55 and conveyed through the suction nip between the suction roll 75 and the rubber-covered top roll 77a of the first press 52. The web is then conveyed while still supported on the felt 55 to a point just under the guide roll 29 where the web is removed from the felt, trained around the guide roll and passed vertically upward into contact with the second or reverse felt 34 which engages the top side or non-wire side of the web. The web and felt 34 then pass vertically upward through the plain nip between the Stonite roll 32a and the rubber-covered roll 31a of the plain press 30. After passage through the nip the web is guided over the top of the Stonite roll 32a into contact with the felt 54 which re-engages the wire side of the web and conveys the web through the plain press 51a composed of the Stonite roll 71 and the rubber-covered roll 68a. After passage through the nip of the press 51a the web then travels over the guide 37 and around the drier drums 38.

It should be understood that numerous arrangements of vertical and horizontal press roll assemblies can be used, and that these assemblies can be equipped with plain metal rolls, Stonite covered rolls, rubber covered rolls, plain suction rolls, and rubber covered suction rolls.

In the reverse press sections of this invention the web is directly received from its forming wire on an under felt engaging the wire side of the web and conveying the web through one or more pressure nips. Additional felts as shown in Figures 3 and 4 can be used to successively receive the wire side of the web.

The reverse press roll assembly includes horizontally aligned rolls that receive the web in an upward vertical direction through the nip therebetween while the web is covered with another felt engaging the top side or non-wire side thereof. Additional press roll assemblies can be mounted between the reverse press and the drier section of the machine.

The reverse press sections of this invention avoid the heretofore necessary long draws of unsupported web with the attendant stretching of the web. In all of the illustrated embodiments of the invention the unsupported web draws are quite short and yet, at the same time, the web is supported almost continually from the time it leaves the forming wire until it passes through the last press. Unsupported web draws are reduced to a minimum.

The reverse press sections of this invention also avoid the necessity for completely changing the direction of travel of the web in order that the top side or non-wire side of the web can be engaged with a felt while the wire side of the web can be subjected to direct action by a press roll.

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.

I claim as my invention:

1. A reverse press section for mounting between the forming part and drier section of a paper making machine comprising a pair of horizontally aligned press rolls rotatably mounted adjacent the couch roll end of the forming part, a first looped felt trained over the first roll of the horizontally aligned rolls and downwardly through the nip provided by the rolls, a guide roll outside of the loop of said felt for directing the felt away from the second roll of said horizontally aligned rolls, a pair of guide rolls within the loop of said felt to form a short top run on said felt in spaced relation beyond said second roll of the horizontally aligned rolls, another guide roll between said second roll of said horizontally aligned rolls and said pair of guide rolls for maintaining the web out of contact with the felt, another guide roll within the loop of said felt for forming a short top run in advance of the first roll of said horizontally aligned rolls whereby a paper web from said forming part will have the wire side thereof engaged by said felt for travel through said nip, around the second press roll out of contact with the felt and into re-engagement with said felt along said short run beyond the second press roll, a second pair of horizontally aligned rolls defining an upward passage pressure nip at a level above the short run beyond the second press roll of the first mentioned horizontal assembly, a guide roll for directing the web from said run upwardly through said second pressure nip, and a second looped felt trained through said nip for engaging the non-wire side of said web.

2. A reverse press section for location between the forming wire and drier section of a paper making machine comprising a pair of cooperating press rolls defining a pressure nip therebetween, a looped felt trained through said nip having a first run in advance of said nip and a second run beyond said nip, said felt runs being arranged for receiving thereon the wire side of a web of paper formed on the forming wire, said second run of the felt being downwardly inclined relative to the first run, a guide roll at a level above the second run of the felt for receiving the paper thereover as it passes from the press rolls to said second run, a pair of horizontally aligned press rolls adjacent said second run of the felt in overlapping relation to said second run, said pair of horizontally aligned rolls defining an upward passage vertical nip in closely spaced relation above said second run of the felt, a single second guide roll immediately adjacent said second run of the felt between said vertical nip and the second run of the felt for receiving therearound the non-wire side of a paper web from said second run to change the direction of travel of the web in a single turn for directing the web upwardly into the vertical nip, and a second felt trained through said vertical nip on the non-wire side of the web of paper to cover said non-wire side of the web as it passes through the vertical nip, whereby the web of paper only has a very short unsupported draw as it passes around the single second guide roll from the second run of the first mentioned felt to the second felt.

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