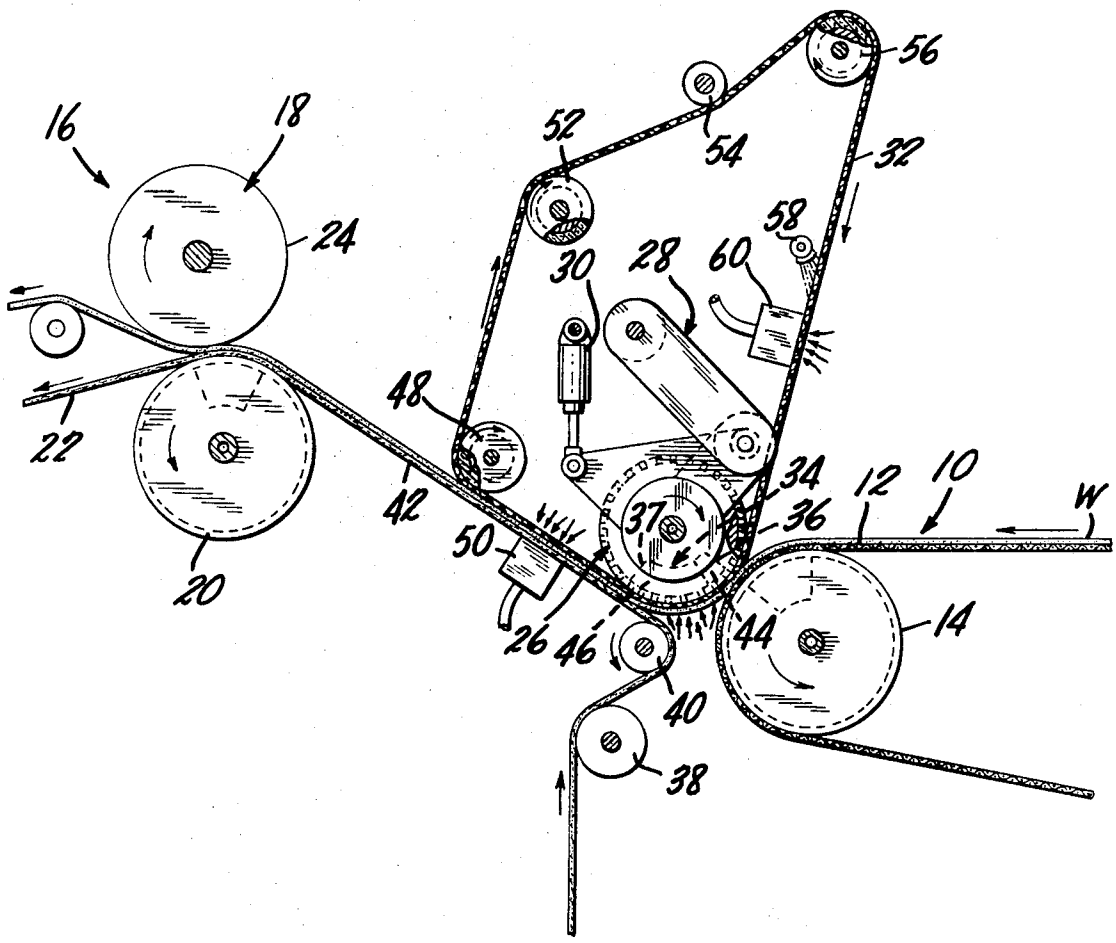
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APPARATUS FOR TRANSFERRING A WEB FROM THE FORMING SECTION TO THE PRESS SECTION IN A PAPERMAKING MACHINE

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APPARATUS FOR TRANSFERRING A WEB FROM THE FORMING SECTION TO THE PRESS SECTION IN A PAPERMAKING MACHINE

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ABSTRACT OF THE DISCLOSURE

Apparatus for transferring a wet paper web from the downstream end of a Fourdrinier wire to a press section comprises a suction transfer roll that runs within an endless, open-mesh transfer fabric and picks the web off the Fourdrinier wire. The web is transferred from the transfer fabric onto a horizontal or inclined run of a carrier belt which is led in closely adjacent the wire section of the machine and into proximity with the transfer roll. The carrier rolls for the transfer fabric are arranged to guide the transfer fabric along a path conjoint with a portion of the run of the carrier belt from the transfer roll to the first press, the transfer fabric being led away from the run of the carrier belt at a location intermediate the transfer roll and the first press of the machine press section. At a location along the conjoint run of the carrier belt and the transfer fabric, a suction box creates a differential pressure across the web to transfer it from the transfer fabric onto the carrier belt so that it runs with the carrier belt to the press section.

BACKGROUND OF THE INVENTION

This invention relates to apparatus for transferring a wet paper web from the downstream end of a Fourdrinier wire to the first press unit of the press section of a paper-making machine.

An important aspect of the handling of paper in a Fourdrinier paper-making machine is the transfer of the sheet from the Fourdrinier wire of the web-forming part of the machine to the first press unit of the press section. In relatively slow speed machines, particularly older machines, a substantial number of which are still in operation, the web is transferred from the wire to a press felt in a self-supporting, socalled "open draw." Because of the limited strength of the wet, newly formed paper web, machines having this transfer arrangement are limited as to their operating speed because of the risk of the web breaking in the open draw. Consequently, modern machines are usually provided with pick-up and transfer devices in which the web is supported at all times on a felt or other flexible belt between the point where it is removed from the wire and the point at which it is pressed in the first press of the machine press section.

One type of transfer system employs a pair of suction rolls, one of which is positioned to pick the web up from the Fourdrinier wire and the other of which forms a nip with the first and pulls the web off the first onto an endless belt that is led around it. In some cases, the first roll, or pick-up suction roll, also runs within an endless fabric, such as a felt or a relatively open mesh fabric of metal wire, textile or synthetic material. The pick-up fabric is normally led directly away from the pick-up roll at the nip with the transfer roll, leaving the web supported on the run of the transfer belt. One disadvatage of this form of equipment is the cost of providing and operating two suction rolls, a suction pick-up roll and a suction transfer roll. Moreover, the provision of two suction rolls at the transfer point occupies a relatively large amount of space. When one is concerned with the design of a new machine, this may not be a problem, although there is always an advantage to be gained by saving space. In the case of older machines, many of which are being modified to enable higher speed operation, the space available for a controlled pick-up and transfer is often limited, and the opportunity to provide a transfer arrangement of the types proposed and used heretofore is frequently impossible or impractical from an economic standpoint. This is particularly true where the table rolls of the Fourdrinier section are located at a relatively low elevation that does not afford sufficient space for the installation of a forward drive roll in the Fourdrinier.

SUMMARY OF THE INVENTION

There is provided, in accordance with the invention, a novel and improved transfer arrangement that is particularly adapted for installation on existing machines but which also provides advantages in new equipment. The transfer apparatus, according to the invention, is of relatively simple construction, occupies a limited amount of space and can be manufactured and installed at a relatively low cost. Nonetheless, it provides for a positive, controlled transfer of the web from the downstream end of the Fourdrinier to the first press unit and is as effective as the arrangements that have been proposed and used in the past. It employs only a single suction roll and is designed so that a transfer wire of relatively open mesh can be used, provided that the paper quality permits such use. A wire or other open-mesh fabric belt, as distinguished from a felt, offers the advantages of longer wear and of being more easily kept clean in operation.

More particularly, the transfer apparatus, according to the invention, comprises a suction transfer roll that runs within a transfer belt, which may be a paper-making felt or a relatively open-mesh fabric of textile, synthetic or metallic material, and a carrier belt, which will usually be a press felt, by which the web is carried through the press section of the machine. The suction transfer roll is positioned adjacent the downstream end of the Fourdrinier wire and may form a nip with the downstream wire turning roll or couch roll or with a free run of wire between the couch roll and a forward drive roll on the Fourdrinier. Suction created in a suction zone in the roll picks the web off the Fourdrinier wire and holds it on the transfer wire along the lower portion of the circumference of the transfer roll. At a suitable point along the lower part of the transfer roll, the carrier belt is bought into adjacent relation to the transfer roll and from such point is led along a horizontal or inclined run to the press section. The transfer belt is arranged to run conjointly with the carrier belt for a portion of such horizontal or inclined run to the press section and is led away from the carrier belt only after a conjoint run for a substantial distance. At any suitable location along the conjoint run of the transfer belt and carrier belt, but downstream from the suction roll, a pressure differential is generated across the belts and the web carried between them to transfer the web from the transfer belt to the carrier belt. Advantageously, the pressure differential is generated by a fixed suction box located within the run of the carrier belt.

An important aspect of the transfer apparatus, according to the invention, is the provision of only one suction roll and the fact that the web is carried in sandwiched relation between the transfer belt and carrier belt for some distance from the point where the carrier belt comes into

adjacent relation to the transfer roll before the web is actually transferred by differential pressure from the transfer belt to the carrier belt. Such arrangement makes possible the elimination of the suction transfer roll, with the consequent advantage of reducing the space requirements for the transfer system, and makes possible the transfer of the web from the transfer belt to the carrier belt by a relatively simple device, such as a fixed suction box.

DESCRIPTION OF THE DRAWING

For a better understanding of the invention, reference may be made to the following description of an exemplary embodiment, taken in conjunction with the accompanying darwing, which is a side elevational view, in generally schematic form, of the embodiment.

DESCRIPTION OF EXEMPLARY EMBODIMENT

In the drawing the reference numeral **10** designates generally the downstream end of a Fourdrinier paper-making machine having the usual endless, foraminous wire **12** that is conducted along an upper run where a paper web W is formed. The wire **12** moves along the upper run from right to left, as represented by the arrow, and the wire is turned around a suction couch roll **14** and is led back along appropriately located carrier and tension rolls to the wet end of the machine. From the Fourdrinier wire section **10**, the web is conducted to a press section, part of which is shown to the left of the drawing and is designated generally by the reference numeral **16**. In the embodiment, a first press unit **18** of the single felted, roll-type is illustrated, and it will be understood that the machine will have two or more press units in the press section. The press unit **18** may be of any suitable type and may, for example, comprise a suction roll **20** that runs within a press felt **22** and a roll **24**, which may be plain or grooved, may be rubber-covered and may run within a felt, that forms a nip with the suction roll **20**. All of the components of the machine are, of course, mounted on a suitable framing system, the details of which are well known to those skilled in the art and therefore are neither illustrated in the drawing nor described herein.

The transfer apparatus, as embodied in the form shown in the drawings and in accordance with the invention, comprises a suction transfer roll **26** that is mounted on an appropriate type of articulating mounting linkage **28** in a position such as to be urged by a suitable mechanism, such as a hydraulic or pneumatic cylinder **30**, into engagement with the Fourdrinier wire **12**. The suction transfer roll **26** is a driven roll and is driven at a speed such that its surface moves at the speed of the web being transferred. In the embodiment shown, the suction roll **26** forms a nip with the suction couch **14**, but it is within the scope of the invention to provide for engagement of the transfer roll **26** with a free run of the wire from the couch to a downstream end, turning roll or forward drive roll of the type used with many Fourdriniers. The suction transfer roll **26** runs within a transfer belt **32**, which is preferably a relatively open-mesh fabric of textile, synthetic or metallic material. Advantageously, the belt **32** is a plastic or metallic fabric, this type of belt providing the advantages of being readily cleaned and of having a relatively long life. Where considerations of paper quality require, however, the transfer belt **32** may be a felt.

A suction box **34** within the suction transfer roll **26** extends from an upstream end **36** at or near the nip between the transfer roll **26** and couch roll **14** to a downstream end **37** in generally the lower or downwardly facing portion of the perimeter of the suction roll and where the roll is brought into adjacent relation to the carrier belt, which may be, as shown, the felt associated with the press section felt **22**. More particularly, the press felt **22** is returned from the press unit **18** around a suitable arrangement of rolls, one such roll **38** being shown below the transfer section, and is led around a turning roll **40** to an inclined run **42** along which it is returned to the nip of the first press unit **18**. The geometric arrangement of the press felt **22** may vary, and the run **42** of the press felt may be horizontal or perhaps downwardly inclined, as well as upwardly inclined as shown in the drawing. Preferably, the roll **40** is located so that it does not form a nip with the transfer roll, though if space considerations require, a nip may be provided. It is also desirable to avoid pressure contact between the transfer belt and the web, on the hand, and the felt, on the other hand, and the equipment may be run with a small spacing between the web and the press felt where they meet.

It is preferable for the suction box **34** to be constructed so as to define two suction zones, a first zone **44** at the upstream end of the box **34** being operated under a higher suction to ensure picking the web off the wire and a downstream section **46** being operated under a relatively lesser vacuum, inasmuch as the vacuum in that zone need merely be sufficient to hold the web on the transfer belt **32** until the transfer belt comes into adjacent relation to the press felt **22**.

The transfer belt **32** is guided from the transfer roll **26** by a turning roll **48** along a path that is conjoint with the initial part of the run **42** of the press felt **22** from the roll **40** to the press unit, and thus the web is carried in a sandwiched relation between the transfer belt and the press felt **22** for such initial portion of the run of the press felt to the press section. Under some conditions, the web will drop off the transfer belt **32**, particularly when the belt **32** is of an open-mesh form and will relatively quickly transfer from the transfer felt **32** onto the press felt **22**. However, to ensure a positive transfer of the web onto the press felt **22**, a suction box **50** located under the press felt **22** along the conjoint run of the transfer belt **32** and press felt **22** is provided in order to create a pressure differential across the web and pull the web off the transfer felt **32** onto the press felt. Thereafter, the web will follow the press felt **22** to the press unit **18**. Once the transfer of the web to the press felt has been accomplished, the transfer belt **32** is led away, as indicated in the drawing, around the turning roll **48** and is conducted by a turning roll **52**, a tension roll **54** and a turning roll **56** back in an endless path to the suction transfer roll **26**. At some suitable point along the run of the transfer belt **32**, the belt is cleaned and dried, such as by spraying water on it from a spray head **58** and dewatering it, such as by means of a suction box or other suitable type of drying device.

We claim:

1. In a paper-making machine of the type having a movable endless foraminous belt trained around a series of carrier rolls and having a top run carrying a wet paper web formed thereon, the series of rolls including a turning roll or couch at the downstream end of the said upper run, and a movable endless flexible carrier belt onto which the web is to be transferred from the foraminous belt and by which it is to be carried to a press section of the paper-making machine, the improvement comprising a rotatable suction transfer roll having a curved surface, an endless flexible foraminous transfer belt looped around a portion of the roll surface opposite the foraminous belt and extending around generally the underside of the transfer roll surface, the transfer roll being located such that a first location on its surface is closely adjacent the endless foraminous belt whereby a suction zone therein picks the web off the foraminous belt, means mounting the transfer roll for movement relative to the foraminous belt, means for urging the transfer roll surface toward the foraminous belt with a predetermined pressure, means for conducting the carrier belt along a path that brings it into closely adjacent but non-contacting relation to the transfer belt adjacent the said portion of the transfer roll surface and at a second location thereon spaced from the said first location and adjacent a generally downwardly facing part of the transfer roll surface and for conducting the carrier belt along a straight horizontal or inclined run to the press section of the machine, means for conducting the transfer

belt from the transfer roll surface along a straight path conjoint with a portion of the said run of the carrier belt extending from the said second location on the transfer roll surface to a place along the said run intermediate the said second location the press section and for leading the transfer belt away from the carrier belt at the said place, means associated with the transfer roll for generating a suction force on the web to transfer it to the transfer belt from the foraminous belt at the said first location and to hold it on the transfer belt until it reaches the second location and to release it at the second location, and means along the conjoint straight run of the carrier belt and transfer belt for establishing a pressure differential across the web effective to transfer it to the carrier belt before the transfer belt and carrier belt are separated.

2. Apparatus according to claim 1 wherein the transfer belt is an open-mesh fabric.

3. Apparatus according to claim 1 wherein the means for establishing a pressure differential to transfer the web from the transfer belt to the carrier belt is a stationary suction box located under the carrier belt along the said run thereof.

4. Apparatus according to claim 1 wherein the means associated with the transfer roll for generating a suction force on the web between the said first and second locations thereof includes means defining a first suction zone extending from said first location to a third location intermediate said first and second location and means defining a second suction zone extending from said third location to said second location, the first suction zone being operated at a higher suction than the second suction zone.

5. Apparatus according to claim 1 wherein the suction transfer roll is located adjacent the turning roll or couch roll at the downstream end of the said upper run of the foraminous belt and forms a nip therewith.

6. Apparatus according to claim 1 wherein the means carrying the carrier belt for movement along said run includes a turning roll located adjacent the transfer roll and in spaced relation thereto such that the turning roll does not form a nip with the transfer roll.

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