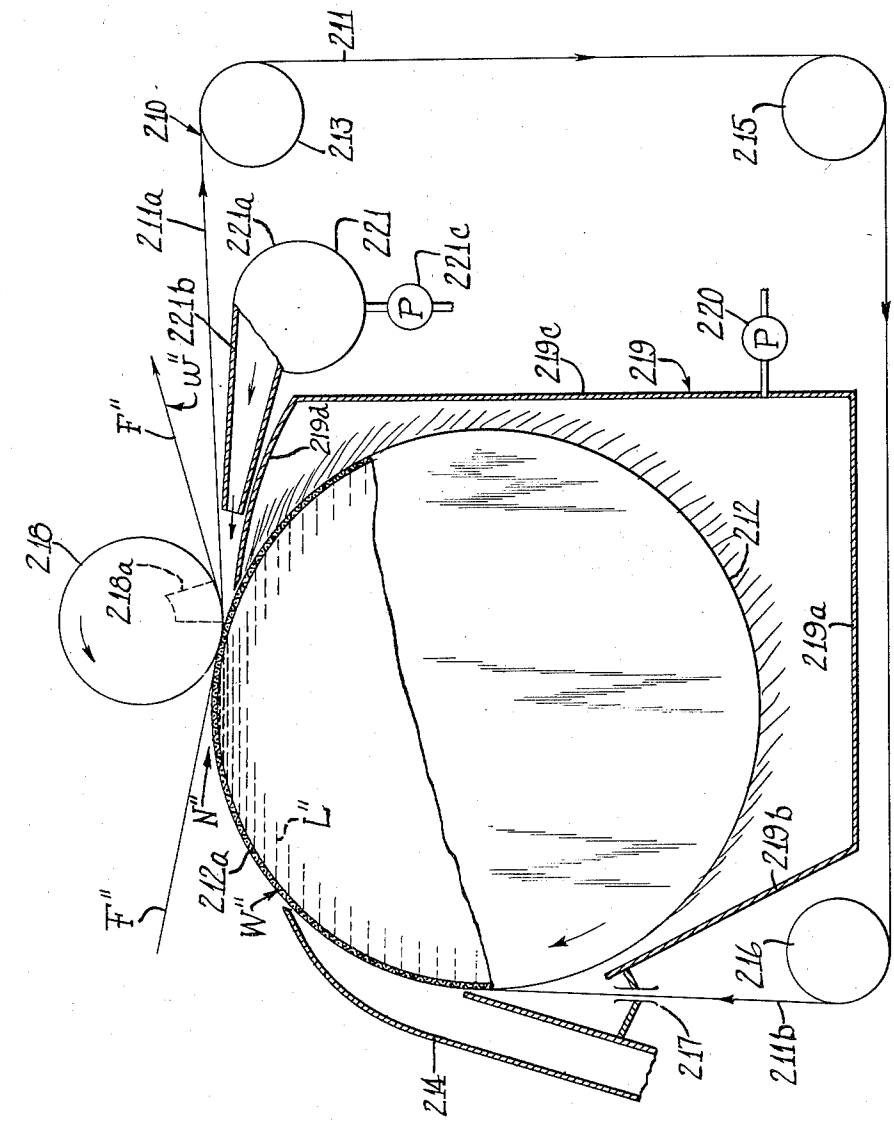
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PAPER MACHINE FORMING SECTION

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PAPER MACHINE FORMING SECTION

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This invention relates to a paper forming machine, and more particularly, to an improved forming section for paper machines.

In one type of paper machine wherein the instant invention is particularly useful, the forming region of the machine comprises a looped forming wire with a rotatably mounted foraminous cylinder within the loop of the forming wire for effecting fibrous web formation on the wire. An inlet feeds stock onto the wire usually along the region of the upper quadrant of the uprunning side of the cylinder. This arrangement is used in cylinder type paper machines wherein a short looped forming wire is trained over the cylinder mold; and this arrangement may also be used in a Fourdrinier type paper machine wherein the Fourdrinier wire is trained around an open breast roll. In either arrangement guide rolls within the loop of the wire are arranged so that the wire covers approximately the upper quadrant of the uprunning or oncoming side of the rotating cylinder. Sealing means are associated with the wire just before it comes in contact with the oncoming (or uprunning) side of the cylinder and just after the wire is taken away from the off-running side of the cylinder. Suction applying means cooperate with such sealing means to create a suction in the interior of the cylinder mold and its enclosure and a pressure differential across the upper quadrant on the uprunning side, so as to assist in drawing water from the stock through the forming wire and the "open" face of the cylinder. At higher operating speeds, however, it has been found that the paper machines of the type just described seem unable to effect satisfactory dewatering of the web. The instant invention is based in part on the discovery of the cause of such inadequate dewatering at high speeds and in part upon the discovery of a method and means for preventing the same. It has been discovered that the rotating foraminous cylinders at high operating speeds rotate so rapidly in the operation of the paper machine that centrifugal forces hold the water against the interior of the cylinder along the uprunning and top sides of the cylinder in spite of suction forces applied to the wire. In fact, a layer of water is actually retained against the inside of the cylinder and the back side of the wire along the upper quadrant of the cylinder on the uprunning side thereof. Such layer of water tends to be thrown back against the wire (and even back into the web on the opposite side thereof) as the wire is taken away from the off-running side of the cylinder, and as it passes over the sealing means ordinarily cooperating with the bottom of the wire in this portion of the wire run.

In the instant invention sealing means associated with the bottom side of the wire at the off-running side of the cylinder in the manner hereinbefore employed are not used. Instead, a sealing member (cooperating with the suction applying means) is mounted in close running relation with the cylinder itself at the off-running side thereof and spaced from the bottom of the wire. Such sealing means are spaced from the bottom of the wire a predetermined distance to permit the entry of gas under pressure

from a suitable source at higher pressure between such sealing means and the wire, and against the cylinder. This arrangement permits a rush of air back against the foraminous surface of the cylinder just after the wire is separated therefrom at the off-running side; and this rush of air drives water (against the centrifugal force) back through the foraminous cylinder surface and breaks up the layer of water tending to be retained on the inside surface of the cylinder. It also permits a pickup roll or suction pickup roll to take the web up off a wire free from water on the bottom side.

It is, therefore, an important object of the instant invention to provide an improved paper machine particularly suited for high speed operation.

Other and further objects, features and advantages of the present invention will become apparent to those skilled in the art from the following detailed disclosure thereof and the drawings attached hereto and made a part hereof.

Figure 1 is an elevational view of a cylinder type paper machine embodying the instant invention with parts shown in section and parts shown diagrammatically.

Referring now to Figure 1, a cylinder type paper machine embodying the instant invention is indicated generally by the reference numeral **200** (wherein similar elements to those hereinbefore described have the same reference numerals in the **200** series) and this machine **200** comprises a looped forming wire **211**, a cylinder mold **212** within the loop of the forming wire **211** for effecting fibrous web formation on the wire **211** in the region **212***a* of approximately the upper quadrant of the uprunning side (indicated by an arrow) of the cylinder mold **212**, and a guide roll **213** within the loop of the wire **211** guiding a reach **211***a* thereof away from the cylinder mold **212** at the off-running side of the cylinder mold **212** (actually near the top of the off-running side of the cylinder mold **212**), and an inlet **214** feeding stock onto the oncoming side of the wire covered cylinder mold **212**.

As will be seen, the wire **211** passes (in the direction indicated by the arrow heads) along the horizontal reach **211***a* from the off-running side of the cylinder mold **212** over a guide roll **213**, then down around a lower guide roll **215** and back beneath a forward guide roll **216** which guides the wire along an upwardly directed reach **211***b* past vacuum sealing means indicated diagrammatically at **217** onto the upper quadrant **212***a* of the uprunning side of the cylinder mold **212**. Stock flows through an inlet **214** onto the wire in the region of said upper quadrant **212***a*. In the region of the quadrant **212***a*, the wire and the cylinder mold surface are both foraminous cylindrical forming surfaces, which are superimposed. Both the foraminous wire surface and the foraminous surface of the "open" cylinder mold **212** permit water to pass through freely, so that a fibrous web W″ may form in the region of the quadrant **212***a*.

A pickup felt F″ (which is actually a looped felt that may pick up webs from a plurality of cylinder mold units such as the one here shown) is positioned above the cylinder mold **12** and the off-running reach **211***a* of the forming wire **211** to receive the fibrous web W″ from the wire **211**. A suction roll **218** with a suction area **218***a* for web pickup and web retention on the bottom of the felt F″ urges the felt F″ downwardly against the wire **211** just after the wire **211** separates from the cylinder **212** to assist in web pickup by the felt F″. As here shown, the suction roll **218** and the cylinder mold **212** are in nip-defining relationship at a nip N″ just after which the transfer of the web W″ from the wire **211** to the felt F″ is accomplished. At this nip N the wire **211** separates from the off-running side of the cylinder mold **212**.

As will be noted, the cylinder mold **212** is rotatably mounted on means (not shown) within a suction or

vacuum box indicated generally by the reference numeral **219** which comprises a floor **219***a*, a forward wall **219***b* extending upward'y from the floor to the wire seal **217**, and a rear wall **219***c* which, in the prior art, extended upwardly to make wire seal contact with the bottom of the off-running wire reach **211***a*. Also, suitable means for evacuating the box **219**, such as a pump **220** shown diagrammatically are provided, so that a pressure differential may be maintained across the wire **211** and the cylinder mold surface in the region of the quadrant **212***a* to assist in drawing water from the stock and into the interior of the cylinder mold **212**.

In the instant invention, the rear wall **219***c* of the suction box **219** extends upwardly but is spaced from the bottom of the wire reach **211***a* and is provided at its upper end with a sealing member **219***d* (which is in the present embodiment a continuation of the metal walls of the box **219**) that extends back toward the upper portion of the off-running side of the cylinder mold **212** to close running relation therewith. The member **219***d* thus functions as a sealing member with the surface of the cylinder mold **212** instead of the bottom of the wire **211**. Airblast means **221** are interposed between the wire reach **211***a* and the sealing member **219***d* for urging a gas such as air under pressure back between the wire **211** and the sealing member **219***d* against the surface of the cylinder mold **212**. As here shown, the air-blast means **221** comprise a header **221***a* and a nozzle member **221***b* which extends a substantial distance into the space between the wire **211** and the sealing member **219***d* and is aimed so as to direct air at the off-running side of the nip N''. In this way the air-blast serves to drive water away at the critical point and actually the air may be driven back through the surface of the cylinder mold **212** so as to completely disrupt the layer L'' of water tending to follow the inside surface of the cylinder mold **212**, in the manner shown in the drawing. In addition, the air-blast tends to assist the suction gland **218***a* of the suction roll **218** in accomplishing transfer of the web W'' from the wire **211** to the felt F''. As here shown diagrammatically a pump **221***c* or other suitable means for producing gas under pressure is connected to the header **221***a*. The air-blast is concentrated in such a relatively small region of the overall surface of the cylinder mold **212** that the amount of air passing into the cylinder at this point is relatively small so that vacuum within the cylinder mold is not lost.

It will be understood that modifications and variations may be effected without departing from the spirit and scope of the novel concepts of the present invention.

I claim as my invention:

1. In a cylinder type paper machine, in combination, a looped forming wire, a cylinder mold within the loop of said forming wire for effecting fibrous web formation on the wire, a guide roll within the loop of said wire guiding a reach thereof away from the cylinder mold at the off-running side thereof, a sealing member in close running relation to the off-running side of said cylinder mold and spaced from said wire, suction means cooperating with said sealing member to create suction within the cylinder mold, and gas-blast means interposed between the wire and sealing member urging gas under pressure back between the wire and the sealing member against the cylinder mold.

2. In a cylinder type paper machine, in combination, a looped forming wire, a cylinder mold within the loop of said forming wire for effecting fibrous web formation on the wire, an inlet feeding stock onto the oncoming side of the wire covered cylinder mold, a guide roll within the loop of said wire guiding a reach thereof away from the cylinder mold at the off-running side thereof, a sealing member in close running relation to the off-running side of said cylinder mold and spaced from said wire, suction means cooperating with said sealing member to create suction within the cylinder mold, and gas-blast means interposed between the wire and the sealing member urging gas under pressure back between the wire and the sealing member against the cylinder mold.

3. In a cylinder type paper machine, in combination, a looped forming wire, a cylinder mold within the loop of said forming wire for effecting fibrous web formation on the wire, a guide roll within the loop of said wire guiding a reach thereof away from the cylinder mold at the off-running side thereof, a pickup felt having a felt run positioned above the reach of said forming wire to receive the fibrous web therefrom, a sealing member in close running relation to the off-running side of said cylinder mold and spaced from said wire, suction means cooperating with said sealing member to create suction within the cylinder mold, and gas-blast means interposed between the wire and the sealing member urging gas under pressure back between the wire and the sealing member against the cylinder mold.

4. In a cylinder type paper machine, in combination, a looped forming wire, a cylinder mold within the loop of said forming wire for effecting fibrous web formation on the wire, a guide roll within the loop of said wire guiding a reach thereof away from the cylinder mold at the off-running side thereof, a pickup felt having a felt run positioned above the reach of said forming wire to receive the fibrous web therefrom, a suction roll urging said felt run against said wire reach to assist in web pickup by the felt, a sealing member beneath said suction roll in close running relation to the off-running side of said cylinder mold and spaced from said wire, suction means cooperating with said sealing member to create suction within the cylinder mold, and gas-blast means interposed between the wire and the sealing member urging gas under pressure back between the wire and the sealing member against the cylinder mold.

5. In a cylinder type paper machine, in combination, a looped forming wire, a cylinder mold within the loop of said forming wire for effecting fibrous web formation on the wire, an inlet feeding stock onto the oncoming side of the wire covered cylinder mold, a guide roll within the loop of said wire guiding a reach thereof away from the cylinder mold at the off-running side thereof, a pickup felt having a felt run positioned above the reach of said forming wire to receive the fibrous web therefrom, a sealing member in close running relation to the off-running side of said cylinder mold and spaced from said wire, suction means cooperating with said sealing member to create suction within the cylinder mold, and gas-blast means interposed between the wire and the sealing member urging gas under pressure back between the wire and the sealing member against the cylinder mold.

6. In a cylinder type paper machine, in combination, a looped forming wire, a cylinder mold within the loop of said forming wire for effecting fibrous web formation on the wire, an inlet feeding stock onto the oncoming side of the wire covered cylinder mold, a guide roll within the loop of said wire guiding a reach thereof away from the cylinder mold at the off-running side thereof, a pickup felt having a felt run positioned above the reach of said forming wire to receive the fibrous web therefrom, a suction roll urging said felt run against said wire reach to assist in web pickup by the felt, a sealing member beneath said suction roll in close running relation to the off-running side of said cylinder mold and spaced from said wire, suction means cooperating with said sealing member to create suction within the cylinder mold, and gas-blast means interposed between the wire and the sealing member urging gas under pressure back between the wire and the sealing member against the cylinder mold.

7. In a paper machine, in combination, a looped forming wire, a rotatably mounted foraminous cylinder within the loop of said forming wire for effecting fibrous

web formation on the wire, guide means within the loop of said wire guiding a reach thereof away from said cylinder at the off-running side thereof, a sealing member in close running relation to the off-running side of said cylinder and spaced from said wire, suction means cooperating with said sealing member to create suction within said cylinder, and gas-blast means interposed between the wire and the sealing member urging gas under pressure back between the wire and the sealing member against said cylinder.

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