June 5, 1956 R. C. HEYS 2,748,671

PAPER-MAKING MACHINES

Filed Jan. 12, 1953

FIG. 1.

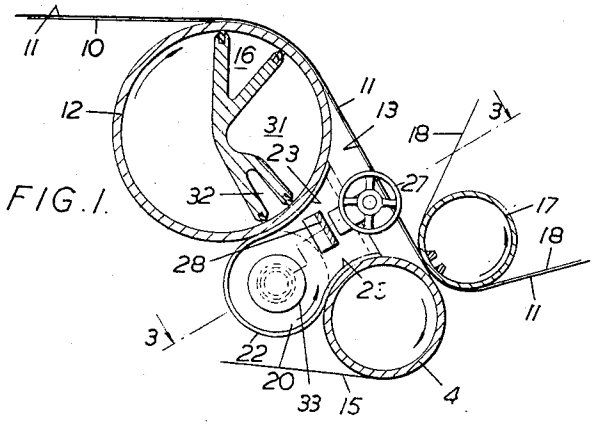


FIG. 2.

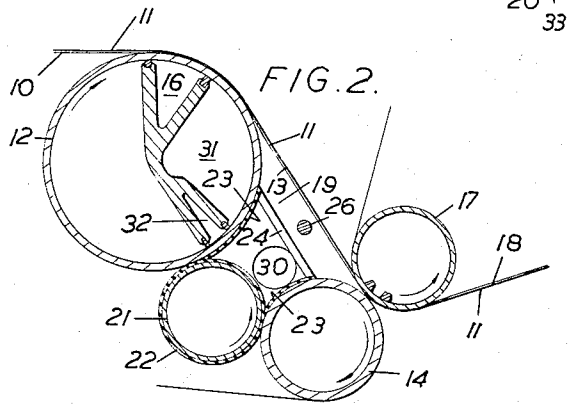


FIG. 3.

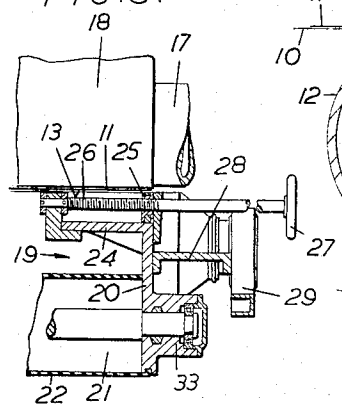
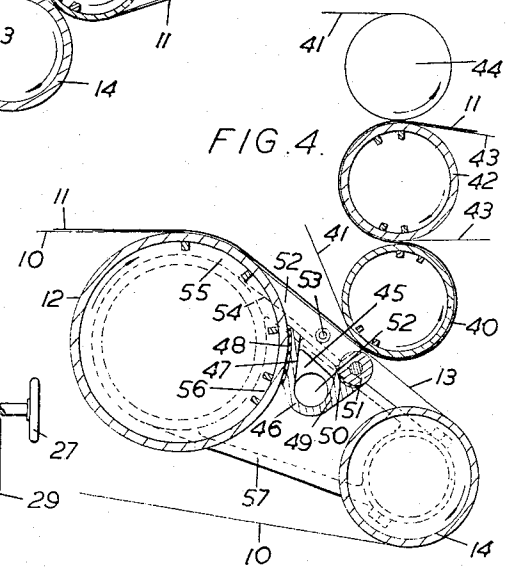


FIG. 4.



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PAPER-MAKING MACHINES

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Claims priority, application Great Britain January 25, 1952

4 Claims. (Cl. 92—44)

This invention relates to paper-making machines of the Fourdrinier type employing automatic pick-up means of a suction roll making contact with the wire at some point in its run from the couch roll to a forward drive roll over which the wire is passed before making its return run to the breast roll. The necessary contact of the pick-up roll with the wire is obtained either by adjustment of the roll itself with respect to the wire, or, if the roll is the bottom roll of a stacked press, by swinging the forward drive roll to adjust its height.

In such constructions, a certain amount of the water extracted from the wet web by the suction couch roll remains entrained in the mesh of the forming wire, and this is carried beyond the suction area of the couch roll while the wire is still supporting the paper web, with the result that entrained water may be re-absorbed by the paper web before the web is removed from the wire by the pick-up roll. It is an object of the present invention to provide means for removing entrained water from the wire to prevent re-absorption by the web, thereby effecting a higher degree of water extraction and a more efficient use of the couch roll.

According to the present invention, in a paper-making machine of the type described, a vacuum chamber is disposed transversely across and below the forming wire between the suction couch roll and the forward drive roll, preferably extending from the point at which the wire leaves the couch roll, and either extending to the point at which the wire reaches the forward roll or stopping at some intermediate point, e. g. opposite a suction pick-up roll making contact with the wire before the wire reaches the forward drive roll.

Thus, a rubber-covered roll may be disposed to contact both the couch roll and the forward roll to complete the bottom of the vacuum chamber, with end plates in sealed contact with the peripheries of the three rolls and with the underside of the wire to form a chamber equal in width to the width of the paper being formed. The end plates are preferably adjustably positioned as to their contact with the wire in accordance with the width of paper being formed. The forward roll should be mounted so as to bring the wire from the couch roll at a steep angle, the top of the forward roll then lying at the bottom of the vacuum chamber, with a water outlet in one end wall draining water collecting at the bottom of the chamber. The vacuum pick-up roll makes contact with the wire where the latter makes its first contact with the forward roll. Suction is applied to the vacuum chamber either through the perforated shell of the couch roll, with a suction-box compartment of appropriate angular extent within that roll, or through the water outlet or a separate vacuum connection to the chamber; or through both the couch roll shell and the water outlet.

The couch roll preferably has at least two suction compartments, one in advance of the point at which the wire leaves the roll and applying say 12" to 15" suction (Hg) and other say 15" to 20" suction. A high velocity air compartment may be provided to clear the perforations of the couch roll of entrained water.

The amount of suction applied depends on the porosity of the paper, and also on the extent to which wire marking may be detrimental to the quality of the finished product, and the values given above may have to be reduced somewhat for very free beaten and porous papers. However, for wet beaten paper, giving low porosity, there will be a tendency to increase the vacuum, within the limits to which the usual vacuum breakers are set.

In another construction, the vacuum chamber is formed by a trough having one wall making sealing contact with the periphery of the couch roll, a second wall making sealing contact with the underside of the forming wire at a point corresponding to the point of contact of a vacuum pick-up roll with the upper surface of the wire, a vacuum connection to the chamber for removal of entrained water in the mesh of the wire into the chamber, a connection for removal of water from the bottom of the trough, and end plates completing the chamber and making sealing contact with the underside of the wire and with the periphery of the couch roll.

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

Figure 1 is a side elevation, in part section, of a machine with one construction of vacuum chamber;

Figure 2 corresponds to Fig. 1, but shows a section through the vacuum chamber;

Figure 3 is a sectional view taken on the line 3—3 of Figure 1; and

Figure 4 is a sectional side elevation of a machine with another construction of vacuum chamber.

In Figures 1 to 3, the wire 10 on which the paper web 11 is formed passes over a suction couch roll 12 into a forward and downward run 13 and round a forward drive roll 14 into its return run 15. Suction of 12" to 15" Hg is applied to the suction box 16 of the roll 12, for further removal of water from the web 11, which is removed from the wire run 13 by means of a suction pick-up roll 17 just in advance of the roll 14. The roll 17 guides a transfer felt 18, which makes the actual contact with the web, and the web passes on the underside of the felt 18 to the press section of the machine. (The perforations have not been shown in either the couch roll 12 or the pick-up roll 17.)

Between the rolls 12, 14 is formed a vacuum chamber 19, closed at the sides by end plates 20 and at the bottom by a roll 21 with a rubber covering 22 making sealing contact with the rolls 12, 14. The edges of the end plates 20 have sealing strips 23 making sealing contact with the rolls 12, 14. To adjust the opening of the chamber 19 to the width of the web 11, each end plate 20 has an inward flange 24 (Figure 3) parallel to the wire run 13, and in the space thus provided is positioned a movable deckle or sealing plate 25 through which is threaded a screwed rod 26 controlled by a hand-wheel 27. The deckle 25 is edged with rubber or like strips to make sealing contact with the inner face of the flange 24 and the undersurface of the wire run 13. The end plates 20 are carried by brackets 28 from brackets 29 on which the roll 14 is mounted.

An outlet 30 is formed near the bottom of one end plate 20 for removal of water from the chamber 19. This outlet may also serve for application of vacuum of say 15" to 20" Hg to the chamber, by means of which water is extracted over the whole of the wire run 13 between the rolls 12, 14. Alternatively, or in addition, vacuum may be applied to the chamber from a second suction box 31 in the couch roll 12, through the perforated shell exposed between the upper edges of the plates 20 and the wire run 13. A further chamber 32 in the couch

roll **12** may serve to clear water from the perforations of that roll by the application of high velocity air.

The peripheral speeds of the rolls **12**, **14** being the same, the sealing roll **21** may be driven by the contact of its rubber cover **22** with these rolls, the roll being freely carried in sealed bearing bosses **33** on the end plates **20**.

In Figure 4, there is the same disposition of couch roll **12** and forward drive roll **14** providing a forward and downward run **13** of the wire **10**, but the suction pick-up roll **40** is the bottom roll of a stacked press, and brings the pick-up felt **41** into contact with the paper web **11** near the middle of the wire run **13**. The web **11** is carried round the middle suction roll **42** of the press between the felt **41** and a transfer felt **43**, leaving the press on the felt **43** after passing the plain top roll **44**, from which the pick-up felt **41** passes into its return run.

Between the point at which the wire run **13** leaves the couch roll **12** and the point of contact of the pick-up roll **40** is vacuum chamber **45** formed by a trough **46** having one wall **47** in sealing contact with the periphery of the couch roll shell, sealing material **48** being interposed. The other wall **49** of the trough makes similar sealing contact at **50** with a roll **51** that makes sealing contact with the undersurface of the wire run **13** opposite the pick-up roll **40**. The roll **51** is carried by bearing bosses in the end plates of the trough **46** in a similar manner to the roll **21** in Figure 3. It may be positively driven by having its shaft carried through a stuffing box in one of the bosses for connection to a driving member. Adjustable deckles or sealing plates **52**, controlled by screwed rods **53**, as are the deckles **25** of Figure 3, enable the effective mouth of the trough **46** to be brought to the width of the web **11**.

A drain connection **52** is provided in the end of the trough **46** for removal of water extracted over the wire run **13** between the couch roll **12** and the pick-up roll **40**. This may also serve for the application of vacuum, say 15″ to 20″ Hg, to the chamber **45**. Alternatively, or in addition, vacuum may be applied to the chamber from a second suction compartment **54** of the couch roll **12**, a first compartment **55** having previously applied say 12″ to 15″ Hg to the wire **10** before it reaches the chamber **45**. A high velocity air compartment **46** of the couch roll **12** serves to clear water from the perforations of the roll after they have passed the trough **46**.

For adjustment of the chamber **45** to make the necessary simultaneous sealing contact with the surface of the couch roll **12** and the underside of the wire run **13**, the trough may be adjustable about a pivot co-axial with the couch roll, the wall **47** of the trough making sealing contact over a substantial arc of the surface of the couch roll shell. With such a construction, the seal with the couch roll shell is maintained in any position, and the trough may be adjusted about the pivot until the sealing roll **51** on the other wall **49** makes contact with the underside of the wire and presses the wire and paper against the pick-up felt **41** passing round the pick-up roll **40**.

In Figures 1 to 3, the pick-up roll **17** is adjusted to and from the wire run **13** to provide for effective sealing with the forward drive roll, and the latter is held in fixed bearings. With the pick-up roll **40** of Figure 4 the relatively-fixed bottom roll of a stacked press, then the forward drive roll **14** may be made adjustable to maintain the necessary sealing contact of the roll **51** with the roll **40**, e. g. by being adjustable about the axis of the couch roll **12**, instead of the more usual adjustment about the axis of its intermediate driving pinion (not shown); for example, the trough **46** and the drive roll **14**, may be carried on a pair of arms **57** adjustable about the axis of the couch roll. The trough **14** may also be separately adjustable on the arms **57** towards and away from the pick-up roll **40**.

The vacuum chamber arrangement of Figures 1 to 3 may be used with a stacked, press pick-up as in Figure 4, and the vacuum chamber arrangement of Figure 4 may be used with an independent pick-up roll as in Figures 1 to 3.

What I claim is:

1. A paper-making machine of the Fourdrinier type having a suction pick-up roll making contact with the forming wire beyond the couch roll in a run of the wire from the couch roll to a forward drive roll, comprising a vacuum chamber disposed transversely across and below the wire between the suction couch roll and the forward drive roll and extending from the couch roll to the forward drive roll, with a rubber-covered roll in contact with both rolls to complete the bottom of the chamber, and end plates in sealed contact with the peripheries of the three rolls and the underside of the wire.

2. A paper-making machine of the Fourdrinier type having a suction pick-up roll making contact with the forming wire beyond the couch roll in a run of the wire from the couch roll to a forward drive roll, comprising a vacuum chamber disposed transversely across and below the wire between the suction couch roll and the forward drive roll and extending from the couch roll to the forward drive roll, with a rubber-covered roll in contact with both rolls to complete the bottom of the chamber, and end plates in sealed contact with the peripheries of the three rolls and the underside of the wire, the end plates being adjustably positioned as to their contact with the wire in accordance with the width of paper being formed.

3. A paper-making machine of the Fourdrinier type having a suction pick-up roll making contact with the forming wire beyond the couch roll in a run of the wire from the couch roll to a forward drive roll, comprising a vacuum chamber disposed transversely across and below the wire between the suction couch roll and the forward drive roll and extending from the couch roll to the forward drive roll, with a rubber-covered roll in contact with both rolls to complete the bottom of the chamber, and end plates in sealed contact with the peripheries of the three rolls and the underside of the wire, the chamber being exposed to the shell of the couch roll for the application of the couch roll suction to the chamber through the shell of the roll.

4. A paper making machine of the Fourdrinier type comprising a looped forming wire, a couch roll within the loop of the forming wire, a forward roll also within the loop of the forming wire and cooperating with the couch roll to support a forward run of the forming wire, a felt covered suction pickup roll making contact with the forward run of the wire to pick up a paper web therefrom, and a vacuum chamber disposed transversely across and below the forward run of the wire between the suction couch roll and the forward drive roll and extending from the couch roll to the forward drive roll, with sealing means engaging both rolls and defining a complete bottom of the chamber and end plates in sealing engagement with the peripheries of the rolls and the underside of the wire defining the side walls of the chamber.

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