July 15, 1958 H. HOLDEN 2,843,025

PAPER-MAKING MACHINES

Filed March 31, 1954 2 Sheets-Sheet 1

FIG. 1.

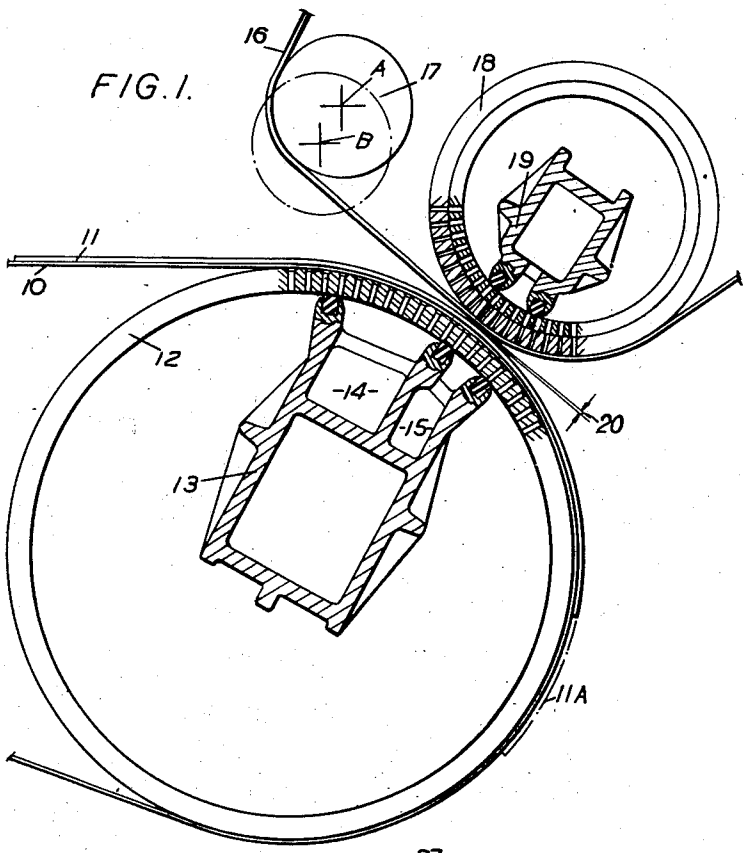
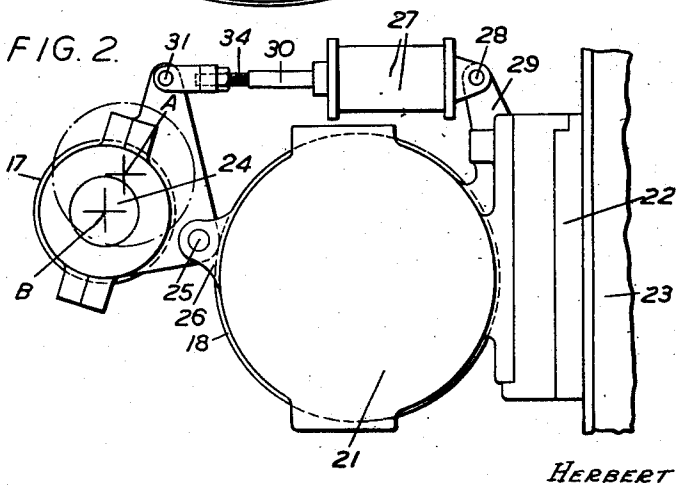


FIG. 2.



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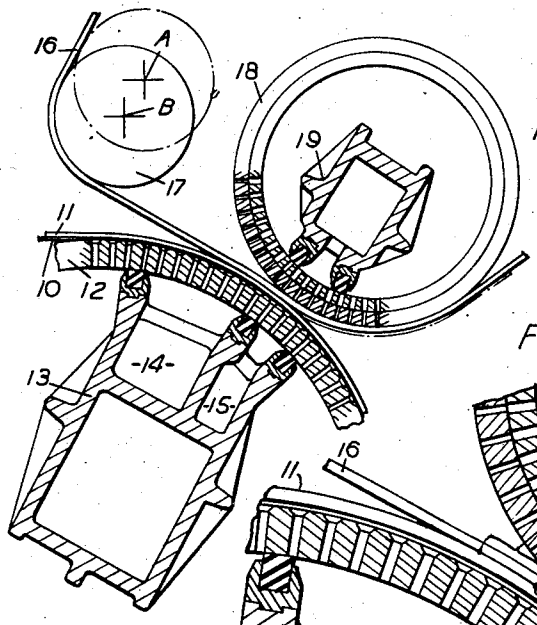


FIG. 3.

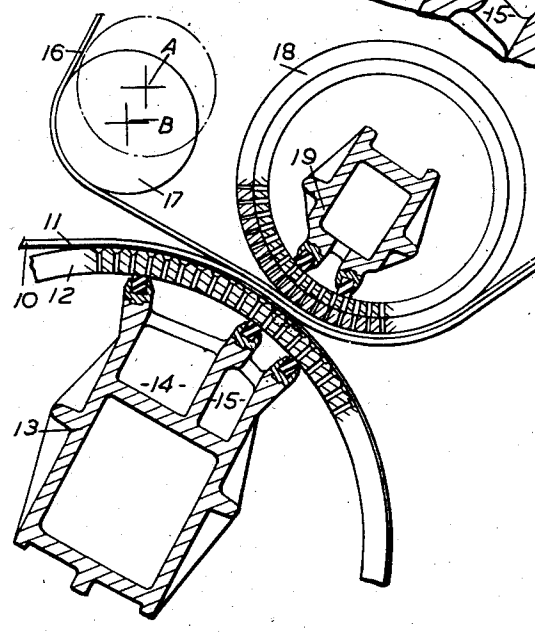


FIG. 4.

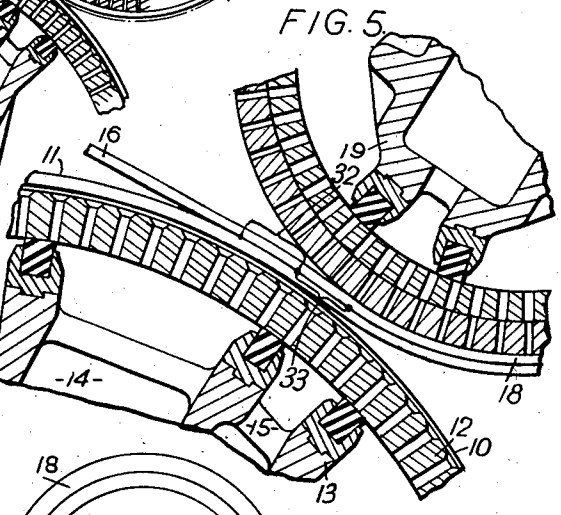


FIG. 5.

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PAPER-MAKING MACHINES

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Application March 31, 1954, Serial No. 420,132

Claims priority, application Great Britain April 2, 1953

2 Claims. (Cl. 92—49)

This invention relates to paper-making machines of the type in which the paper web is removed from the forming wire by means of a vacuum pick-up roll and a transfer felt.

The usual arrangement has the vacuum pick-up roll so disposed as to bring the transfer felt into contact with the web on the wire either at the periphery of the couch roll or in a run of the wire from the couch roll to a forward drive (or return) roll, and the first contact of the transfer felt with the web is at the nip formed by the pick-up roll and the wire. There is thus at the nip simultaneous contact between the four elements: pick-up roll, transfer felt, paper web, and wire. In the case of pick-up at the couch roll, there is simultaneous contact with a fifth element: the couch roll itself. In some cases, the pick-up roll is the bottom roll of a "stacked" press, into which the web is directly carried.

Pick-up at the couch roll has the advantage that the couch roll itself provides a firm backing for pressure to be applied to the web during transfer, the pick-up roll and the couch serving as a preliminary press section, with the vacuum applied primarily for the pick-up also serving to extract from the transfer felt water expressed into it from the web. However, the newly-formed web may have some variations in thickness or small lumps of fibres, and damage to the web in such early stage of its formation may result from the localised pressure arising from the passage of these through a positive nip between the pick-up roll and the couch roll.

The object of the invention is to provide a vacuum pick-up arrangement that gives a press action at the couch roll, and yet permits the passage of inaccuracies of the kind mentioned without damage to the web or wire.

According to the present invention, a vacuum pick-up mechanism for a paper-making machine comprises a couch roll over which the forming wire passes, a transfer felt, a vacuum pick-up roll, and a guide roll for the transfer felt in advance of the vacuum pick-up roll, the guide roll and the pick-up roll in operative position lying clear of the forming wire by an amount greater than the thickness of the felt, which amount provides that a straight line tangential to the outer felted surfaces of both the guide roll and the pick-up roll would, for a portion of its length, form a chord of the circle provided by the lap of the wire round the couch roll.

This means that the couch roll must deflect the felt to something approximating to its own curvature in the span of the felt between the guide roll and the pick-up roll. It also means that the web makes its first contact with the felt at a point between the guide roll and the pick-up roll and leaves the wire before the felt reaches the pick-up roll. Between these points, the web is subjected to pressure exerted solely by an arc of felt conforming to the curvature of the couch roll (the web and the wire constituting intermediate arcs of similar length), and the felt thus forms a flexible bite, capable of passing lumps and variations in thickness without the same likelihood of damage to the web or wire that arises in passage through a positive nip.

The invention will now be described in greater detail with reference to the accompanying drawings, in which

Figure 1 is a vertical section through the pick-up mechanism of a paper-making machine before pick-up of the web commences;

Figure 2 is an elevation of one of the two end mountings of the pick-up roll and felt guide roll;

Figure 3 is a section corresponding to Figure 1 at the point when pick-up of the web commences;

Figure 4 is a further section corresponding to Figure 1 with continuous pick-up of the web; and

Figure 5 is an enlarged fragment of Figure 4.

In Figures 1, 3, and 4, a forming wire **10** carrying a paper web **11** passes over a couch roll **12** having a suction box **13** divided into two compartments **14**, **15**. A felt **16** is directed round a guide roll **17** to pass between the couch roll **12** and a vacuum pick-up roll **18** having a suction box **19**. The pick-up roll **18** lies clear of the forming wire **10** at a distance greater than the combined thickness of the felt **16** and the paper web **11** by an amount **20** (Figure 1), so that the paper in passing between the pick-up roll **18** and the couch roll **12** is not subjected to any positive nip by the two rolls **12**, **18**.

In Figure 2, the vacuum pick-up roll **18** is mounted at each end in a housing **21** attached to a slide **22** adapted to be moved vertically on an upright **23** of the machine frame for setting of the pick-up roll position. The guide roll **17** is mounted at each end in a bracket **24** adapted to swing about a pivot **25** attached to a projection **26** of the housing **21**. The roll is moved from one extreme position A of its axis to an opposite extreme position B by means of pneumatic cylinder **27** attached by a pivot **28** and a projection **29** to the housing **21**, and an adjustable piston rod **30** attached to the bracket **24** by a pivot **31**. Equivalent mechanical, hydraulic, or other means may also be used to effect the movement of the roll **17**.

In Figure 1, the guide roll **17** is in the position A, and the felt **16** is clear of the web **11** on the wire **10**. Until pick-up takes place, the web **11** is repeatedly severed prior to reaching the couch roll **12** and the broke **11A** is later doctored from the return run of the wire into a hog-pit (not shown).

Movement of the guide roll **17** to the axial position B, when it makes its nearest approach to the couch roll, brings the felt **16** into contact with the web **11** over a small arc (Figure 3). The compartment **14** of the suction box **13** is under normal vacuum to remove water from the web **11**, whilst the other compartment **15** is supplied with high velocity air to assist the suction pick-up first of a starting tail (cut from the full width of the web by the usual jet cutter over the wire) by blowing it on to the underside of the felt **16**, and later of the full width web itself, by bringing the tail and then the web into reach of the suction applied by the box **19** in the pick-up roll **18**.

When the starting tail, followed by the full width of the web **11**, has been fed successfully through the machine, the compartment **15** is changed over from high velocity air blown outwards to low vacuum producing a high velocity flow inwards to remove any water in the meshes of the wire and in the holes of the couch roll, to prevent this water from being flung centrifugally back on to the web **11** after the latter has passed the vacuum compartment **14**.

In the normal running position (Figure 4) of the pick-up mechanism, the felt **16** remains deflected approximately to the curvature of the couch roll **12** over a small arc **32** in the span of the felt between the guide roll **17** and the pick-up roll **18**. This means that the web **11** makes its first contact with the felt **16** at a point between the

guide roll **17** and the pick-up roll **18** and leaves the wire **10** before the felt **16** reaches the pick-up roll **18**. Therefore, between these points, the web **11** is subjected to pressure exerted solely by the arc **32** (seen more clearly in Figure 5) of felt conforming to the curvature of the couch roll **12**, and the felt **16** thus forms a flexible bite. The thickness of the web is normally less than the clearance **20** (Figure 1), and the clearance allows for any variation in thickness, and also for the passage of small fibre lumps, which are therefore not crushed into the web at this early stage of its formation, there being flexibility in the contact between the felt **16** and the web **11** over the length **33** (Figure 5) of mutual contact directly following the arc **32**.

The clearance of the pick-up roll with respect to the couch roll may be adjusted by raising or lowering the slides **22** according to the expected variation in web thickness or the size of small lumps or fibre. The position of the guide roll may also be adjusted in its nearest approach to the couch roll by the adjusting means **34** in the links **30** for varying the amount and extent of the deflection of the felt by the couch roll. The spacing of the centres of the rolls **17**, **18** is such as to produce the required amount and extent of the deflection of the felt **16** by the couch roll **12**.

The flexible bite provided over the arc **32** assists in expressing water from the web **11**, and the compartment **14** of the suction box **13** extracts this water, including any pool forming between the web **11** and the felt **16** just in front of the arc **32**. The compartment **15** discharges high velocity air through the perforations of the couch roll **12** and the wire **10** just beyond the contact length **33** and the air readily lifts the web (or its starting tail) into contact with the felt **16** when transfer is started.

The suction box **19** of the pick-up roll **18** covers an arc commencing opposite the centre of the length **33** and extending sufficiently to maintain contact of the web **11** with the felt **16** after the web has been lifted clear of the wire **10**. Although the drawings show the felt **16** leaving the pick-up roll **18** on its way to a separate press section, the pick-up roll could be the bottom roll of a stacked press, in which case the felt **16** would continue in contact with the roll until it passed through the bite of that roll with the superimposed roll of the stacked press.

The arrangement is applicable both to machines in which the wire is returned by the couch roll and to machines in which the wire proceeds from the couch roll to a forward driving (or return) roll, the wire only leaving the couch roll after the felt and the web have left the wire.

What I claim is:

1. In a vacuum pick-up mechanism in a paper making machine including a suction couch roll, a forming wire for forming and carrying a paper web, said forming wire being looped around said couch roll to be held in contact therewith and to overlie the suction area thereof, and a transfer felt, the combination therewith of a vacuum pick-up roll spaced from said couch roll in operating position by a distance slightly greater than the combined thicknesses of said wire, web and transfer felt to provide an open nip, said couch and pick-up rolls having closely adjacent overlying suction areas continuous respectively from immediately in advance of to beyond said nip, an adjustable guide roll immediately in advance of said nip and having said transfer felt trained therearound to guide said felt into said nip and into its first contact with said pick-up roll, said guide roll in non-operating position holding said felt clear of said web carried by said wire and being so positioned in operating position that said transfer felt after leaving said guide roll first contacts the web on said wire backed by said suction couch roll while said wire is subjected to the suction effect of said couch roll in advance of said nip and the felt then passes into and through said nip and is subjected to the vacuum effect of said pick-up roll to be held thereagainst with the web transferred to said pick-up roll, said web at and beyond said nip being carried by said transfer felt free of said wire and said wire continuing in contact with said couch roll before, at and beyond said nip, whereby the web is not subjected to positive roll pressure at said nip.

2. A vacuum pick-up mechanism in a paper making machine having a forming wire on which the web is formed and conveyed, a suction couch roll around which said forming wire is trained to lie in contact therewith and with the suction area thereof, a vacuum pick-up roll arranged in close proximity to said couch roll to form an open nip therebetween, a guide roll immediately in advance of said pick-up roll, means for moving said guide roll about said pick-up roll toward and away from said couch roll into operating and non-operating positions, respectively, and a transfer felt trained over said guide roll to be guided thereby into said open nip, said guide roll in non-operating position holding said felt clear of said web carried by said wire and in operating position guiding said felt first into contact with said web on said wire at the suction area of said couch roll and then into contact with said pick-up roll at the suction area of the latter, the operating positions of said guide roll, couch roll and pick-up rolls being such that a tangential line between said guide and pick-up rolls on the outer surface of said felt intersects an arc of said wire on said couch roll before said wire and felt reach a line joining the centers of said couch and pick-up rolls, the suction areas of said couch and pick-up rolls being so closely positioned in overlapping relationship in the area of the nip as to exert a substantially continuous suction effect on the web as the same is carried through said nip, said web at and beyond said nip being carried by said transfer felt free of said wire and said wire continuing in contact with said couch roll before, at and beyond said nip, whereby said wire, web and felt are not subjected to positive roll pressure at said nip.

References Cited in the file of this patent

UNITED STATES PATENTS

1,991,346	Ellis	Feb. 12, 1935
2,204,426	Millspaugh	June 11, 1940
2,209,757	Berry	July 30, 1940
2,415,350	Hornbostel et al.	Feb. 4, 1947
2,415,351	Hornbostel et al.	Feb. 4, 1947

FOREIGN PATENTS

232,059	Germany	Feb. 23, 1910
499,657	Great Britain	Jan. 26, 1939