

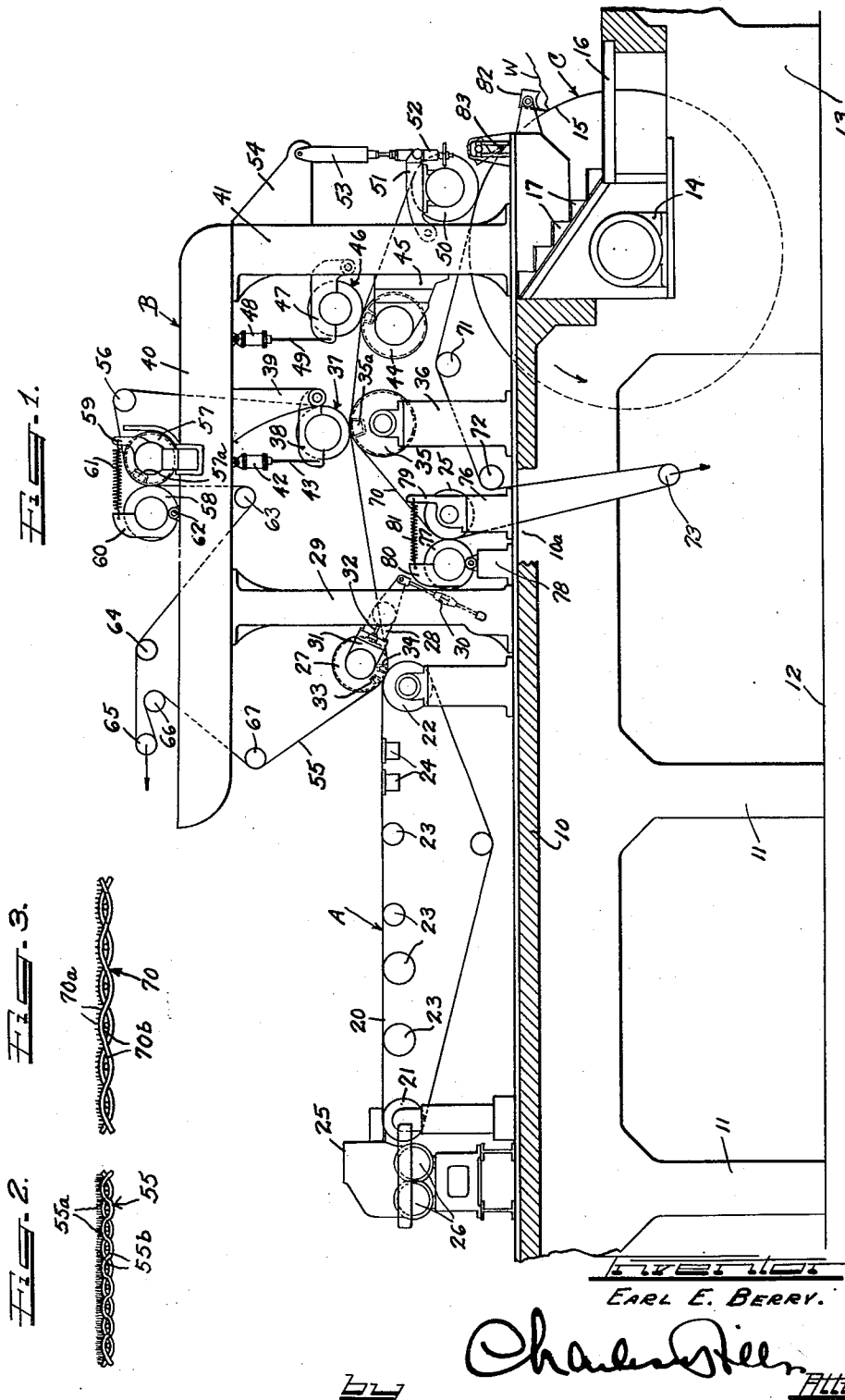
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APPARATUS FOR MAKING TISSUE TYPE PAPER

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APPARATUS FOR MAKING TISSUE TYPE PAPER

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This invention relates to a paper making machine especially adapted for the production of soft toilet tissue type papers and more particularly relates to an inverted pick-up felt machine disposed between the forming part and the drier section of a paper making machine.

In conventional pick-up felt arrangements for paper making machines the web is picked up from the forming surface of the paper making machine onto a pick-up felt. The transfer from the forming surface to the felt is usually accomplished by running the felt between top and bottom couch rolls and pressing the felt against the newly formed web on the forming wire trained around the bottom couch roll. The felt and web is then usually passed through a press roll assembly together with a covering felt for protecting the exposed face of the web.

If a suction press roll assembly is used, suction must be applied through the bottom or covering felt since the pick-up felt is usually quite impervious and resists passage of water and air therethrough. As a result, the suction will tend to transfer the web to the bottom or protecting felt and then, as the web passes through the nip of the assembly, it is again squeezed against the pick-up felt so that it can follow this felt to the drier section of the machine.

If a suction top couch is used the pick-up felt must be of a more open or pervious type so that suction could be effective to transfer the web onto the felt. However, if such an open pick-up felt is used, it will not retain the web to a satisfactory degree and the web will be transferred to the bottom felt or covering felt instead of following the pick-up felt to the drier section.

Now, the present invention provides for the use of a pick-up felt for conveying the web from the forming section to the first press assembly, together with the use of a more pervious felt for conveying the web from this first press assembly to the drying section and through additional press assemblies if desired.

The use of the two felts for different conveying operations makes it possible to obtain maximum pick-up efficiency and maximum drying efficiency, whereas heretofore a compromise had to be effected because the pick-up felt carried the web through the press roll section to the drying section.

The present invention also provides for the separate drying of the pick-up felt and the drying felt at points away from the press roll assembly.

Another advantage is that higher pressures can be used at the first press roll assembly receiving both felts therethrough so that the web can be dewatered to a greater extent than was heretofore possible when it was necessary to retain the web on the pick-up felt. In accordance with the present invention, high pressures at the first press roll assembly insure transfer to the bottom felt and additional water removal.

It is, then, an object of this invention to provide an inverted pick-up felt machine for handling fragile paper webs between the forming section and the drying section of a paper making machine.

Another object of this invention is to provide a paper making machine capable of producing fragile, delicate soft tissue papers without sacrificing efficiency in the press roll section of the machine.

A still further object of this invention is to utilize separate pick-up felts and drying felts in a press roll section of a paper making machine to successively convey the web from the forming part to the drying section of the machine.

Another object of this invention is to increase the production capacity of machines for making tissue-type papers by extracting higher percentages of water from the newly formed tissue by means of suction and pressure, and thereby decrease the drying time.

A further object of this invention is to provide a paper making machine of the Yankee type wherein a pick-up felt transfers the sheet from the forming part to a suction press, and wherein a more liquid-pervious felt conveys the sheet from the suction press to the top of the Yankee drier drum.

A further object of the invention is to provide a Yankee type paper making machine wherein the forming part and press roll sections are mounted at a level above the Yankee drier drum.

Other and further objects of the invention will be apparent to those skilled in the art from the following detailed description of the annexed sheet of drawings which, by way of example, discloses a preferred embodiment of the invention.

On the drawing:

Figure 1 is a diagrammatic side elevational view of a machine embodying the principles of this invention.

Figure 2 is a cross-sectional view, greatly enlarged, illustrating the characteristics of the

pick-up felt used in the machines of this invention.

Figure 3 is a cross-sectional view, greatly enlarged, illustrating the more open bottom felt or drying felt used on machines of this invention.

As shown on the drawing:

In Figure 1 the reference character A designates generally the forming part or wet end of the paper machine, the reference character B designates the press roll section of the machine, and the reference character C designates generally the Yankee drier drum of the machine.

The wet end A and the press roll section B are mounted on a floor 10 supported by pillars 11 above a sub-floor or basement 12. The Yankee drier C is mounted on end supports 13 carrying bearings such as 14 to rotatably mount the drier drum 15 at a level beneath the press roll section B. A platform 16 can be provided adjacent the side of the drier drum 15 and stairs 17 can be provided to connect the platform 16 with the floor 10.

The forming section A includes a forming wire 20 trained between a breast roll 21 and a couch roll 22 and having its upper run directed over table rolls 23, suction boxes 24 and the like. A head box 25 supplies stock to the upper run of the forming wire 20 adjacent the breast roll end thereof and this head box 25 can receive the paper stock from oppositely flowing streams of stock in conduits 26.

A suction couch roll 27 is rotatably mounted on arms such as 28 which are pivotally supported from pedestals such as 29 and adjusted by means of turnbuckles 30 or other adjusting mechanisms. The upper suction couch 27 can be shifted on the arms such as 28 by means of shiftably mounted bearings 31 adjusted by screws such as 32.

The roll 27 has a perforated periphery and has spaced suction heads 33 and 34 mounted therein immediately before and immediately after the nip between the rolls 22 and 27.

A first suction press assembly including a suction roll 35 mounted on pedestals such as 36 from the floor 10 and a top press roll 37 mounted on arms such as 38 pivotally mounted on brackets such as 39 depending from an overhead support 40. The overhead support 40 is carried on the pedestals such as 29 and additional pedestals such as 41.

The suction roll 35 has the suction box 35a thereof extending through the nip between the rolls 35 and 37 to cover the nip area and areas immediately before and after the nip areas. The roll 37 is urged against the roll 35 by means of hydraulic jacks such as 42 depending from the overhead support 40 and having the piston rods such as 43 thereof connected to the free ends of the arms such as 38. The jacks 42 are effective to exert a downward pressure or a lifting force so that the pressure in the nip between the rolls 35 and 37 can be accurately controlled.

A second suction press assembly is positioned in the press section B and includes a lower suction roll 44 rotatably mounted on bearings carried by brackets such as 45 which, in turn, are carried by the pedestals such as 41.

A top press roll 46 cooperates with the suction roll 44. The roll 46 is carried on arms such as 47 which are pivotally mounted on the pedestals such as 41 and moved toward and away from the suction roll 44 by means of hy-

draulic jacks such as 48 having their piston rods 49 depending from the top support B.

A transfer roll 50 is rotatably mounted on bearings carried by arms such as 51 which are pivoted to the pedestals such as 41 to extend laterally from the pedestals in a direction opposite to the arms 47 and brackets 45. Lift screw devices such as 52 are pivotally connected to the outer ends of the arms such as 51 and are carried by arms such as 53 which are pivotally connected to brackets such as 54 carried by the pedestals 41. The transfer roll 50 can therefore be raised and lowered toward and away from the drier drum 15.

In accordance with this invention a pick-up felt 55 having an efficient singed pick-up nap 55a and a rather fine weave 55b, is trained around the top couch roll 27 and top press roll 37 for picking up a web from the forming wire 20 and conveying the web on the under side thereof to the first suction press assembly. The pick-up felt 55 is then directed around the roll 37 away from the web and over a guide roll 56 mounted above the top support 40. A horizontal suction press roll assembly including a suction roll 57 and a plain press roll 58 mounted on top of the support B next receives the felt 55 in a downward direction through the nip provided thereby. The suction roll 57 has a suction box 57a in advance of the nip for maintaining a dry nip and for sucking water out of the felt.

The rolls 57 and 58 have upwardly extending arms 59 and 60 respectively connected by springs or other take-up means 61. The roll 58 is pivotally mounted as at 62 and the springs such as 61 will urge the roll against the suction roll for maintaining a desired nip pressure.

After passing through the nip of the horizontal suction press assembly the felt 55 is then directed around the guide roll 63 and thence upwardly over a guide roll 64 to a stretcher roll 65. Additional guide rolls 66 and 67 then guide the felt back to the suction couch 27.

A drying felt or bottom felt 70 having a shorter and coarser nap 70a and a more open weave 70b than the nap and weave of the pick-up felt 55, is trained over the suction rolls 35 and 44, around the transfer roll 50 and thence over guide rolls 71 and 72 to travel above the drier drum 15 in the path of heat radiation and convection therefrom. Radiated heat from the drum will tend to warm up the water in the felt and make it easier to extract by pressure. From the guide roll 72 the felt 70 is directed through an opening 10a in the floor 10, around a stretcher roll 73 rotatably mounted in the basement beneath the press section B, back through the opening 10a and through the nip of a horizontal press roll assembly. The horizontal press roll assembly comprises a roll 75 mounted on bearings carried by pedestals such as 76 at the ends of the opening 10a, and a roll 77 pivotally mounted on pedestals such as 78. The bearing supports for the rolls 75 and 77 have upwardly extending arms 79 and 80 respectively connected by springs such as 81 or other means for urging the roll 77 toward the roll 75 to create pressure in the nip.

After passage upwardly through the nip between the rolls 75 and 77, the felt 70 is directed back over the suction roll 35.

A web of paper W partially formed on the forming wire 20 is picked up by the pick-up felt

55 as the web and wire advance through the nip between the top and bottom couch rolls 22 and 27. The suction box 33 in the top couch roll 27 will maintain the nip area in a substantially dry condition and will prevent a crushing of the delicate web as it passes through the nip. The pressure existing in the nip between the rolls 22 and 27 will effect a transfer of the web from the wire to the pick-up felt and the second suction box 34 located immediately after the nip will assist in retaining the web on the pick-up felt. The web then travels, while supported on the under side of the pick-up felt, from the couch roll to the first suction press, where it is covered by the bottom felt 70.

The press rolls 35 and 37 of the first suction press can be urged together to create a higher nip pressure than was heretofore practical in the handling of tissue-type papers in the conventional press roll section. This high pressure will effect a transfer of the web from the pick-up felt 55 to the bottom felt 70. The suction box 35a extending through the nip area will assist in this transferring of the web and will maintain a dry nip area to prevent crushing of the web.

The pick-up felt 55 is then conveyed away from the web immediately after the two felts with the web therebetween have been passed through the nip of the first suction press assembly.

The bottom felt 70 then supports the web on the top surface thereof and carries the same through the second suction press assembly where it is again subjected to suction and pressure for elimination of additional amounts of water.

The web and felt 70, after passing through the second suction press assembly are trained around and under the transfer roll 50 so that the web will be suspended from the under face of the felt. The transfer roll 50 is urged against the drier drum 15 and the web will be transferred to the top of the drum. The drum rotates in a counter-clockwise direction as indicated by the arrow and, has the periphery thereof heated to vaporize the remaining moisture in the web.

An excellent transfer from the felt 70 to the drier drum 15 is insured because the felt 70 does not have as great an affinity for the web as the pick-up felt 55, and because gravity assists in the transfer inasmuch as the web, at the point of transfer, is on the underface of the felt 70 and is deposited on top of the roll 15. Heretofore the transfer to a Yankee drier drum was effected at the bottom of the drum. As a result the web had to be pasted onto the drum under considerable pressure so that it would not fall away from the drum as it was carried upwardly away from the transfer roll. In the present installation such high pressures are not necessary and gravity is used to aid the transfer.

The web then travels with the roll 15 for almost a complete revolution thereof and is doctored off of the roll by means of a doctor 82.

Before the surface of the drum 15 recontacts the web, it is preferably cleaned by a scraper or wiping device 83.

The machines of the present invention are far more efficient and can be operated at higher speeds than heretofore known pick-up type machines. Thus high speed and great efficiency are made possible by the use of a top pick-up felt designed mainly for pick-up efficiency and a bottom conveying felt designed mainly for water-transfer efficiency whereas heretofore a single felt was used and had to be a compromise in every

respect, so that it was capable of picking up the web and also capable of permitting water transfer therethrough. The use of the two different felts to carry out their respective functions has made possible the use of higher pressures in the press section and better transfer at the drier section. The feature of mounting the drier drum at a level beneath the transfer roll instead of above the transfer roll has also materially increased the transfer efficiency.

The papers produced by machines of this invention are superior to those produced on conventional pick-up machines since both sides of the sheet are contacted with felts and the top sides of the sheet can be subjected to direct action by a press roll as it is conveyed by the under felt to the drier drum section. This same top side of the sheet is then contacted with the drier drum.

It will, of course, be understood that various details of the invention may be varied through a wire 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. In a paper making machine having a forming wire trained around a couch roll and a top suction couch roll cooperating with said first mentioned couch roll, the improvements of a drier drum rotatably mounted at a level beneath the level of the couch roll in spaced lateral relation from the couch roll, a suction press roll assembly, a pick-up felt trained through the nip between the couch rolls and a nip between the rolls of the suction press roll assembly for picking up a web of paper from said forming wire to convey the web to the press roll assembly, a transfer roll cooperating with the top portion of said drier drum on the side thereof remote from the forming wire, a bottom liquid-pervious felt trained through a nip of said press assembly, around said transfer roll and above the drier drum in the path of heat convection from the drum for covering the web on the pick-up felt, for conveying the web from the press assembly to the drier drum, and for being heated by the drier drum and a suction box acting through said bottom felt at the nip area of said press assembly to transfer the web from the pick-up felt to the bottom felt.

2. In a paper making machine, top and bottom couch rolls defining a nip therebetween, a forming wire trained around said bottom couch roll, a pick-up felt trained around said top couch roll through said nip to receive a paper web from the forming wire, a suction head in said top couch roll in advance of the nip to dry the nip, a second suction head in said top couch roll positioned after the nip to act through said pick-up felt for retaining the web on the felt, a first suction press roll assembly including a top roll and a bottom suction roll providing a suction nip receiving the pick-up felt and web there-through, a second suction press roll assembly including a top roll and a bottom suction roll providing a second suction nip, a transfer roll, a drier drum beneath the transfer roll, a bottom drying felt trained through the nips of both suction presses, around the transfer roll and over the drier drum in the path of heat convection from the drum, a press assembly receiving the bottom felt alone therethrough, and another press assembly receiving the pick-up felt alone

therethrough whereby successive felts will engage opposite faces of the paper web en route to the drier drum and the felts will be dewatered by said press assemblies between each engagement with the web.

3. In a paper making machine including a forming part and a drier drum in spaced longitudinal relation from the forming part, the improvements comprising a top pick-up felt receiving a web from said forming part on the underface thereof, a press roll assembly receiving said pick-up felt and web thereon through a nip thereof, a bottom liquid-pervious felt covering said web as it passes through said nip, means transferring said web from the pick-up felt to the liquid-pervious felt, a transfer roll above said

5 drier drum on the side thereof remote from the forming part receiving the liquid-pervious felt and web therearound to deposit the web on the drum, means to rotate the drum for carrying the web around the top portion thereof in a direction toward the forming part and around the lower portion thereof in a direction away from the forming part, means on the same side of the drum as the transfer roll to remove the web from the drum, guide means directing said liquid-pervious felt alone over the drier drum in the path of heat convection therefrom to heat liquid retained in the felt, and a press assembly receiving the felt therethrough to extract the heated liquids therefrom.

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