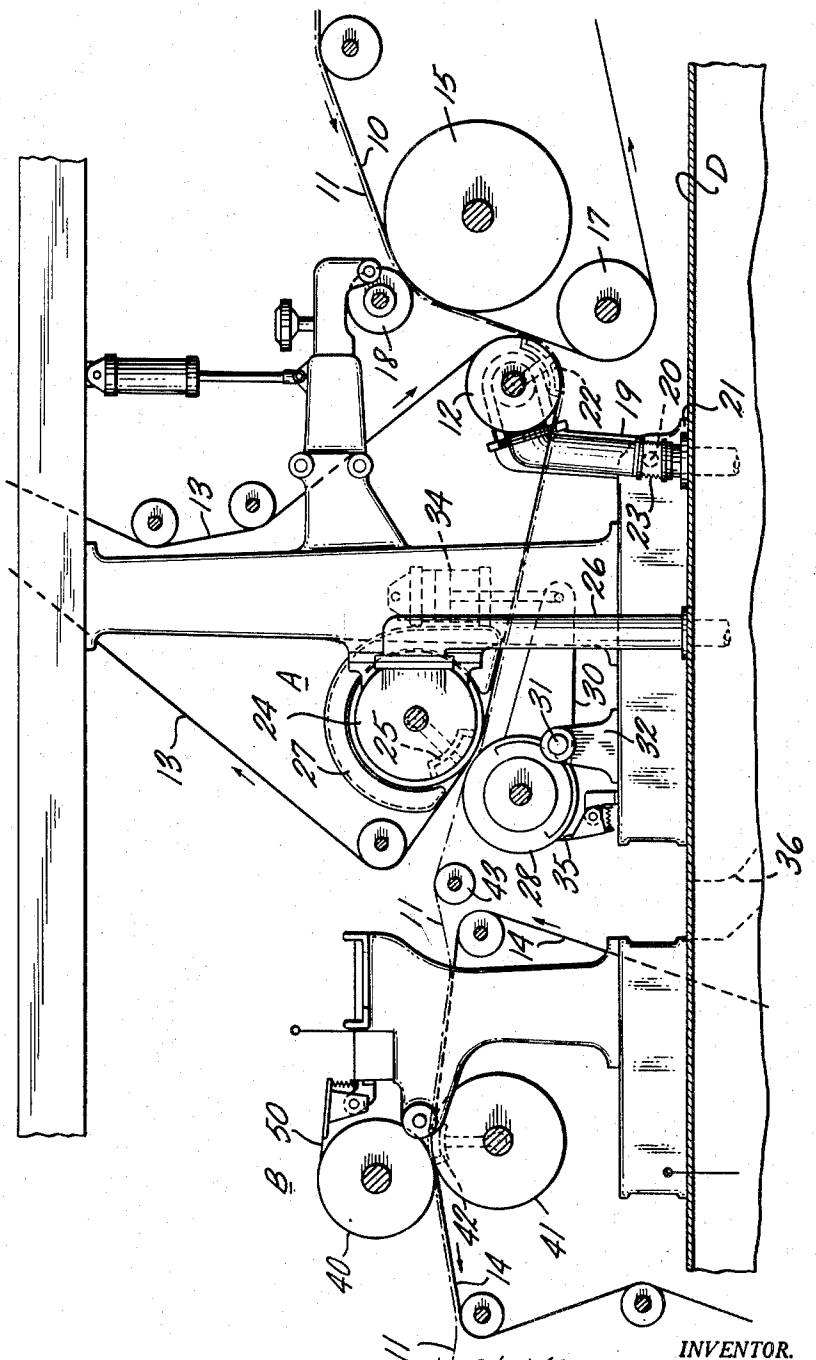
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PAPERMAKING MACHINE

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PAPERMAKING MACHINE

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This invention relates to paper making machines, such as machines of the Fourdrinier type, wherein wet pulp is fed to and spread evenly upon the surface of a moving wire to form a wet web sheet thereon, the web fed through a series of press rolls which serve to remove water, consolidate the web, and remove the impressions produced in the web by the wire, and the web thereafter dried and calendered. In machines of this general organization, it is customary to guide the web in its travel through one or more of the press units either between continuous moving felt strips or upon a single continuous moving felt strip, the web in either case being positively supported on top of a moving felt strip.

In the present invention the paper web is removed or picked off the forming wire by a rotating transfer roll, preferably with the help of suction, and the web transferred to an upper felt strip. The wet web inherently adheres to the underside of the felt strip, and the web is thereby carried, without lower support, through one or more of the press units.

In the conventional design of the press units of paper making machines, the lower roll is a suction roll journaled in fixed bearings, whereas the bearings of the upper roll are movable toward the lower roll, the pressure therebetween being determined by the weight of the upper roll. The purpose of the suction, in machines of conventional design, is to remove water from the web and the felt strip and since the peripheral surface of the suction roll is ordinarily perforated, it is deemed preferably that the suction roll engage the felt rather than the web directly. In the present invention there is no lower felt, but only the upper felt. Nevertheless, it is feasible, in the present invention, to utilize a suction press to withdraw water from the web by inverting the conventional rolls. Thus, in the present invention the upper roll is the suction roll and the bottom roll is a plain roll. In this way, the suction roll engages the felt, rather than the web, and the suction roll, in addition, helps to fix the web to the lower surface of the felt in a cohesive relationship.

In the preferred form of the invention, the top suction roll is journaled in fixed bearings and provision is made for raising the plain bottom roll into engagement with the top suction roll with the desired pressure. Thus, a controllable pressure may be realized between the upper and lower press rolls so that it is not necessary to rely merely on the weight of the upper roll. Furthermore, the fact that the upper suction roll need not be adjustable toward and away from the lower plain roll is an important advantage inasmuch as the connections to the suction box of the suction roll need not be movable.

The elimination of the lower felt strip, of course, affords simplification in the construction of the machine, and the new arrangement has the further advantage that the web is at all times accessible, unobstructed by the lower felt, from the pit beneath the press. Therefore, in case of a rupture or break of the web, the web may be brought straight down into the pit instead of having to be fed through the press and beyond the point of separation of the felt. The web may be readily repaired and the cohesion between the web and the undersurface of the felt reestablished. In addition, as the lower plain roll of the first press unit will bear directly against the side of the paper web engaged by the wire, instead of acting through the lower felt, the wire marks therein will be effectively smoothed out in the first press unit.

In the preferred design of the machine, the upper pick-up felt travels essentially in a straight path between the transfer or pick-off roll and the top roll of the first press unit. In this way, the paper web, adhering to the underside of the pick-up felt, is not subjected to any changes of direction which might endanger the cohesion and cause the web to drop off the felt. Thus, the felt may be primarily chosen with regard to its high water absorption qualities, rather than with a view to the adhesiveness of the felt. Of course, the straight path of the web also facilitates the repair of the web after rupture and makes it easier to inspect and maintain the machine.

The invention will be more fully described hereinafter with reference to the accompanying drawing which diagrammatically shows a part of a paper making machine embodying the present invention.

Referring to the drawing, the pulp is applied evenly to the wire 10 of the paper making machine forming a web 11 which is picked off the wire 10 by a rotating transfer roll 12. The web 11, adhering to the lower surface of an endless moving felt 13, is carried thereby through a press unit, generally designated by the reference character A. From the press unit it is transferred to the top surface of another endless continuously moving felt 14 which carries the web through another press unit, generally designated by the reference character B. The web is then conveyed to the drying portion of the machine which forms no part of this invention.

The web forming wire 10 of the paper making machine travels in a closed circuit, only part of which is shown in the drawing. In the portion shown, the web is trained over a couch roll 15, preferably a suction type roll, and then travels in a downwardly sloping direction to a wire drive roll 17, passing around part of the circumference of the roll 17 to change the direction of travel of the wire. A pressure roll 18 bears against the couch roll 15 and is so journaled that it can be raised in order to facilitate the change of the wire.

The driven transfer roll 12 bears against the unsupported downwardly inclined stretch of the wire between the couch roll 15 and the wire drive roll 17, and the function of the transfer roll 12 is to remove the web 11 from the wire 10. The transfer roll is journaled in the upper ends of arms 19 which are pivotally mounted about pins 20 to a base structure 21 anchored to the floor D. The pivotal arms permit the transfer roll to be translated toward and away from the inclined stretch of the wire, and thus, by adjusting the arms in the desired pivoted position, the pressure of the transfer roll against the wire and the arc of the circumference of the roll engaged by the web may be regulated as desired. The transfer roll 12 is preferably in the form of a perforated suction roll and has a suction zone 22 which is connected by means of a flexible tube 23 to a vacuum pump (not shown).

The felt 13 which carries the paper web 11 from the wire 10 to the press unit A travels in essentially a straight line between the transfer roll 12 and the top roll 24 of the press unit A. As explained above, it is deemed desirable in order to insure the adherence of the web to the underside of the felt 13 that the path of travel of the felt be essentially in a straight line and in approximately the horizontal direction, although in the embodiment illustrated in the drawing the path of travel of the felt between the transfer roll 12 and the upper roll 24

of the press unit is in a slightly, but insignificantly, inclined direction.

The upper roll **24** of the press unit A, in the preferred embodiment, is a perforated suction roll having a suction zone **25** communicating with a vacuum pump (not shown) by means of a fixed conduit **26**. An upper hood **27** communicating with the conduit **26** surrounds the greater part of the suction roll **24** and serves to collect the water thrown out therefrom.

The bottom roll **28** of the press unit A is an idling stone roll journaled between arms **30** (only one of which is shown) pivotally mounted to pins **31** (only one being shown) of a mounting bracket **32**, and the pivotal adjustment of the arms **30** moves the roll **28** towards and away from the periphery of the upper roll **24**. The pivotal action of the arms **30** is controlled by a pneumtaic piston **34**, and the bottom roll **28** can be raised from a lowered position and brought to bear against the top roll **24** at a desired pressure by adjusting the pneumatic pressure upon the piston **34**.

A doctor blade **35** is suitably mounted at the left side (as viewed in the drawing) of the roll **28**, above a pit **36** formed in the surface of the floor D beneath the press unit A, and the blade is adapted to bear against the periphery of the lower roll **28**. In the event of a rupture or break of the web between the presses, as well as when initially drawing the web through the machine, the web is scraped off the surface of the roll **28** by the doctor blade **35**, the web running vertically down into the pit **36**.

The felt **13**, as mentioned above, forms a closed loop engaging the transfer roll **12** and the top suction roll **24** of the first press unit. The felt is guided in its circuit by a plurality of rolls and runs from above to the roll **12**, engaging the periphery thereof throughout a center angle exceeding 90° and leaving the transfer roll **12** approximately in the horizontal direction. Without bearing against any guide roll or similar means, the felt then runs directly to the first press unit A, its path being essentially straight between the rolls **12** and **24**. Due to the fact that the top roll **24** is displaced somewhat at an angle in relation to the lower roll, the felt **13** will engage the lower periphery of the top roll **24** somewhat in advance of the bite between the rolls **24** and **28**. After passing between the press rolls **24** and **28**, the felt runs in an inclined, upward direction, substantially tangential to the bite between the rolls **24** and **28**, to a guide roll and then travels upwardly over a series of rolls to complete circuit. Preferably the change of direction of the felt in passing around the periphery of the suction roll **24** is in the order of 20 to 30°.

The press unit B is of a more conventional design and comprises an upper roll **40** and a suction bottom roll **41** having a suction zone **42**. The paper web travels from the press unit A over the guide roll **43** to the top surface of the endless moving felt **14**. The felt **14** guides the web through the bite between the press rolls **40**, **41**, the upper roll **40** of the press unit B engaging the upper surface of the web. A doctor blade **50** is adapted to engage the surface of the upper roll **40**. After passing through the press unit B, the web **11** travels towards the drying section of the machine.

In operation, the paper web **11**, as mentioned before, is formed on the moving wire **10** and during the downwardly inclined stretch of the wire between the suction roll **15** and the drive roll **17**, the web is engaged by the surface of the pick-up felt **13** which, with the help of the vacuum of the suction zone **22** of the transfer roll **12**, causes the web to adhere to the surface of the felt, whereby the web is transferred from the wire **10** to the surface of the felt. Thereafter, the web follows the path of the felt around the transfer roll **12** in a straight path toward the press unit A, the web being held against the felt by cohesion forces of sufficient magnitude to outweight the effect of gravity on the web. The web **11** passes through the bite between the press rolls **24** and **28** of the press unit A, and, as explained above, the disposition of the rolls of the press unit A is such that the web is caused to engage a portion of the suction surface of the press roll **24**. Thus, although the web, in following curved paths around portions of the peripheries of the transfer roll **12** and the suction roll **24**, is influenced by centrifugal forces, the web is, nevertheless, held at these two points by suction as well as by the cohesive effect of the surface of the felt **13**.

The invention has been shown and described in a single preferred form and by way of example only, and it is understood that many variations and modifications may be made therein without departing from the spirit of the invention. For example, the transfer roll **12** may be applied to the wire at a point opposite the couch roll **15**, that is approximately where the roll **18** is positioned, said roll being removed. Also, of course, the suction boxes may take various forms other than that shown, or may be divided in such a manner that the suction zone of a higher vacuum is active at the bite between the rollers and another zone adjacent thereto of lower vacuum serves to hold the web against the felt or to prevent water in the perforation holes in the suction roll from being thrown out onto the felt. It is understood, therefore, that the invention is not to be limited to any specified form or embodiment, except insofar as such limitations are expressly set forth in the claims.

I claim:

1. In a paper making machine having a wire with an outer surface on which a paper web is formed; the combination of a first suction roll adjacent to the outer surface of said wire, a second suction roll spaced from said first roll and said wire and substantially parallel with said first roll, an endless felt passing around and below said suction rolls and being interposed between and having an inner surface in direct engagement with the first and second suction rolls and an outer surface adjacent to said wire to pick-up said web and carry it away from said wire, a plain press roll directly beneath said second suction roll and having a surface engaging the outer surface of said felt and any web thereon and squeezing them against said second suction roll, the outer surface of said felt being substantially completely exposed between said wire and said press roll and a scraper engaging the surface of said press roll for disengaging a broken web thereon and discharging it downwardly by gravity.

2. A combination as set forth in claim 1, wherein the first suction roll is adjustable towards and away from the inclined portion of the forming wire.

3. A combination as set forth in claim 1, wherein the press roll is adjustable towards and away from the second suction roll and including means to control the pressure of the press roll against the second suction roll.

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