

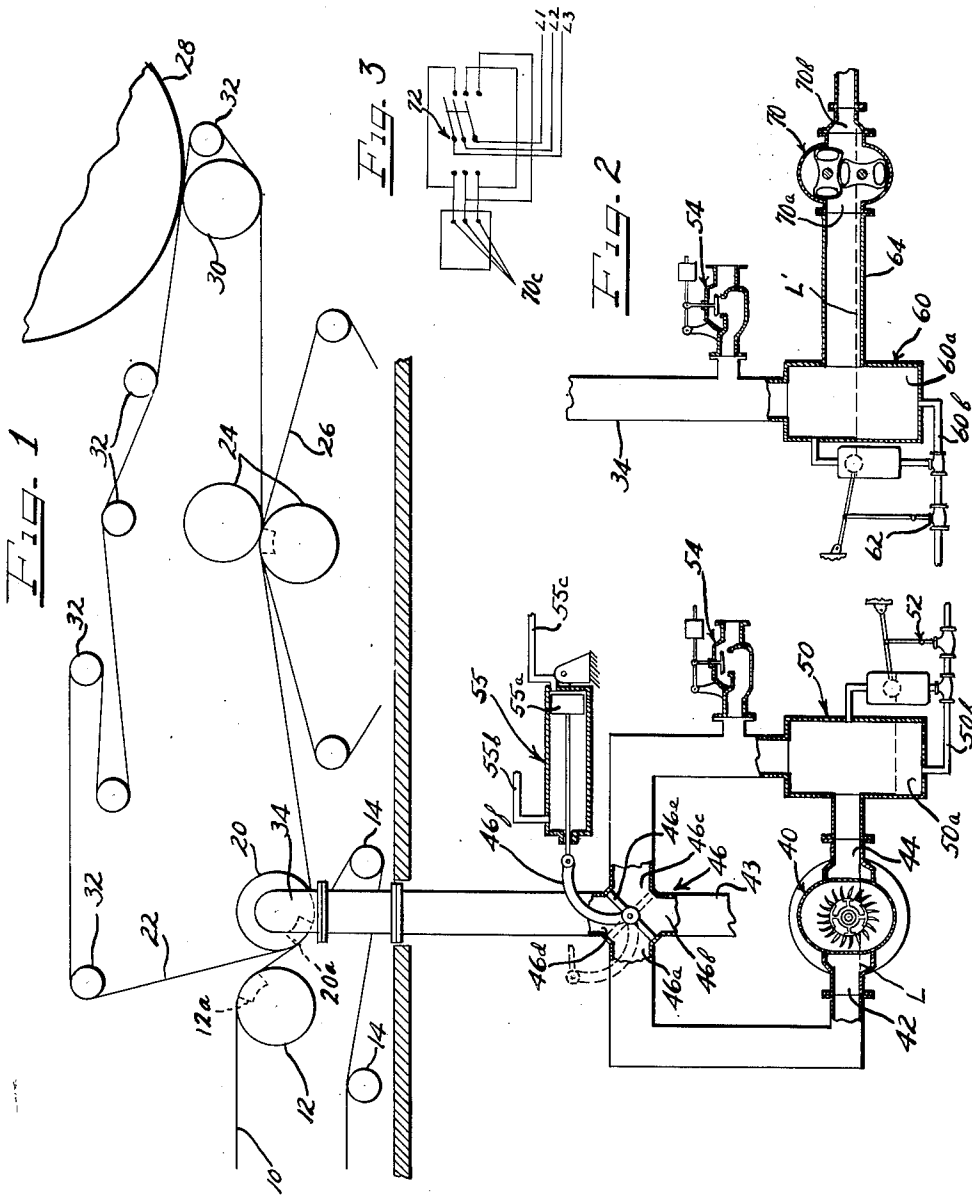
Dec. 23, 1952

J. E. GOODWILLIE

2,622,492

SELECTIVE WEB TRANSFER CONTROL FOR PAPER MACHINERY

Filed July 26, 1947



Inventor
JOHN E. GOODWILLIE

The Firm of Charles Merrill
ATTY =

UNITED STATES PATENT OFFICE

2,622,492

SELECTIVE WEB TRANSFER CONTROL FOR
PAPER MACHINERYJohn E. Goodwillie, Beloit, Wis., assignor to Beloit
Iron Works, Beloit, Wis., a corporation of Wis-
consin

Application July 26, 1947, Serial No. 763,905

6 Claims. (Cl. 92—49)

1

This invention relates to an improved suction transfer station of a paper making machine and particularly to an improved method and apparatus for selectively causing or preventing the transfer of a paper sheet from one belt carrier to another belt carrier which are interlapped on a suction transfer roll.

In the paper making process, conditions often arise wherein it would be desirable to interrupt the transfer of the paper sheet from one belt-like carrier to another. This is particularly true with respect to the transfer of the wet sheet from the Fourdrinier wire to the pickup felt of the press section when the machine is initially put into operation. Those skilled in the art will recognize that when a paper making machine is initially started, the sheet is not immediately completely formed upon the Fourdrinier wire. It has been customary in conventional apparatus to employ a movable top couch roll at the transfer point between the wire and the pickup felt and to maintain such top couch roll out of contact with the wire until the sheet is fully formed and wet end conditions stabilized. The top couch roll is then moved into contact with the wire to accomplish the automatic transfer of the sheet to the felt. Similar conditions may arise in the transfer of the sheet from a press felt or from suction forming equipment.

When it is desired to employ a suction type transfer roll, the arrangements heretofore known of movably mounting such roll, so as to selectively control the initiation of a transfer operation, are subject to several substantial objections. In the first place, the ordinary suction roll is a much heavier unit than a plain top couch roll, and hence the bodily movement of such roll is difficult to accomplish. In addition, vacuum connections must necessarily be provided for the suction roll and resort must be had to some form of flexible vacuum connection to permit the control movement. Furthermore, in many machines it may be necessary or desirable to have the suction transfer roll depress the wire or the felt in its transfer position. Hence when moved out of its transfer position, the length of the wire or felt is changed and requires special and complicated adjusting mechanisms to accommodate the change in length.

The aforementioned obstacles indicate the desirability of employing a suction roll in a fixed mounting. Yet it is still desirable to be able to selectively control the initiation and termination of the sheet transfer operation of the suction transfer roll.

2

Accordingly, it is an object of this invention to provide an improved suction transfer device for a paper making machine characterized by the provision of a novel method and mechanism for selectively permitting or preventing the transfer of the sheet which is operable without requiring displacement of the suction roll with respect to its co-operating wire or felts.

A particular object of this invention is to provide an improved suction transfer assembly for a paper making machine wherein a roll of the ordinary suction type is selectively provided with air at sub-atmospheric or super-atmospheric pressure, the super-atmospheric pressure preventing transfer of the sheet to the pickup felt carried by the roll, while the sub-atmospheric pressure assists the transfer of the sheet as in the normal suction transfer operation.

Still another object of this invention is to provide an improved pressure supply apparatus for a transfer roll of the suction type of a paper making machine, wherein a single valve selectively connects either the outlet or the inlet of a continuously operating fluid pump to the transfer roll.

A further object of this invention is to provide a fluid pressure supply apparatus for the transfer roll of a paper making machine wherein a reversible, water-sealed type of pump may be employed and selectively energized in opposite directions to supply either sub-atmospheric or super-atmospheric air pressures to the transfer roll, and especially characterized by the provision of means for supplying sufficient water for sealing purposes in either condition of operation of the water-sealed reversible pump.

The specific nature of this invention, as well as other objects and advantages thereof, will become apparent to those skilled in the art from the following detailed description of the annexed sheet of drawings which, by way of preferred example only, illustrate one specific embodiment of the invention.

On the drawings:

Figure 1 is a schematic elevational view, partly in section, of a suction transfer station of a paper making machine to which pressure controlling apparatus embodying this invention has been applied;

Figure 2 is a schematic elevational view, partly in section, of a modified form of pressure controlling apparatus for the suction transfer roll of a paper making machine; and

Figure 3 is a circuit diagram indicating a suitable arrangement for effecting a reversal of the

motor of the pump employed in the modification of Figure 2.

As shown on the drawings:

While this invention will be particularly described and illustrated in connection with a suction transfer section for effecting the transfer of a paper sheet from a Fourdrinier wire to a press felt, it should be understood that the principles thereof are equally applicable to any transfer station wherein selective control of the transfer of the paper sheet or web from one belt-like carrier to another is desired.

Referring to Figure 1, the numeral 10 indicates a Fourdrinier wire which is trained over a suction couch roll 12, having a suction area 12a, and thence over return rolls 14. Intermediate the suction couch roll 12 and the next adjacent return roll 14, a suction transfer roll 20 of conventional type having a suction area 20a, is rotatably positioned on a fixed axis. Preferably, the suction transfer roll 20 depresses the Fourdrinier wire 10 so that selective control of the transfer of the sheet from the wire by shifting the axis of couch roll 20 is impractical.

A pickup felt 22 is trained around suction transfer roll 20 and thence through the nip of a suction press composed of rolls 24. A bottom or covering felt 26 also passes through the nip of the press. The sheet remains on the felt 22 and may then be applied to a Yankee dryer 28 through a nip defined therewith by a pressure roll 30. Suitable guide rollers 32 complete the path of the pickup felt 22 in conventional fashion.

A conduit 34 is provided which is connected in conventional fashion to the suction area 20a of suction transfer roll 20 so that the air pressure existing within the interior of the suction transfer roll 20 may be controlled. In accordance with this invention, the air pressure within suction transfer roll 20 is selectively maintained either at sub-atmospheric values or super-atmospheric values. When the pressure within such transfer roll 20 is below atmospheric, the roll 20 will function as a suction transfer roll in conventional manner and effect the transfer of the sheet from the Fourdrinier wire 10 to the pickup felt 22. However, when the air pressure within the transfer roll 20 is maintained above atmospheric values, a blast of air is in effect blown outwardly from the area 20a of the transfer roll, through the pickup felt 22, and prevents the transfer of the sheet to the pickup felt.

In the modification of Figure 1, a continuously operating unidirectional air pump 40 is provided having a suction inlet conduit 42 and a pressure outlet conduit 44. In accordance with this invention, such inlet and outlet conduits are selectively connected to the transfer roll conduit 34 so as to produce either a sub-atmospheric or a super-atmospheric pressure within the transfer roll 20.

Such selective interconnection may be conveniently accomplished by the utilization of a two-position selector valve 46 having four ports 46a, 46b, 46c and 46d. The port 46a is connected to inlet conduit 42 of the pump 40, the port 46b is connected to atmospheric pressure by pipe 43, the port 46c is connected to the outlet conduit 44 of the pump 40 through a water and air separator 50, to be described in more detail later, and lastly, the port 46d is connected to transfer roll conduit 34. Valve 46 is provided with a shiftable vane or plug 46e which may be selectively positioned in either of two positions

with respect to the four ports of the valve. In the solid line position illustrated in Figure 1, the vane 46e effects a fluid interconnection of ports 46a and 46d and also of ports 46b and 46c. Hence the suction inlet of the pump 40 is connected directly to the interior of the suction transfer roll 20 while the pressure outlet of the pump 40 is connected to atmosphere. In the dotted line position of the valve vane 46e, the interior of transfer roll 20 is supplied with air at greater than atmospheric pressure through the pump outlet 44, while the pump inlet 42 is connected to atmosphere.

The selective shifting of the vane 46e may be accomplished by any conventional form of manually controllable apparatus, such, for example, as by an operating lever 46f which is selectively shifted between two positions by the piston 55a of an air cylinder unit 55. Air, or other suitable operating fluid is supplied to cylinder 55 through either of the pipes 55b or 55c, which are in turn connected to a suitable source of actuating fluid by a manually shiftable valve (not shown) of well known construction.

While not limited thereto, the pump 40 is preferably of the water-sealed type that is well known in the paper making art. Such pumps require a minimum amount of water to be supplied thereto to maintain proper sealing conditions in the pump and hence permit the pump to operate. Such level is indicated by L. When the pump is connected to produce a sub-atmospheric pressure in transfer roll 20, it is obvious that a substantial amount of water will be drawn into the pump from the wet sheet in the course of the transfer process. Such excess water may be conveniently removed from the system by the provision of a water and air separating tank 50 which is connected in the system intermediate the pump outlet conduit 44 and the valve port 46c. The separator 50 embodies a sump portion 50a which is disposed generally below the level of the pump 40 and which has a drain conduit 50b communicating with the bottom thereof. The level of water trapped in sump 50a may be controlled in any conventional fashion, such as by a float operated valve 52 disposed in the drain conduit 50b.

When utilizing the pump 40 to produce a super-atmospheric pressure within the transfer roll 20, it has been found that the air pressure produced at the outlet side of the pump is in excess of that required to be applied to the transfer roll 20 to expeditiously prevent the transfer of the sheet to the pickup felt without injuring the sheet. Furthermore, it is desirable to limit the output pressure against which the pump 40 works in order to prevent the possibility of overloading the pump motor. Both of these objectives may be conveniently accomplished by the provision of a vent valve 54 which is connected at any convenient point in the outlet side of the fluid pressure generating system, such as intermediate the separator 50 and the valve 46. Relief valve 54 is of any conventional construction which may be conveniently adjusted so as to maintain a predetermined maximum pressure on the outlet side of the pump 40.

As is well known to those skilled in the art, there are several forms of suction pumps for paper making machines which may be conveniently converted to operate as compressors merely by reversing the direction of rotation of the driving motor of such pump. If such a reversible pump is employed, then the modification of Figure 2

5

permits a further simplification of the apparatus in accordance with this invention for selectively controlling the transfer of the sheet from one belt carrier to another at any particular suction transfer station.

In this modification, the conduit 34 which communicates with the transfer roll 20 is connected through an air and water separator 60 directly to one side 70a of a reversible, water-sealed type pump 70. The other side 70b of the pump is connected to atmosphere.

The pump 70 is selectively operated either as a suction pump or as a compressor by reversal of its driving motor. Such reversal may be conveniently accomplished by the well known expedient, illustrated in Figure 3, of providing a reversing switch 72 connected in phase-reversing relationship between the input terminals 70c of the pump motor and line terminals L1, L2 and L3.

A pressure relief valve 54 is again provided, being connected directly into the conduit 34 and operating so as to maintain any desired maximum pressure within the transfer roll 20. The air and water separator 60 is of similar construction to the separator 50 previously described in connection with Figure 1. If the pump 70 is of the type that will tend to discharge its sealing water when operation as a compressor, the separator 60 is arranged so as to maintain a minimum water level L' in the sump portion 60a sufficient to insure a gravity flow of water into the pump 70 at all times. Such level may, of course, be conveniently maintained by suitable adjustment of the float controlled drain valve 62 which controls the draining of fluid from the sump 60a through drain conduit 60b. With such construction, when the pump is operated in the direction to produce sub-atmospheric pressure in the transfer roll 20, the resulting air flow will carry sealing water into the pump through connecting pipe 64 and the float control valve 62 will remain substantially closed at all times. When acting as a compressor, the pump 70 will discharge air and sealing water into the separator 60 and tend to hold the water in the separator at a level somewhat higher than the bottom of the conduit 64 connecting the pump and the separator, thus causing the float control valve 62 to open and drain out the excess water as it is accumulated.

From the foregoing description, it is apparent that this invention provides an improved method and apparatus for selectively controlling the transfer of a paper sheet from one belt-like carrier to another at any suction transfer station of a paper making machine. The apparatus required by this invention is of unusual simplicity and, in fact, involves very few additional components over that conventionally required for a suction transfer stage. Furthermore, the method of this invention completely eliminates the problem heretofore encountered of effecting an actual displacement of the suction transfer roll in order to control the initiation or termination of the sheet transfer operation.

It will, of course, be understood that various details of construction may be modified through a wide range without departing from the principles of this invention, and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. In a suction transfer section of a paper making machine wherein the paper web is nor-

6

mally transferred from a first belt-like carrier to a second belt-like carrier, the improvements of a suction transfer roll having a suction area thereof concurrently lapped by both of said carriers and said web interposed therebetween, a conduit communicating with the interior of said roll, a fluid pressure generating system having an inlet and an outlet for connection to said conduit, and a selectively shiftable valve operatively disposed between said conduit, said inlet and said outlet, said valve having one position connecting said inlet to said conduit and another position connecting said outlet to said conduit to selectively subject the interior of said roll to varying fluid pressures which are transmitted through one of said carriers to said web to effect or prevent transfer of the web to the second of said carriers.

2. In a suction transfer section of a paper making machine wherein the paper web is normally transferred from a first belt-like carrier to a second belt-like carrier, the improvements of a transfer roll of the suction type disposed to have a portion of its periphery concurrently lapped by both of said carriers and said web interposed therebetween, a conduit communicating with the interior of said roll, a fluid pressure generating system having a suction inlet and a pressure outlet, a shiftable valve having four ports associated therewith, the first of said ports being connected to said conduit, the second port being connected to said inlet, the third port being connected to said outlet, and the fourth port being connected to atmosphere, said valve having a first position connecting said conduit and outlet together, and said inlet to atmosphere, and a second position connecting said conduit and inlet together and said outlet to atmosphere, the fluid pressure blast through said second carrier against said web serving to prevent the transfer of said web to said second carrier when said valve is in said first position, and the suction exerted on said web through said second carrier serving to effect said transfer when said valve is in said second position.

3. In a paper making machine, a first belt carrier adapted to carry a paper sheet thereon, a second belt carrier, a suction transfer roll for concurrently receiving about its suction area said first and second belt carriers and said paper sheet interposed therebetween, a conduit communicating with the interior of said roll, a fluid pressure generating pump having an inlet and an outlet, a pressure relief valve in said outlet constructed and arranged to maintain a predetermined maximum pressure therein, and a shiftable valve operatively disposed between said conduit, said inlet and said outlet, said valve having one position connecting said inlet to said conduit, and another position connecting said outlet to said conduit.

4. In a paper making machine, a first belt carrier adapted to carry a paper sheet thereon, a second belt carrier, a transfer roll of the suction type having a portion of its periphery concurrently lapped by said first and second belt carriers, a reversible, water-sealed pump, conduit means connecting the interior of said suction roll to said pump, means for selectively operating said pump to produce sub-atmospheric or super-atmospheric pressures within said roll, whereby the transfer of said sheet to said second belt carrier is respectively effected or prevented, a water and air separator connected between said conduit

7

means and said pump, and means for maintaining the level of water in said separator higher than the minimum gravity flow level between said separator and said pump, whereby water for sealing said pump is provided under both conditions of operation. 5

5. A suction transfer assembly comprising a suction roll having a suction area, a conduit extending from said area, a pump communicating with said conduit, shiftable means for alternately placing the inlet and outlet sides of the pump in communication with said conduit and a liquid and air separator device connected to one side of said pump and in flow communication therewith to receive water flowing through said conduit from said roll when the inlet side of the pump communicates with said conduit. 10

6. In a paper making machine, a first belt carrier adapted to carry a paper sheet thereon, a second belt carrier, a transfer roll of the suction type having a portion of its periphery concurrently lapped by said first and second belt carriers and said paper sheet interposed therebetween, conduit means connected to the interior of said suction type transfer roll, and actuating means communicating with said conduit for selectively imparting thereto fluid pressure and vacuum to produce sub-atmospheric and super-atmospheric pressures within said roll, said actuating means comprising a reversible pump in communication with said conduit and a switch for reversing said pump whereby transfer of said 15

8

sheets to said second belt carrier is respectively effected or prevented by the utilization of a single pump.

JOHN E. GOODWILLIE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
16,430	Blake	Jan. 20, 1857
689,400	Keeney	Dec. 24, 1901
906,044	Malcom	Dec. 8, 1908
1,025,822	Millsbaugh	May 7, 1912
1,315,924	Fuller	Sept. 9, 1919
1,701,226	Collins	Feb. 5, 1929
1,701,238	Kennedy	Feb. 5, 1929
1,702,166	Lorenz	Feb. 12, 1929
1,959,520	Blais et al.	May 22, 1934
1,981,049	Kellett	Nov. 20, 1934
2,321,756	Kyle	June 15, 1943
2,424,189	Randall	July 15, 1947

FOREIGN PATENTS

Number	Country	Date
201,776	France	Nov. 7, 1889

OTHER REFERENCES

30 "Elements of Chemical Engineering," by Badger and McCabe (1937), published by McGraw-Hill Co., New York, pp. 112-115.