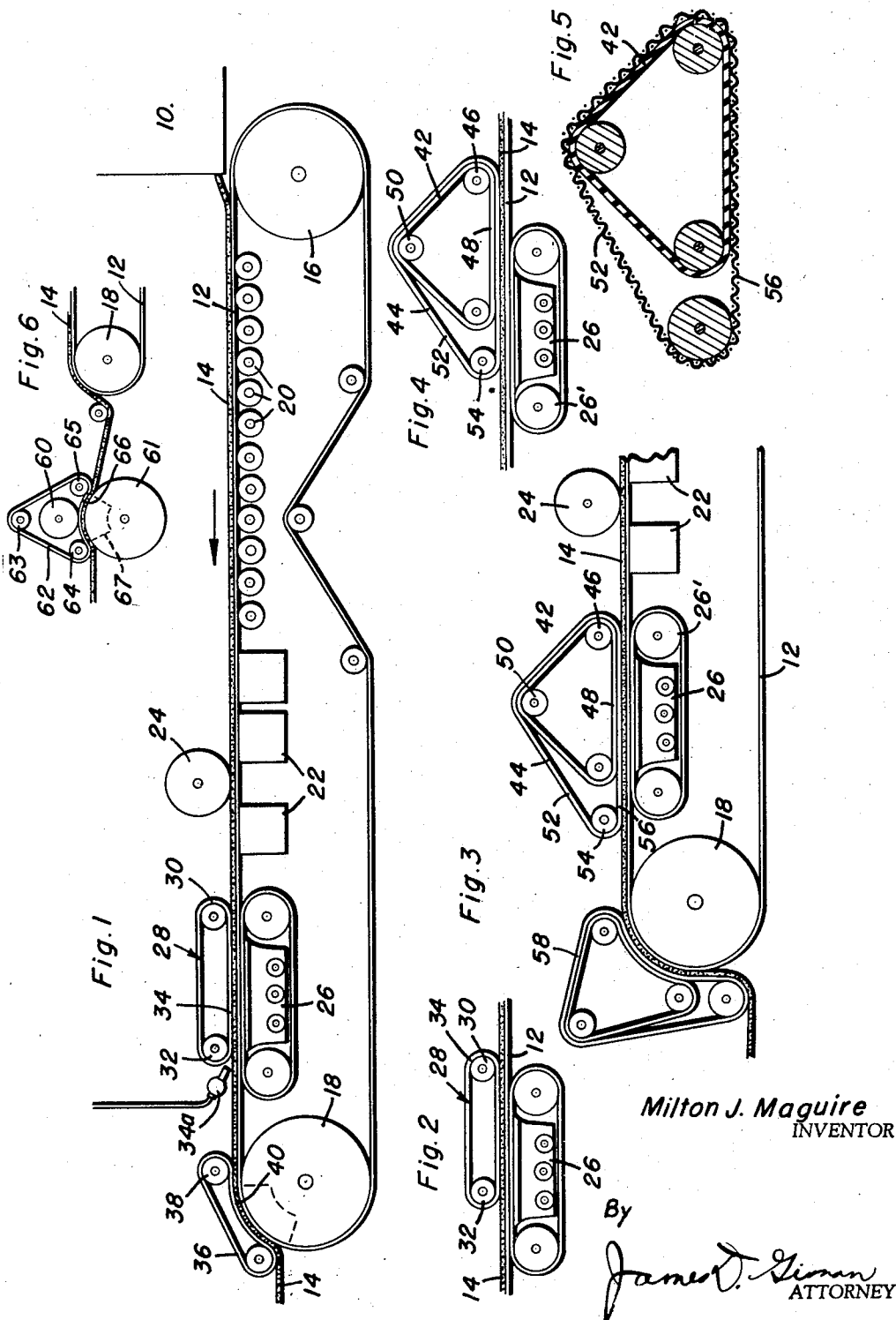


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M. J. MAGUIRE
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PAPER MAKING MACHINE

Milton J. Maguire, Portland, Oreg.

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7 Claims. (Cl. 162—210)

This invention relates to improvements in the paper making art and is particularly directed to a method and means for removing maximum water content from webs of paper during manufacture or from pulp.

It is conventional in the making of paper with known paper making machines to support the web on a moving Fourdrinier forming wire which passes over suction devices, such as regular stationary suction boxes, or over the "Rotabelt Suction Unit" disclosed in Evans Patents Nos. 2,039,308 and 2,601,378 and over rotary suction couch and press rolls. Such suction devices have in common the purpose of removing water from the web by vacuum creating a suction and sucking the water from the web. However, it is extremely desirable to remove as much water as possible at this point in the paper making process. Since the amount of water that can be removed from the web is limited, any increase in the extractive power of the vacuum force must come from some means augmenting or assisting the vacuum pressure.

Thus, a primary object of this invention is to provide means, which overlies the paper web above the vacuum means, for applying pressure to the paper web through the medium of vacuum pressure on the overlying means. Such air restriction means comprehended by this invention operates in conjunction with the vacuum water extraction means, of roll type to allow higher vacuums to be imposed on the web on top of the wire. The air restriction means moves with the web on the upper face thereof and over the vacuum means to restrict the atmospheric air and thereby enable the vacuum means to draw a greater amount of water from the web by pressure of the air restriction means due to the vacuum.

Another object of this invention is to provide a novel method of extracting water from a web of paper or the like material which includes the step of restricting the passage of air through the web by suction below the web and resisting the suction above the web over the major area of the suction means to thereby create a downward pressure on the web over the major area of the suction means.

A further object of this invention is to provide a moving belt which overlies the web in pressure free contact therewith and is positioned above or in confronting relation to a vacuum means so as to oppose the vacuum means with the web interposed therebetween, the belt covering the surface of the web so as to provide a pressure backing for the suction force and restrict the atmospheric air from being sucked through the web.

This invention comprehends the provision of air restriction belts disposed in confronting relation to the various suction or vacuum devices on a paper making machine, such devices, including the suction boxes and devices under the wire, the suction couches and presses. The belts may be made from rubber, natural or synthetic, or similar plastic material or may be made of canvas or heavy cloth or wool. In such instances, the belt may be of semi-porous or perforated materials of

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the above types as, for example, when it is desired to allow some water displacement by air as well as by pressure. The belts are preferably of the endless type and are driven by the moving web to which they are held by the suction created by the vacuum means.

The foregoing and ancillary objects are attained by this invention, the preferred embodiments of which are set forth in the following description and illustrated in the attached drawing, wherein:

Figure 1 is a diagrammatic side elevation of the invention applied to the paper making machine in connection with the "Rotabelt" suction unit and the couch roll;

Figure 2 is a detail view of a modification of Figure 1;

Figure 3 is a modified form of the invention shown in association with the same elements of the paper making machine;

Figure 4 is a detail view of a modification of Figure 3;

Figure 5 is a vertical sectional view of the belt arrangement of Figures 3 and 4; and

Figure 6 is a side elevation showing the invention applied between a top press roll and a suction press roll.

Referring now more particularly to the drawing and initially to Figure 1, which is a diagrammatic view of the forming end of a paper making machine, the numeral 10 designates the usual head box from which the paper stock flows out onto the usual Fourdrinier forming wire 12 forming a paper web 14. The forming wire 12 is of endless form and is entrained over a breast roll 16 and a couch roll 18, which is of the conventional rotary suction type and has a suction box on the inside by means of which a vacuum is imposed on the web before it leaves the couch roll and passes on to the presses (not shown). The forming wire is supported by suitable table rolls 20 and the web 14 is initially subjected to a suction action created by suction boxes 22 which underlie the dandy roll 24. The wire with the web travels over a moving type suction device 26 such as, for example, a type known as a "Rotabelt suction unit" and is disclosed in Patent No. 2,039,308 to W. P. Evans and No. 2,601,378 to J. W. W. Evans.

An air restricting means 28, in accordance with this invention, is provided in functional association with the suction device 26 and includes an endless belt 30, which may be formed from rubber, natural or synthetic, plastic, canvas or the like materials and which is entrained over parallel, longitudinally spaced rollers 32. The rollers are suitably journaled and are mounted so that the lower reach 34 of the belt 30 rests by gravity on top of the web 14 and is held by the suction action of the suction means 26 in contact with the web. For pressing purposes, as, for instance, with a suction press, the lower reach 34 may be held by a pressing roll in pressing engagement with the web as well as by the pressure of the belt exerted by vacuum. The belt 30 is rotated by the movement of the web on the moving forming wire and is driven by the web as the suction holds the lower reach in face to face contact with the web. Guide means may be provided for ensuring that the belt tracks evenly with the web and prevent the lower reach from running to one side or the other of the web.

The lower reach 34 of the belt 30 is disposed in confronting relation to the suction device and provides a firm pressure backing surface across the upper face of the web and against which the suction force is exerted to hold it on the web in facial contact therewith. The lower reach 34 is of sufficient width but of greater axial extension to complement the area of suction and the area of web being

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subjected to the suction action so as to restrict air from the portion of the web being treated. The restriction of air enables a greater amount of water to be extracted by the suction device 26, the lower reach 34 permitting a higher vacuum to be imposed on the web without damaging or straining the web and the lower reach providing a backing surface in opposed position to the vacuum force.

Since the traveling end of the reach 34 of the belt 30 and the roller it embraces are disposed beyond the corresponding end and, therefore, the influence of the suction area of the suction device 26, I provide a transverse nozzle 34A so positioned as to direct a continual flow of air under pressure between the web and the bottom reach 34 of the belt to prevent the web from adhering to the belt.

In the modification shown in Figure 2 I dispense with the nozzle 34A by merely positioning the traveling end of the reach 34 and its roller within the suction area of the suction device 26 so that the web will be held in facial contact and move along with the forming wire 12 by the suction and will thereby be prevented from adhering to the belt. It is to be understood, of course, that the nozzle could be used if desired.

If some water displacement by air is desired the belt 30 may be made porous or perforated so as not to completely exclude the atmospheric air but to exclude a great or desired part thereof. With the imperforate lower reach, no air is sucked through the web but with a perforate belt, some air will be sucked through to displace the free water in the web not removed by the compression under vacuum.

A similar belt 36 cooperates with the suction couch roll 18 and is entrained on rollers 38 which are disposed at circumferentially spaced points on the periphery of the roll 18 and have their axes paralleling the axis of the roll. The lower or inner reach 40 of the belt 36 functions identically to the reach 34 and is curved to complement the curvature of the couch roll.

In Figures 3, 4 and 5 a modified form of belt arrangement is shown where a double belt, consisting of an inner belt 42 and an outer belt 44, is provided. The inner belt 42 is entrained over triangularly arranged rollers 46 and has a lower, base reach 48. The belt is triangularly arranged over the base pair of rollers 46 and the upper roller 50 at the apex thereof. The roller 50 is vertically adjustable for tightening the belt. The reach 48 is disposed parallel to the wire 12 and is disposed in confronting relation to the suction means 26. The reach 48 is the equivalent of the reach 34 of the belt 30 and cooperates with the suction means 26 in an identical manner.

An outer belt 52 is disposed around the belt 42 and entrained over the outermost roller 46 and the top roller 50. The traveling end of the belt is entrained over a roller 54. The outer belt has a lower or base reach 56, which is interposed between the reach 48 and the web 14 and which is in facial contact with the web 14.

The inner belt 42 is formed of rubber or other suitable material while the outer belt 52 is formed of porous material, such as wire mesh. Since the base reach 56 of the outer belt and the corresponding end of the reach 48 extend towards the couch roll and beyond the suction means 26, the air nozzle 34A should be applied between the web and the reach 56 for the purpose above pointed out in connection with Figure 1 and may be dispensed with in the modification shown in Figure 4 for the reasons given in connection with the modification in Figure 2, since the traveling ends of the reaches 48 and 56 are positioned within the suction area of the suction device 26.

The double belt arrangement 58, provided for the couch roll 18 is constructed identically to the belt arrangement for the suction means 26 and has curved reaches which cooperate with the suction means of the couch roll 18 similar to the reach 40 of the belt 36.

The suction area of the suction means 26 is defined axially of the web by the boxlike housing, that is, it is

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located between the rollers 26' and the reach 48 of the inner belt disposed in confronting relation to such suction area, while the reach 56 of the outer belt extends therebeyond. The suction force of the suction means passing through the porous outer belt contacts the inner belt to hold the reaches 48 and 56 on the web, with the reach 56 being in actual contact with the web and with the reach 48, the belts being moved by the engagement of the reach 56 with the moving web.

In Figure 6 where the invention is shown applied to co-operating top press and suction press rolls 60 and 61, respectively, the belt 62 is entrained over three triangularly arranged rollers 63, 64 and 65, the bottom two of which are spaced apart a distance calculated to engage the maximum area of the web with the suction press roll 61. The bottom reach 66 of the belt 62 extends beyond both ends of the suction box 67 within the suction press roll.

It is to be understood that either belt arrangement of Figures 1 or 2 can be used in association with any suction means along any point of the web travel in a paper making machine where water is to be extracted from the web and that such belts will provide a reach in facial contact with the web and in opposing or confronting relation to the suction means to exclude air from the web and thereby permit a greater extraction of water from the web. Thus, the exclusion of air by such a means constitutes a novel step in the method of making paper.

While the best known forms of this invention have been shown in the drawing and described herein, other forms may be realized as coming within the scope of the invention defined in the appended claims.

I claim:

1. In a paper making machine including a couch roll and a breast roll and a moving forming wire entrained thereover and carrying a paper or pulp web on its flat horizontal upper reach; the improvement comprising a horizontal suction means underlying and parallel with said forming wire between said couch and breast rolls, an endless revolvable perforate belt having its upper reach underlying and parallel with the wire above the suction means, an endless revolvable porous belt having its lower reach constantly overlying the web in facial contact therewith above and in confronting relation to said first mentioned revolvable belt to restrict passage of air through the web between both of said belts.

2. In a paper making machine including a couch roll and a breast roll and a moving forming wire entrained thereover and carrying a paper or pulp web on its flat horizontal upper reach; the improvement comprising a horizontal suction means underlying and parallel with said forming wire between said couch and breast rolls, an endless revolvable perforate belt having its upper reach underlying and parallel with the wire above the suction means, an endless revolvable porous belt having its lower reach constantly overlying the web in facial contact therewith above and in confronting relation to said first mentioned revolvable belt to restrict passage of air through the web between both of said belts, over the major area of the suction means.

3. In a paper making machine which comprises a flat horizontally disposed forming wire entrained over the couch roll and the breast roll and having a horizontal upper reach carrying a paper or pulp web; the improvement comprising a flat horizontal suction means, an endless revolvable perforate belt having its upper reach underlying and parallel with the wire above the suction means, a porous double belt disposed in horizontal confronting relation to said suction means and including an outer and inner belt, said last mentioned belts having lower reaches disposed in parallelism and paralleling the wire and the outer belt being in facial contact with the web.

4. The improvement of claim 3, wherein said lower reach of the inner belt is substantially coextensive in length with the suction area while the lower reach of the

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outer belt extends therebeyond and means for directing air pressure across and between the web and said lower reach of the outer belt to separate the web from the outer belt at the traveling end thereof.

5. In the method of preparing a paper or pulp web which comprises the steps of moving a web in a horizontally supported manner over and parallel with a horizontal suction means and extracting water from the web by suction and pressure upon application of a suction force from the suction means upwardly through the web, the step of restricting passage of atmospheric air downwardly through the web over the major area of the suction means and thereby creating a pressure upon the web whereby the web will be held flat and undistorted in its passage across the suction means.

6. In a paper making machine including a flat horizontally disposed forming wire having a wet paper web carried thereon and extending entirely thereacross, the improvement comprising a horizontal suction means underlying and parallel with said forming wire, an endless revolvable perforate belt having its upper reach underlying and parallel with the forming wire above the suction means, a flat horizontal porous member parallel with and constantly overlying the web full width thereof and in moving facial contact therewith above and in confronting relation to said revolvable belt to restrict passage of air through the web between said belt and said member.

7. In a paper making machine including a flat horizontally disposed forming wire having a wet paper web carried thereon and extending entirely thereacross, the im-

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provement comprising suction means including a horizontally disposed box member underlying and parallel with said forming wire, a roller rotatably mounted at each end of the box member, an endless perforate belt entrained over said rollers and having its upper reach underlying and parallel with the forming wire above the box member, an endless revolvable porous belt having its lower reach constantly overlying the web in contact therewith above and in confronting relation to said perforate belt to restrict passage of air through the web between both of said belts whereby to extract water from the web by suction from its underside and suction-created pressure on its topside.

References Cited in the file of this patent

UNITED STATES PATENTS

412,359	Boyne	Oct. 8, 1889
1,590,875	Barlow et al.	June 29, 1926
1,742,991	Heys	Jan. 7, 1930
1,833,350	Berry	Nov. 24, 1931
1,881,404	Hadley	Oct. 4, 1932
1,925,917	Chalon	Sept. 5, 1933
1,955,399	Weston	Apr. 17, 1934
2,278,525	Rich et al.	Apr. 17, 1942
2,488,700	Bidwell	Nov. 22, 1949
2,714,340	Brown	Aug. 2, 1955
2,744,453	Hornbostel	May 8, 1956

FOREIGN PATENTS

232,059	Germany	Mar. 6, 1911
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