June 27, 1961 H. F. RANCE ET AL 2,990,013

PAPER MAKING MACHINES

Filed June 22, 1955 3 Sheets-Sheet 1

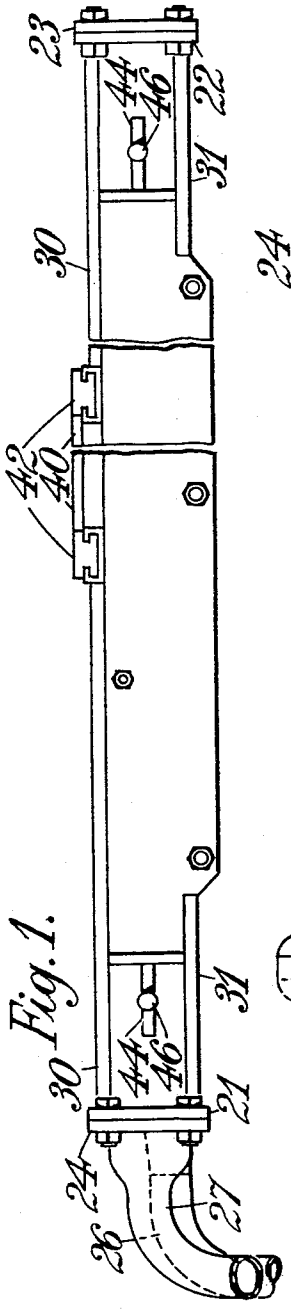


Fig. 1.

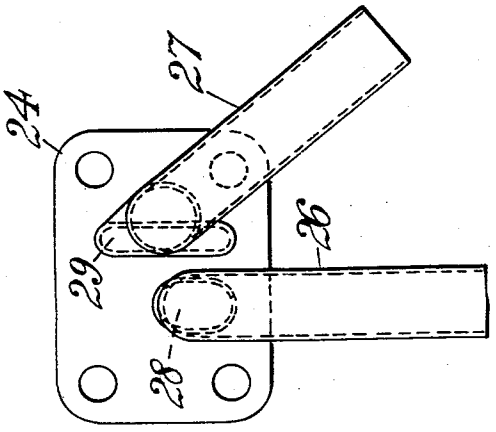


Fig. 4.

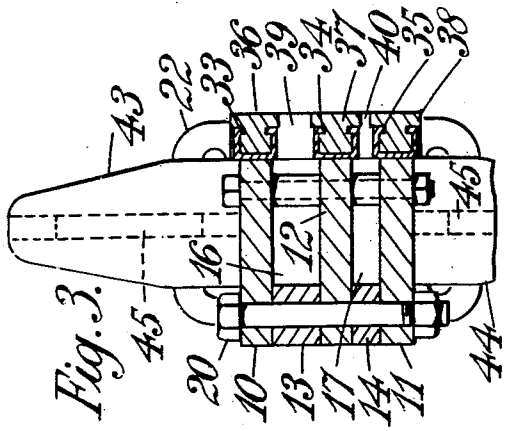


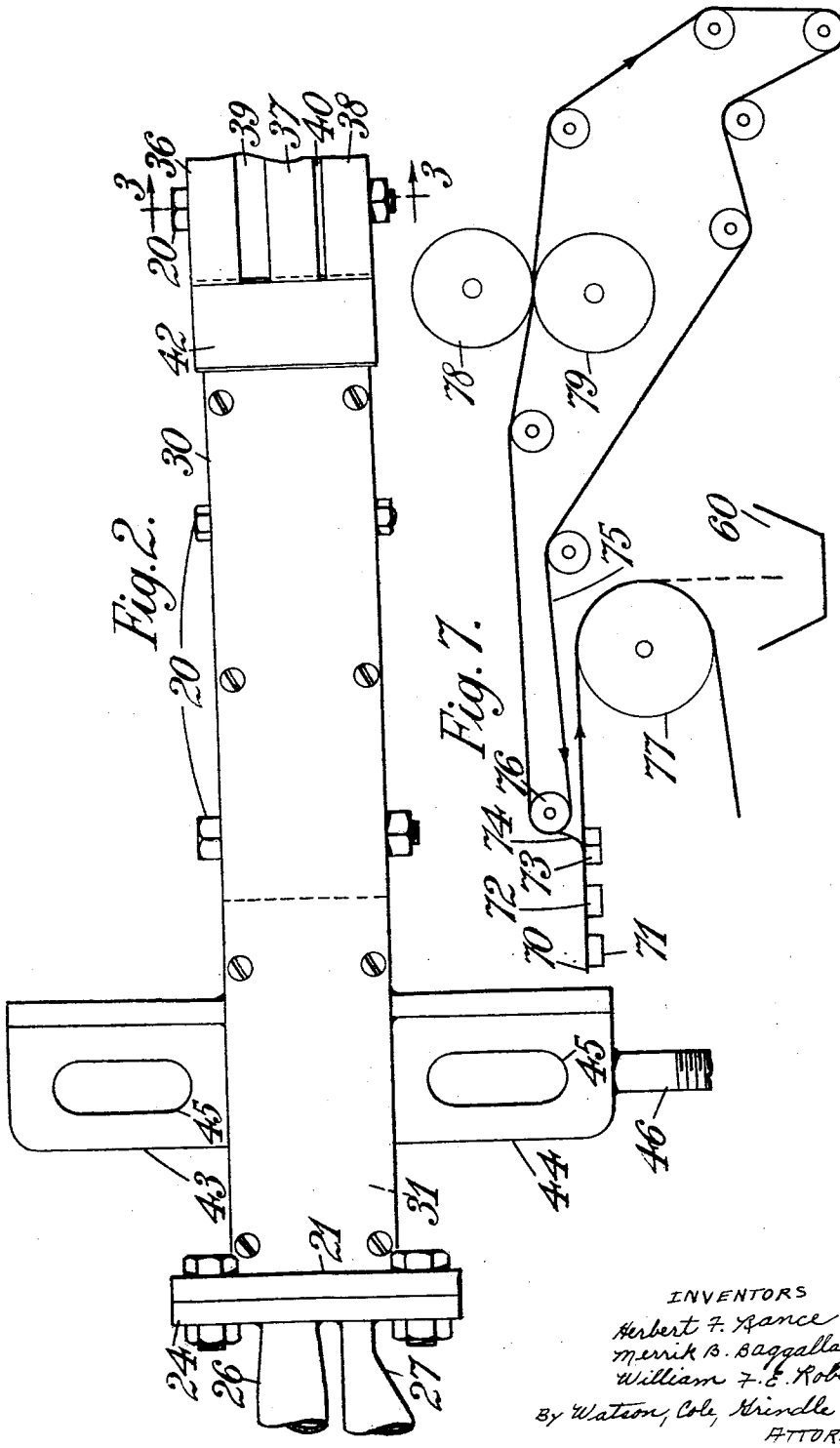
Fig. 3.

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Fig. 5.

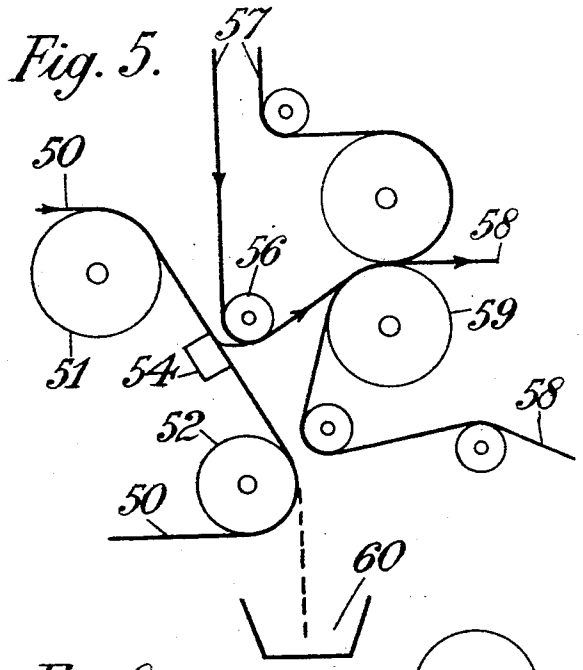
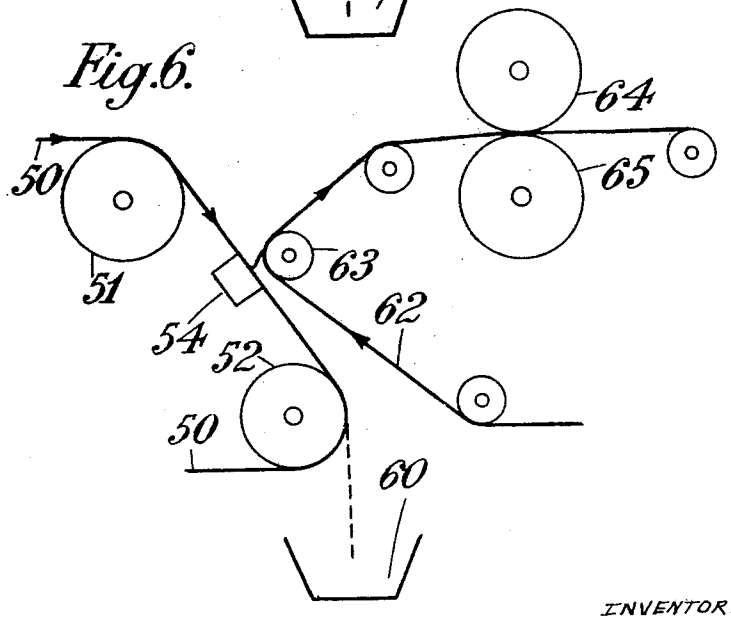


Fig. 6.



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United States Patent Office 2,990,013 Patented June 27, 1961

2,990,013

PAPER MAKING MACHINES

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Filed June 22, 1955, Ser. No. 517,221
Claims priority, application Great Britain July 8, 1954
10 Claims. (Cl. 162—307)

The invention relates to paper making machines of the kind in which the paper, formed from pulp as a continuous web on a travelling endless wire mesh band or on a wire mesh drum and, after removal of some of the water, is transferred from the wire to a travelling receiving surface, usually a felt.

It is an object of the invention to improve the separation of the paper web from the wire.

The invention is based on the appreciation of the facts that if the web is subjected to suction through the wire, water is sucked from the web and forms a film between the web and the wire, that this water facilitates clean removal of the web after release from the suction, provided that such removal is effected before re-absorption of the water is allowed to occur, and that if the web is transferred to the felt across a gap so that there is no pressure applied between the felt and the wire, there will be less tendency for the web to adhere to the wire or to be marked thereby and, further, unwanted trim from the edges of the web will not be transferred to the felt.

It is known in a machine of the above kind to remove the web from the wire immediately after passing a perforated suction-couch but it is found that the perforations tend to produce shadow markings on the paper and separation may be more difficult from the land areas between the perforations.

According to the present invention a machine of the above kind is characterised by the features that the receiving surface is spaced from the wire by a small distance at the transfer position and there is at, or immediately preceding, the transfer position a continuous transverse suction slot which draws water from the web into the wire over substantially the whole width of the web and so facilitates separation of the web and wire.

In a preferred form of the machine according to the invention there is included a transverse slot closely or immediately following the suction slot for emission of compressed air to assist in separation of the web from the wire and transfer of the web to the felt. It is further preferred that the air slot extends across the full width of the web and the arrangement may be that the air is emitted continuously during the operation of the machine.

In one construction of the machine according to the invention the web-carrying wire passes over a perforated suction couch before reaching the suction slot aforesaid and there is a sufficient distance between the couch and the slot for local inequalities in the water content of the web caused by the couch and which might result in shadow markings in the final product, to become sufficiently equalised to avoid production of such markings. The distance required for this purpose varies considerably with the speed of operation of the machine and other factors such as the kind and weight of paper being made. It may for example be between three inches and two feet. A distance of twenty to twenty-four inches is commonly found suitable.

In another construction of the machine according to the invention the water content of the web is reduced by one or more suction boxes having transverse suction slots over which the web passes before reaching the aforesaid suction slot at or immediately before the transfer position. If desired both a suction box or boxes and a suction couch roll may be used.

By way of example of how the invention may be carried into effect there will now be described with reference to the accompanying drawings, a box embodying suction and compressed air slots and some specific applications of this box to paper making machines.

In the drawings

FIGURE 1 is a side elevation of the box,

FIGURE 2 is a plan view showing a part of the box,

FIGURE 3 is a section on the line 3—3 in FIGURE 2,

FIGURE 4 is a view of one of the end cover plates for the box,

FIGURE 5 is a diagram showing the application of the box to a paper making machine,

FIGURE 6 is a diagram showing the application of the box to a modified form of machine, and

FIGURE 7 is a diagram showing another application of the box.

The box, shown in FIGURES 1–4, comprises two longitudinal side plates **10** and **11** and an intermediate plate **12** which are separated by distance pieces **13, 14** and define between them two longitudinal channels **16, 17** for suction and compressed air respectively.

The plates are secured together by clamping bolts **20** and at each end are provided with flange plates **21, 22**. A cover plate **23** is attached to the flange **22** to form a closure for the ends of the channels and a plate **24** is bolted to the flange **21**. The plate **24** has pipe connections **26, 27** for suction and air respectively which lead through ports **28, 29** to the ends of the channels **16, 17**.

Cover plates **30** close the mouths of the channels at each end of the box and plates **31** screwed to the edges of the plates replace the distance pieces **13, 14** for a short distance at each end.

Secured to the upper edges of the plates **10, 11** and **12** there are metal channels **33, 34, 35** which hold laminated plastic strips **36, 37, 38** defining slots **39**, and **40** for the suction and air, the air slot **40** being narrower than the suction slot **39**. The ends of the slots are defined by short cross strips **42** of plastic.

Brackets **43, 44** are secured to the side plates **10** and **11** and provide means by which the box may be secured to the frame members of the machine. The brackets have slots **45** for securing bolts and the brackets **44** have adjusting screws **46** by which the box may be adjusted in position lengthwise of the machine before the bolts are tightened.

In one machine embodying the invention, see FIGURE 5, the web-carrying wire **50** is taken around a perforated suction couch roll **51** and then along a downward sloping path to a lower, driving roll **52**. At a position intermediate between the couch roll **51** and the driving roll **52** there is located a suction and compressed air box **54** as above described with the suction slot **39** preceding the compressed air slot **40**. The slots extend cross-wise and below the wire. Immediately opposite to the box there is a vacuum transfer roll **56** around which there passes an upper felt **57**. The felt is a short distance (i.e. ½ inch or less) from the web carried on the wire **50**.

In use some of the water is extracted from the web into the couch roll **51**. The web then passes to the suction and air box, there being sufficient distance (e.g. one to two feet depending on the speed of travel of the web) between the couch roll and the box for sufficient equalization of the water content of the web to avoid the production of shadow marking. As the web passes over the suction slot **39**, water is extracted substantially evenly over the whole width of the web and forms a film between the web and the wire. The web then passes imme-

diately to the compressed air slot **40** and is readily separated from the wire by the air and blown on to the felt **57** as the latter passes over the vacuum transfer roll **56**. The web then passes to a press embodying a lower felt **58** and a suction roll **59** by which further water is extracted. The trim which lies outside the ends of the suction and compressed air slots remains on the wire and may be removed from the wire when it passes over the driving roll and run to a hog pit **60** from which it may be pumped back for immediate re-use.

In the modified form of the machine as just described, shown in FIGURE 6, the upper felt **57** is replaced by a lower felt **62** which passes around a roll **63** opposite to the box, the roll not necessarily being of the vacuum type. The web is blown on to the top of the felt and runs with the felt through a plain press **64, 65**.

In another example of the machine according to the invention, shown in FIGURE 7, the web-carrying wire **70** passes in a horizontal run firstly over two suction boxes **71, 72** and then to the above described combined suction and compressed air box **73**. The air blows the web **74** upwardly on to a lower felt **75** which passes over a roll **76** spaced a short distance above the wire. The wire then continues to a driving roll **77**. No suction roll couch is employed in this example. The felt carries the web to a plain press **78, 79**.

The invention is particularly suitable for the use in the manufacture of very light weight or very wet beaten papers and has the advantages that the formation of shadow markings may be avoided or reduced, damage to the under side of the paper at the point of release from the wire is reduced, wire marks resulting from the pressure of a transfer roll on the web are avoided, damage to the felt or wire due to lumps passing beneath the transfer roll is reduced, difficulties due to the transfer of trim to the pick-up felt are avoided and the trim may be removed from the wire in a form convenient for re-use (i.e. without requiring to be separated from water employed to wash the trim off the wire).

The invention is not restricted to the constructional details of the above examples. For instance the suction and compressed air box may be built up from round suction tube divided into suction and air compartments by a diametrical partition and the slots defined by one or more longitudinal strips covering longitudinal openings in the walls of the tubes. In the case of the first described machine the drive roll may be replaced by an idling roll and the wire driven by other means.

We claim:

1. In a paper making machine of the kind comprising a travelling endless wire mesh on which pulp is carried and partly dried to form a continuous paper web, and at a transfer position where the mesh follows a substantially straight path, a travelling receiving surface to which the web is transferred from the wire, the combination of a suction box having continuous transverse suction slot located immediately beneath the wire and immediately before the transfer position to draw water from the web into the wire over substantially the whole width of the web with the feature that the receiving surface is spaced a small distance, greater than the thickness of the web, from the wire.

2. A paper making machine as claimed in claim 1 and including a compressed air box having a slot immediately following the slot of the suction box for emission of compressed air to assist in separation of the web from the wire.

3. A paper making machine as claimed in claim 2 in which the slot of the compressed air box extends across substantially the full width of the web.

4. A paper making machine as claimed in claim 1 and including at least one additional suction device having a slot over which the web-carrying wire passes before reaching the transfer position, to effect a preliminary reduction of the water content of the web.

5. A machine as claimed in claim 1 in which there is, at the transfer position, a combined suction and compressed air box providing a transverse suction slot immediately followed by a transverse air slot, the box comprising three parallel transverse plates, distance pieces which space the plates apart to provide two channels, means for connecting one channel to a source of suction and the other to a source of compressed air and means confining the mouths of the channels to narrow slots extending transversely beneath the wire.

6. A machine as claimed in claim 1 including a perforated suction couch roll around which the web-carrying wire passes on its way to the transfer position, a wire driving roll around which the wire passes after leaving the transfer position, a box having a slot for emission of compressed air located immediately after the slot in the suction box at the transfer position, a vacuum transfer roll at the transfer position and spaced from the wire and an upper felt which passes around the transfer roll spaced a short distance from the wire and to which the web is transferred.

7. A machine as claimed in claim 1 including a perforated suction couch roll around which the web carrying wire passes on its way to the transfer position, a web driving roll around which the wire passes after leaving the transfer position, a box having a slot for emission of compressed air located immediately after the suction slot at the transfer position, a transfer roll at the transfer position and spaced from the wire and a lower felt which passes around the transfer roll spaced a short distance from the wire and to which the web is transferred.

8. A machine as claimed in claim 1 including at least one preliminary suction box having a slot over which the web-carrying wire passes in a run to the transfer position, a compressed air box having a slot following the suction slot at the transfer position, a roll spaced a short distance from the wire at the transfer position and a lower felt which passes around the roll spaced a short distance from the wire and to which the web is transferred.

9. A paper making machine as claimed in claim 1 and including a perforated suction couch over which the web-carrying wire passes before it reaches the slot of the suction box, the length of the path of the wire between the couch and the slot being between three and twenty-four inches.

10. In a paper making machine of the kind comprising a travelling endless wire mesh on which pulp is deposited to form a continuous paper web, a perforated suction couch roll over which the web-carrying wire passes and a travelling receiving surface to which the web is transferred from the wire, the combination of the feature that the receiving surface is located at a position spaced apart along the wire from the couch roll with a suction box having a continuous transverse suction slot immediately beneath the wire at the transfer position to draw water from the web into the wire over substantially the whole width of the web.

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