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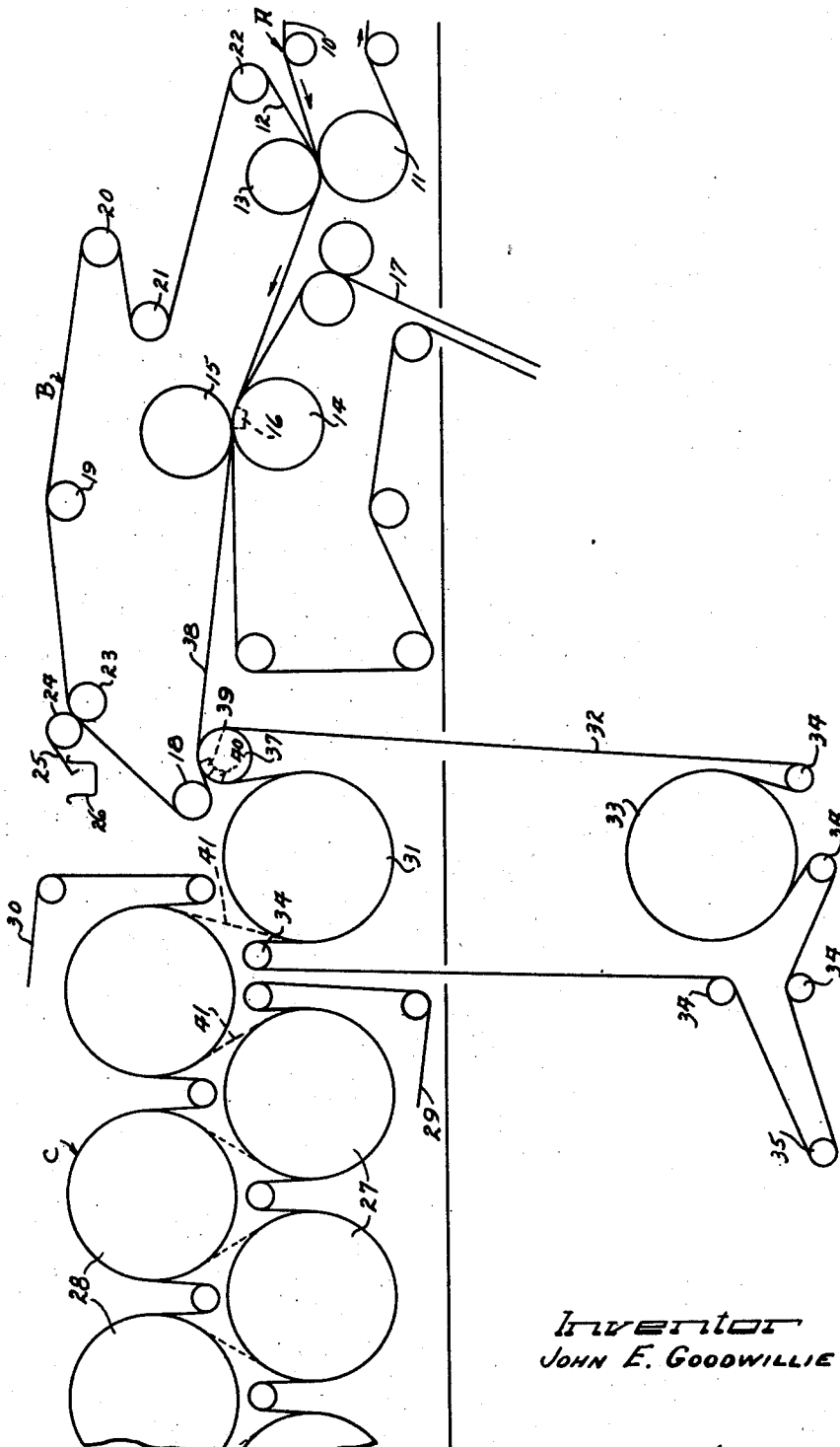
J. E. GOODWILLIE
STRUCTURE FOR WEB TRANSFERS

2,537,129

Filed Oct. 5, 1945

3 Sheets-Sheet 1

FIG. 1



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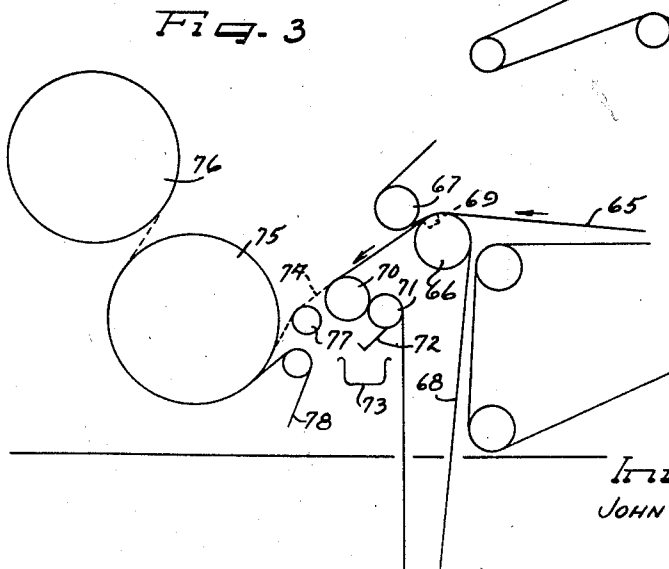
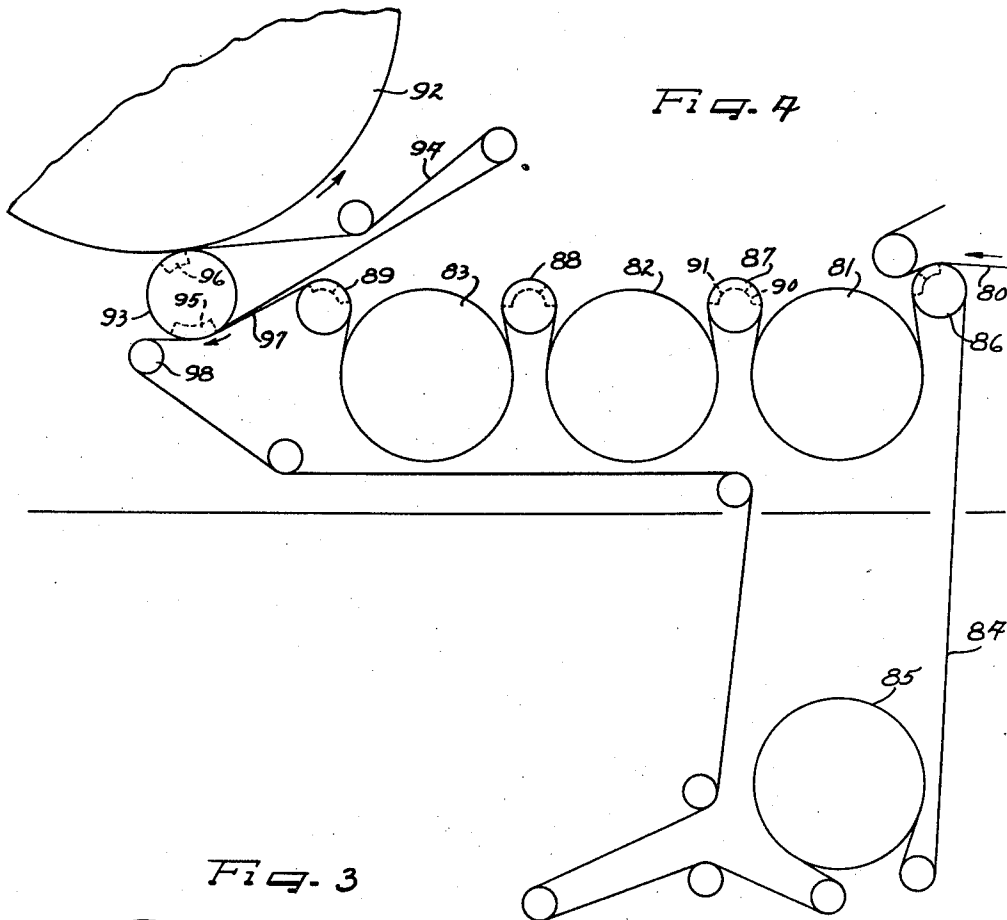
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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STRUCTURE FOR WEB TRANSFERS

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4 Claims. (Cl. 92-49)

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This invention relates to a paper machine, and more particularly to a paper machine provided with means including a suction transfer roll for transferring a moist web of paper or other fibrous material from one felt to another felt, such as from a pick-up felt to a drier felt, without the direct application of roll pressure upon the felt at the point of transfer.

Heretofore, whenever a suction roll has been immediately or subsequently used for transferring a moist web of paper from one felt to another, a pressure roll has been employed to exert a pressing action directly against the moist web, which pressure causes the web to firmly adhere to the surface to which the transfer is to be made. With such an arrangement the fibrous web cannot be transferred to its next section without being subjected to the strains necessary to strip it free from the surface to which it has been caused to adhere by the previously mentioned pressing action. In the case of very light weight sheets, particularly the very "free" type used for crepe tissue, such as cleansing tissue and the like, it obviously would be impossible to strip such sheets safely. Even with heavier weight sheets when operating at higher speeds there is a loss in production due to breaks, using the old pressure roll arrangement.

In accordance with the principles of my present invention, I employ a suction transfer roll but do not use a pressure roll over the suction area of the transfer roll. The felt to which the transfer of the moist fibrous web is to be made is lapped about the suction transfer roll so as to entirely cover the suction area thereof. The felt carrying the moist fibrous web, such as a pick-up felt, press felt or the like, is then guided into contact with the felt that is to receive the fibrous web so as to bring the web into contact with such felt over a portion at least of the area that is subjected to the suction effect of the transfer roll.

The suction effect of the transfer roll is thus operative to transfer the moist web of paper, or other fibrous material, to the felt that is to receive it, but without the application of any pressing action that would cause the web to adhere so firmly to the receiving felt as to make the subsequent stripping of the web difficult.

Preferably, the felt that is to receive the moist fibrous web of the transfer operation just referred to is of an open, porous type, such as a drier felt, so that if any substantial pressing action occurred, the moist fibrous web would be forced into the open meshes of the receiving felt, and that would be extremely undesirable.

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In order to insure the proper transfer of the moist fibrous web from one felt to the other, the felt carrying the web in the first instance is guided away from the suction transfer roll intermediate the limits of the suction area, while the felt that is to receive the moist fibrous web is lapped completely around the suction area of the transfer roll. There is thus only a momentary interval of contact between the two felts while both are subjected to the suction effect of the transfer roll. Since the degree of suction employed is only sufficient to effect the transfer of the moist fibrous web from the one felt to the other, there is no tendency at all for the web to be forced into the open, porous surface of the receiving felt.

It is therefore an important object of this invention to provide means in a paper machine for effecting the transfer of a moist fibrous web from one felt to another without damaging the web or causing the web to adhere too firmly to the receiving felt, even though the web may be of extremely light weight paper of the nature of a cleansing tissue and the receiving felt is of an open, porous type.

It is a further important object of this invention to provide a paper machine having means for effecting the transfer of a moist fibrous web from one felt to another, while supporting the web on a felt through the press roll section and thence to the drier section, the means including a suction transfer roll having a suction area of limited extent around which a receiving felt is lapped and against which the web carrying felt is momentarily contacted, thereby effecting the transfer of the web from one felt to the receiving felt without the exercise of positive roll pressure, and with the receiving felt having a web carrying run extending beyond the suction area to the drier section to transfer said web to the drier section without the necessity of stripping the web from a bare press roll surface.

Other and further important objects of this invention will be apparent from the disclosures in the specification and the accompanying drawings.

On the drawings:

Figure 1 is a schematic view of a portion of a paper machine, including the couch roll end of a forming section, a press section, and the first portion of a drier section, showing means embodying my invention for effecting the transfer of the moist paper web from a top pick-up felt of the press section to a bottom drier felt of the drier section.

Figure 2 is a schematic view of a modified form of my invention, in which the moist paper web is

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transferred from the bottom press felt of the press section to a top drier of the drier section.

Figure 3 is a schematic view of a further modification of my invention showing the use of an intermediary felt for aiding in the transfer of the moist fibrous web from a press felt to a drier section.

Figure 4 is a schematic view of a further modification of my invention for effecting the transfer of a partially dried paper web, after leaving the pre-driers, to a surface of a Yankee drier drum.

As shown on the drawings:

In Figure 1 the reference character A indicates generally the couch roll end of the forming wire section of a paper machine; the reference character B represents the press section; the reference character C represents the drier section of a paper machine. Since the construction and operation of these sections of a paper machine are well understood by those versed in the art, only a brief description will be given.

The upper run of the forming wire 10, carrying on its upper surface the wet web of partially formed paper, passes around a lower couch roll 11 at the end of its forward travel. A top press felt, or pick-up felt 12 is guided into the nip between the lower couch roll 11 and an upper couch roll 13 to pick up the wet fibrous web from the wire 10. For this purpose, the pick-up felt 12 is usually a felt having a relatively long, soft nap, to which the moist fibrous web readily adheres.

The wet fibrous web is carried on the underside of the pick-up felt 12 into the nip between a lower suction press roll 14 and an upper plain press roll 15. The suction head of the lower suction press roll 14, indicated in dotted lines at 16 lies slightly ahead of the nip. A bottom press felt 17 is also guided between the press rolls 14 and 15 into contact with the lower suction press roll 14 to prevent the moist web of paper from being drawn off of the pick-up felt 12 into the openings of the suction area 16.

From the press roll assembly 14, 15, the pick-up felt 12 is trained around guide rolls 18, 19, 20, 21 and 22 back to the couch roll assembly 11, 13. In the course of its travel, the pick-up felt 12 passes through the nip of a pair of felt cleaning rolls 23 and 24 that serve to remove from the pick-up felt 12 the edge trim formed by the edge jet (not shown) on the Fourdrinier wire 10. The roll 23 is a rubber-covered roll, or is otherwise provided with a resilient surface, while the roll 24 is a hard surfaced roll. The latter runs in contact with the edge trim carried by the pick-up felt 12 and picks the edge trim off of the felt under the pressure exerted by the rubber-covered roll 23. The edge trim is then scraped off of the surface of the roll 24 by means of a doctor 25 and allowed to fall into a receiver 26.

The drier section C includes a plurality of horizontally arranged tiers of drier drums, the drums 27 constituting the drums in the lower tier and the drums 28 constituting those in the upper tier. A bottom drier felt 29 is trained in the usual manner against the under surfaces of the lower drums 27, while an upper drier felt 30 is similarly trained against the upper surfaces of the upper drier drums 28. The drier drum and felt arrangement is entirely conventional except for the first drier drum and felt arrangement that will now be described.

A first bottom drier drum 31 is arranged ahead of the rest of the drier section but driven in synchronism therewith. A separate drier felt 32 of

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open, porous texture, is trained against the lower half of the drier drum 31 and also partially around an auxiliary drier drum 33. The latter drier drum serves to dry the felt itself. The usual guide rolls, indicated generally by the numeral 34, and a stretch roll 35 are provided for the drier felt 32.

In accordance with the principles of my present invention, a suction transfer roll 37 is positioned ahead of the first bottom drier 31 and in the path of the run, indicated at 38, of the pick-up felt 12 as it passes from the nip between the press rolls 14, 15 and the guide roll 18. Said suction transfer roll 37 is provided with separate suction areas, a main area 39 and an auxiliary area 40, around both of which the drier felt 32 is lapped. End deckle parts in the vacuum boxes controlling the area 39 and 40 are so set that only the desired part of the moist fibrous web is removed from the underside of the pick-up felt 38, while the edge strips, as previously stated, pass on with the pick-up felt to the rolls 23, 24 and are there removed.

The guide roll 18 is so positioned as to bring the run 38 of the pick-up felt 12 into contact with the drier felt 32 traveling over the surface of the suction transfer roll 37 at a point slightly in advance of the leading main suction box area 39. No direct roll pressure is applied against the upper surface of the pick-up felt 12 as it passes into contact with the drier felt 32, but a sufficient tension is kept upon the felt run 38 to establish firm contact between the two felts, with the moist fibrous web therebetween. Accordingly, the suction effect in the leading suction area 39 causes the moist web of paper to be separated from the under surface of the felt run 38 and to adhere to the upper surface of the drier felt 32. The auxiliary suction box insures that the paper web adheres to the drier felt.

The length of contact between the felt run 38 and the drier felt 32, while subjected to the suction effect of the leading suction area 39, is relatively short, being of only sufficient length to effect the desired transfer of the moist paper web to the drier felt. If desired, somewhat higher suction may be maintained in the suction area 39 than in the suction area 40.

A drive (not shown) is provided for the bottom drier 31 and the suction transfer roll 37, interconnected with the drive for the wet end of the machine, namely the forming section A and the press section B, so that these rolls and the associated felt drier 33 all start and stop with the wet end of the machine.

A moderate vacuum is preferably maintained in the auxiliary suction area 40 of the transfer roll 37 so that the fibrous web is continuously held on the first drier felt 32 until it passes in a straight line into contact with the first bottom drier 31. The sheet is then passed from the drier drum 31 to the succeeding drier drums 28, 27, of the train of driers as indicated by the dotted lines at 41.

From the foregoing description it will be apparent that the transfer of the moist web of paper from the pick-up felt 12 to the drier felt 32 is effected without the use of a pressure roll but by the use of a suction transfer roll alone. The elimination of a pressure roll for effecting the transfer obviates the difficulty that would arise from the moist fibrous web becoming embedded in the rather open, porous type of felt that is ordinarily used as a drier felt. Consequently, my arrangement makes possible the

transfer of the very lightest weights of tissues, such as tissues running as low as 4 pounds per ream, as well as the most open type of tissues, without the attendant difficulty so often experienced where a pressure transfer roll is employed in combination with a suction transfer roll.

In Figure 2, the same reference characters B and C are used to designate the press roll and drier sections of a paper machine. The arrangement of the press section B is, however, slightly different and will therefore be briefly described.

Said press section B comprises a pair of press rolls, consisting of a lower suction press roll 45 and an upper plain press roll 46, a bottom press felt 47 and a top press felt 48, together with the usual guiding and stretcher rolls. The lower press roll 45 has a suction area, indicated at 45a in advance of but including the nip between said upper and lower press rolls 46 and 45. This is for the purpose of holding the moist fibrous web on the bottom felt 47 after leaving the nip between the press rolls, since the suction effect of the area 45a continues to be exerted upon the lower press felt 47 slightly beyond the nip itself.

The fibrous web is thus carried on the upper surface of the bottom press felt run, indicated by the reference numeral 49, after leaving the lower suction press roll 45. A suction transfer roll 51 is positioned so that its lower surface contacts and slightly deflects downwardly said lower felt run 49, as at 52, just ahead of the guide roll 50. Said suction transfer roll 51 includes a main suction area 53 and an auxiliary suction area 54. A top drier felt 55 is trained around said suction transfer roll 51 to completely lap the main and auxiliary suction areas 53 and 54. The fibrous web of paper is thus transferred from the upper surface of the press felt run 49 to the under-surface of the drier felt 55 in much the same manner as has been previously described.

The roll 50 is preferably resiliently covered for cooperation with a hard surfaced roll 56 in the removal of the edge strips carried by the lower press felt 47 after leaving the main suction area 53. A doctor 57 scrapes the edge strips from the hard surfaced roll 56. The edge strips then drop into a receptacle 58.

After leaving the surface of the transfer roll 51, the drier felt 55, with the moist web of paper on its under surface, passes into contact with a first upper drier drum 59. The web is then stripped from the drier felt and the latter passes upwardly to a felt drier drum 60. The web of paper passes through the drying section C along the path indicated by the dotted lines 61.

It will be appreciated that substantially the only difference between the arrangement shown in Figure 2 and that shown in Figure 1 is that the moist web of paper is carried on the bottom press felt, rather than the top press felt, and is transferred to a top drier felt, rather than to a bottom drier felt. The two constructions are otherwise substantially the same.

The construction illustrated in Figure 3 is a further modification in which the moist fibrous web is not transferred direct from a press felt to a drier felt but to an intermediary transfer felt. The reference numeral 65 indicates a top press felt, on the under surface of which is carried the moist fibrous web. A suction transfer roll 66 is positioned in the path of the press felt 65, the latter being held in contact with said suction transfer roll 66 by means of a guide roll 67, as previously described. A transfer felt 68 is trained over the suction transfer roll 66 to overlie the

suction area 69 thereof and thus to effect the transfer of the fibrous web from the press felt 65 to the transfer felt 68. Said transfer felt, after leaving the suction transfer roll 66, passes around a rubber surfaced roll 70 and a hard surfaced roll 71, the edge strips being transferred to the hard surfaced roll 71 and being scraped therefrom by a scraper 72 and allowed to fall into a receptacle 73.

The moist web of paper is manually led from the surface of the transfer felt 68 as it passes into contact with the rubber surfaced roll 70 along the path indicated by the dotted line 74 into contact with a lower drier drum 75. The paper web 74 is carried in a straight line from the surface of the transfer felt 68 over a small paper carrying roll 77 and into the nip between the first bottom drier 75 and its regular drier felt 78. From the bottom drier drum 75, the fibrous web passes to a top drier drum 76 and thence through the remaining driers of the drier section.

In Figure 4, the difference in construction resides mainly in the provision of an intermediate transfer felt for effecting the transfer of a partially dried paper web from a pre-drier felt to the surface of a Yankee drier. The arrangement shown in this figure is such that the paper web is at all times supported until it is completely dried. The construction here illustrated includes a press felt 80, a series of pre-driers 81, 82 and 83, a felt 84 trained therearound and also around a felt drier 85, and a suction transfer roll 86 for effecting the transfer of the fibrous web from the press felt 80 to the drier felt 84. The suction transfer roll 86 operates in exactly the same manner as that described in connection with the suction transfer roll 37 (Fig. 1).

Since there would be a tendency, where only bottom driers, such as the drier drums 81, 82 and 83 are used, for the fibrous web to sail away from the surface of the drier felt, causing uneven stretching and wrinkles, suction rolls 87, 88 and 89 are provided after each of the drier drums 81, 82 and 83. The suction rolls 87, 88 and 89, like the suction roll 86, are provided with main and auxiliary suction areas, indicated at 90 and 91, so that the fibrous web of paper is held on the felt 84 while the felt is being turned from a straight line of travel and brought around to its next straight line of travel to a contact point. The suction rolls 86, 87, 88 and 89 thus serve as automatic means for transferring the paper web from the press felt to the drier felt and from one drier drum to the next, all without the direct application to the web of a pressure roll, the pressing action of which would cause the web to become embedded in the felt.

The pre-driers 81, 82 and 83 serve to partially dry the paper web. While it would be possible to completely dry the paper web on driers such as the driers 81, 82 and 83, the arrangement shown in Figure 4 includes a Yankee drier drum 92 for completing the drying of the web.

In order to effect the transfer of the fibrous web from the drier felt 84 to the surface of the Yankee drier drum 92, there is provided a suction transfer roll 93 having a separate felt 94 trained therearound. Said transfer roll 93 is provided with a suction area 95 for stripping the paper web from the drier felt 84, and also with a suction area 96 just ahead of the nip between said transfer roll 93 and the Yankee drier drum 92. The run of the drier felt 84, indicated at 97, between the felt roll 89 and a guide roll 98 overlies only a portion of the suction area 95,

while the separate felt 94 is lapped completely about both of the suction areas 95 and 96. The web of paper is thus transferred from the drier felt 97 to the separate felt 94 and caused to travel around the roll 93 into contact with the surface of the Yankee drier drum 92 at a point just beyond the trailing edge of the suction area 96.

The arrangement illustrated in Figure 4 thus provides for the transfer of a fibrous web from a press felt to a drier felt and then from the drier felt to a separate felt, and thence to the surface of a drier drum. The web of paper is at all times supported during its travel through the machine until it is completely dried.

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.

What I claim is:

1. In a paper making machine including a press section and a drier section composed of a single tier of pre-driers and a Yankee drier, a press felt and a pre-drier felt, means for transferring a web of paper from said press felt to said pre-drier felt, from one drier to the next and from said pre-drier felt to said Yankee drier, said means comprising a suction transfer roll around which said pre-drier felt is trained and against the suction area of which an unbacked run of said press felt is guided for the transfer of said paper web from said press felt to said pre-drier felt, a suction transfer roll between successive pre-drier drums over which said pre-drier felt is trained in transferring said web from one pre-drier drum to the next, a suction transfer roll positioned against said Yankee drier drum, a transfer felt trained around said last mentioned suction transfer roll and a roll guiding said pre-drier felt against said transfer felt over a suction area of said last mentioned suction transfer roll to transfer said paper web to said transfer felt for subsequent transfer therefrom to the surface of said Yankee drier.

2. In a paper making machine having a press section, a drier section, and a press felt for carrying a moist tissue paper web through said press section, apparatus for transferring the paper web from the press felt to said drier section comprising a suction transfer roll having a suction area, a porous drier felt of coarse, open weave lapped about said roll to cover the entire suction area thereof and a guide roll for guiding an unbacked run of said press felt carrying said moist paper web into contact with said drier felt at said suction area to remove said web from said press felt to said drier felt, said drier felt extending beyond said suction area directly into said drier section from said suction transfer roll without the application of roll pressure to the drier felt and the moist web carried thereon, whereby said web is prevented from becoming embodied in the porous drier felt.

3. In a paper making machine including a press section, a press felt therefor, a drier section and a drier felt therefor, means for transferring a wet web of paper from said press felt to said drier felt with the wet web constantly supported upon the surface of a felt until said web reaches said drier section to thereby eliminate the necessity of stripping said web from a bare press roll surface, said means comprising a suction transfer roll having a suction area around which said drier felt is lapped, and rolls guiding said press felt with the wet web thereon to bring a length of said web supported only by said press felt into contact with said drier felt at said suction area to cause the suction effect thereof to transfer said web to said drier felt, said drier felt with the web thereon extending beyond said suction area into said drier section to transfer said web to said drier section.

4. In a paper making machine having a forming wire section, a press section and a drier section, means for transferring a wet web of paper from said wire section through said press section to said drier section with said web constantly supported upon the surface of a felt from the time of leaving said forming wire section to a point beyond said press section to thereby eliminate the necessity of stripping said web from a bare press roll surface, said means comprising press felts for carrying said web from said forming wire section through said press section, one of said press felts having an unbacked run beyond said press section on which the web is carried, a suction transfer roll having a suction area in the path of said unbacked run of said press felt, and a suction transfer felt lapped about said transfer roll to cover the entire suction area thereof and thus receive said web from said press belt by the action of suction at said suction area, said transfer felt having a run carrying said web and extending beyond said suction area to said drier section to deliver said web to said drier section.

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