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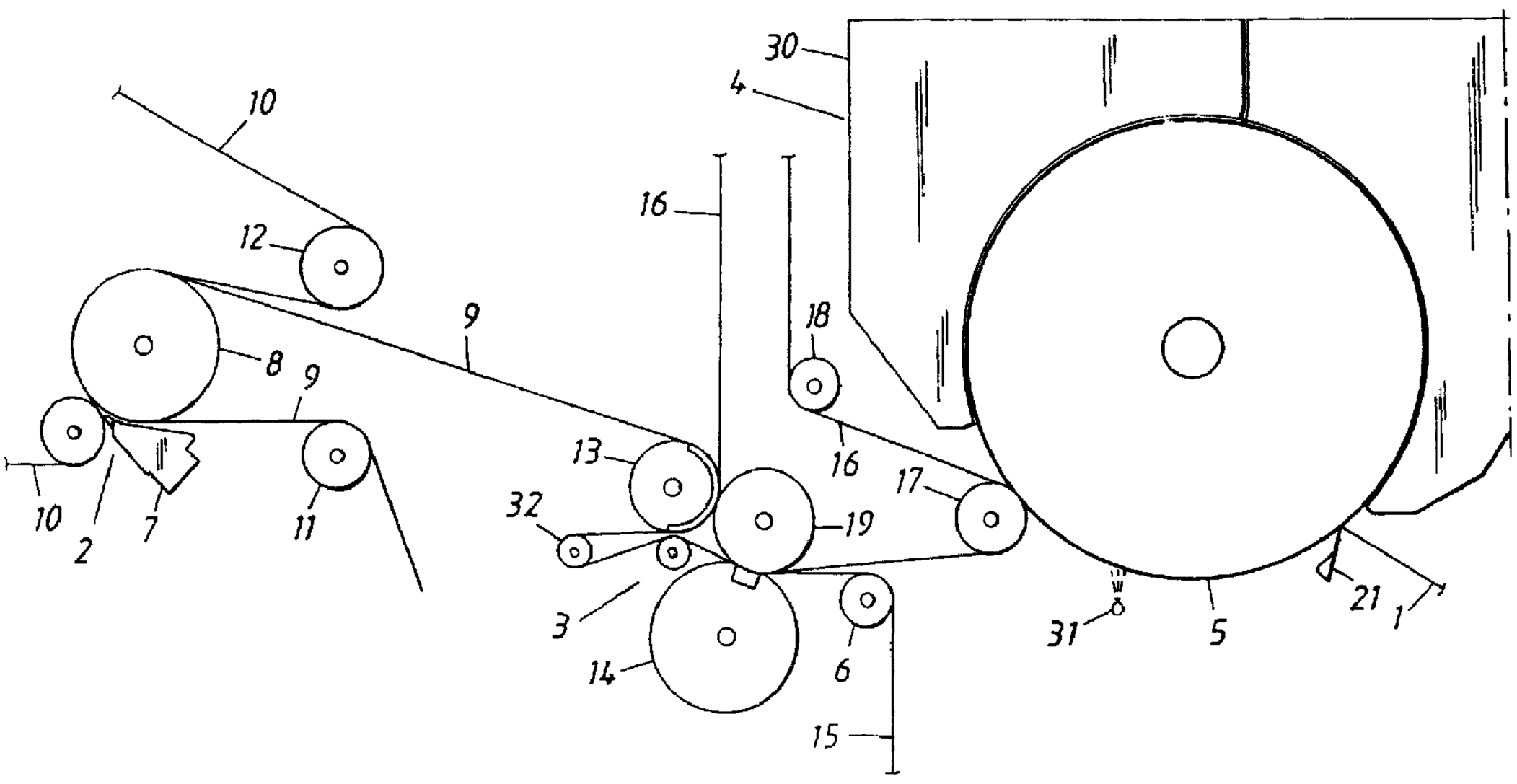

(57) Abrégé/Abstract:
Paper machines comprise press sections (3) with shoe press nips, through which substantially impermeable belts (16) and felt (15) run with the fibrous webs (1) enclosed between them, drying cylinders (5) and transfer rolls (17) forming nips for transfer of the webs to the drying cylinders. Belts (16) have compressible polymer coatings having hardness of 50 to 97 Shore A, with web-contacting surfaces with a degree of roughness in unloaded state of 2m<Rz<80 m, and a lower degree of roughness of O<Rz<20 m when the polymer coating is compressed by linear load of 20 to 220 kN/m on the belt as measured in a non-extended press nip. Belts run from shoe presses to drying cylinders to carry webs to the transfer nips, the felts running away from the belts before a water film formed in the nip on the belt breaks up. Adhesive is applied on the drying cylinder.

ABSTRACT

Paper machines comprise press sections (3) with shoe press nips, through which substantially impermeable belts (16) and felt (15) run with the fibrous webs (1) enclosed between them, drying cylinders (5) and transfer rolls (17) forming nips for transfer of the webs to the drying cylinders. Belts (16) have compressible polymer coatings having hardness of 50 to 97 Shore A, with web-contacting surfaces with a degree of roughness in unloaded state of 2m<Rz<80 m, and a lower degree of roughness of O<Rz<20 m when the polymer coating is compressed by linear load of 20 to 220 kN/m on the belt as measured in a non-extended press nip. Belts run from shoe presses to drying cylinders to carry webs to the transfer nips, the felts running away from the belts before a water film formed in the nip on the belt breaks up. Adhesive is applied on the drying cylinder.

Paper machine for and method of manufacturing soft paper

The present invention relates to a paper machine for manufacturing a fibrous soft paper web, including:

- a wet section having a headbox; a forming roll; and inner an outer clothings running around the forming roll, between which clothings the fibrous web is formed;

- a press section having at least one shoe press having a shoe press roll and a counter roll, said rolls forming an extended press nip, a substantially impermeable belt and a press felt, the substantially impermeable belt and the press felt running through the extended press nip with the fibrous web enclosed therebetween; and

- a drying section having a drying cylinder and a transfer member which, together with the drying cylinder, forms a transfer nip for transfer of the fibrous web to the drying cylinder.

The invention also relates to a method of manufacturing a fibrous soft paper web in a paper machine, said machine including:

- a wet section having a headbox; a forming roll; and inner and outer clothings running around the forming roll, between which clothings the fibrous web is formed;

- a press section having a least one shoe press having a shoe press roll and a counter roll, said rolls forming an extended press nip, a substantially impermeable belt and a press felt, the substantially impermeable belt and the press felt running through the extended press nip with the fibrous web enclosed therebetween; and

- a drying section having a drying cylinder and a transfer member which, together with the drying cylinder,

forms a transfer nip for transfer of the fibrous web to the drying cylinder.

A paper machine of the type described above is disclosed in US-5,393,384, see particularly Figure 6. The paper machine shown therein has a belt impermeable to water, which runs in a loop through an extended press nip formed by a shoe press roll and a counter roll. A press felt is conducted directly to the press nip, where it runs together with the impermeable belt and the paper web. The paper web is transferred from a forming fabric to the impermeable belt, which is to carry the paper web on its under side up to the press nip and thence to the drying cylinder. The impermeable belt thus carries the paper web a relatively long distance after the paper web has been transferred from the forming fabric to the impermeable belt. There is therefore a risk of the paper web not adhering sufficiently strongly along the entire distance and thus becoming detached from the impermeable belt. According to the '384 patent, the adhesion force between the impermeable belt and the paper web is greater than that between the press felt and the paper web. The impermeable belt in question is not compressible and has a smooth, web-carrying surface. It is generally known that such a smooth, impermeable belt obtains a film of liquid on its smooth, web-carrying surface when the belt, press felt and paper web pass together through a press nip and that, after the press nip, the paper web therefore adheres to the impermeable belt instead of to the press felt which does not have a smooth surface, when the press felt and the impermeable belt run away from each other. This situation is also utilized in US-4,483,745. Since, however, both the impermeable belt and the drying cylinder in the paper machine according to US-5,393,384 have smooth surfaces, with which the paper web is intended to come into contact, there is considerable risk of the paper web continuing to adhere

to the smooth surface of the impermeable belt after it is passed the nip at the drying cylinder instead of being transferred to the smooth surface of the drying cylinder as desired. Probably not even the application of large quantities of adhesive on the envelope surface of the drying cylinder would ensure adhesion of the paper web to the drying cylinder.

DE-195 48 747 describes a paper machine for manufacturing creped tissue paper, which is provided with a press comprising a shoe press roll, a counter roll and a suction roll, the counter roll forming a first press nip with the suction roll and a second extended press nip with the shoe press roll. A felt passes through the two press nips together with the paper web and then carries the paper web with it to a Yankee dryer, to which the paper web is transferred when the felt and the paper web pass around a transfer roll forming a non-compressing nip with the Yankee dryer. Suction zones for dewatering the felt are provided before and after the first press nip, the suction zone before the press nip being situated within the suction roll whereas the suction zone after the press nip is in a side loop in which the felt runs alone and joins the paper web again at the entry to the second press nip. One drawback with such a paper machine is that the paper web is exposed to rewetting by the wet felt before it reaches the Yankee dryer.

US-5,298,124 describes a compressible transfer belt for use in a paper or board machine in order to eliminate open draws of the paper web and to easily release the paper web so that it can be transferred to a fabric or belt. The transfer belt carries the paper web through the press section, which comprises one or more press nips, and on to the drying section which comprises a plurality of drying cylinders and a belt passing in a loop around a transfer roll which forms a nip with the

transfer belt. Each press is also provided with a felt passing through its press nip and enclosing the paper web between it and the transfer belt. The impermeable transfer belt is also designed so that a liquid film formed in the press nip between the transfer belt and the paper web breaks up when the pressure on the transfer belt ceases after the press nip, so that its release properties increase and the paper web can thus more easily be transferred to a fabric or another belt running in a loop. There is no proposal or suggestion to having the transfer belt to carry the paper web to a drying cylinder in a tissue machine.

US-5,298,124 offers an excellent description of the tasks a transfer belt cooperating with a press felt shall perform in a satisfactory manner, and also of the properties and design of such transfer belts, which then were described in patent specifications US-A-4,483,745, 4,976,821, 4,500,588, 5,002,638, 4,529,643 and CA-A-1,188,556. According to US-A-5,298,124, for a transfer belt intended for cooperation with a press felt the critical tasks are a) to remove the paper web from the press felt without causing instability problems; b) to cooperate with the press felt in one or more nips to ensure optimal dewatering and high quality of the paper web; and c) to transfer the paper web in a closed draw from a press in the press section to a paper receiving fabric or belt in the following press or presses of the press section or to a pick-up fabric in the drying section. As mentioned, the transfer belt for the press section of a paper machine described in US-5,298,124 has a web-contacting surface which is substantially impermeable to water and air and has pressure-responsive microscale topography. Under influence of the pressure in a press nip in the press section, the transfer belt is compressed so that the microscale roughness of said surface is decreased, whereupon the surface becomes much

smoother and allows the formation of a thin, continuous film of water thereon.

It has surprisingly been found that a belt of the type described in US-5,298,124 is also well suited for use in a paper machine according to the invention, for transferring a soft paper web in closed draw from a shoe press nip in the press section to a Yankee dryer in the drying section of the soft paper machine. As is known, a shoe press nip results in a high degree of dewatering.

The object of the present invention is to provide an improved paper machine and an improved method of manufacturing soft paper, said paper machine and said method enabling the manufacture of a fibrous web with high dry solids content before the drying cylinder in order to enable a high production rate to be achieved at reasonable cost, and to reliably transfer the fibrous web to the drying cylinder although the fibrous web is carried to the drying cylinder by an impermeable belt.

The paper machine according to the invention is characterized in that

a) the substantially impermeable belt comprises a carrier with a compressible polymer coating on the side facing the paper web, having a hardness in the range from 50 to 97 Shore A, which polymer coating has a web-contacting surface with a pressure-responsive, recoverable degree of roughness, the web-contacting surface having a degree of roughness in unloaded state of R_Z=2-80 m, measured in accordance with ISO 4287, Part I, and a lower degree of roughness of R_Z=0-20 m when the polymer coating is compressed by linear load of 20-220 kN/m on the substantially impermeable belt as measured in a non-extended press nip;

b) the press felt is arranged to carry the fibrous web to the press section from the forming roll or from a point situated downstream of the forming roll and upstream of the press section;

c) the substantially impermeable belt and the web-carrying press felt are arranged to run together not until they enter the press section to enclose the fibrous web between them, the substantially impermeable belt being arranged to run directly to the press section;

d) the substantially impermeable belt is arranged to run from the shoe press to the drying cylinder to carry the fibrous web to said transfer nip;

e) the press felt is arranged to run in a direction away from the substantially impermeable belt at a point immediately after the extended press nip and before a water film formed in the extended press nip on the substantially impermeable belt breaks up; and

f) a device for applying adhesive is arranged before said transfer nip to apply a continuous adhesive layer on the envelope surface of the drying cylinder and/or on the fibrous web.

The method according to the invention is characterized by

a) performing the pressing with the aid of a substantially impermeable belt that includes a carrier and a compressible polymer coating on the side facing the paper web, said polymer coating having a hardness in the range from 50 to 97 Shore A and a web-contacting surface with a pressure responsive, recoverable degree of roughness, the web-contacting surface having a degree of roughness in unloaded state of R_z=2-80 m, measured in accordance with ISO 4287, Part I, and a lower degree of roughness of R_z=0-20 m when the polymer coating is compressed by linear load of 20-220 kN/m on the

substantially impermeable belt as measured in a non-extended press nip;

b) using the press felt to carry the fibrous web to the press section from the forming roll or from a point situated downstream of the forming roll and upstream of the press section;

c) running the substantially impermeable belt and the web-carrying press felt together not until they enter the press section to enclose the fibrous web between them, and running the substantially impermeable belt directly to the press section;

d) running the substantially impermeable belt from the shoe press to the drying cylinder to carry the fibrous web to said transfer nip;

e) running the press felt in a direction away from the substantially impermeable belt at a point immediately after the extended press nip and before a water film that is formed on the substantially impermeable belt in the extended press nip breaks up; and

f) applying a continuous adhesive layer on the envelope surface of the drying cylinder and/or on the fibrous web by means of an adhesive applying device at a point before said transfer nip.

It is surprising that a transfer belt according to US-A-5,298,124, which is intended for pressing in a press section and usable for transferring a paper web from the press section to a drying fabric, is useful with advantage for transferring a soft paper web from a shoe press nip directly to a Yankee dryer or other drying cylinder. As is well known, the conditions at a Yankee dryer are completely different from those in a press nip. With a Yankee dryer no pressing of the soft paper web occurs for direct dewatering. Rather it is a question of

supporting the soft paper web to the envelope surface of the Yankee dryer so that the fibers of the soft paper web adhere efficiently to the surface of the Yankee dryer thereby achieving good heat transfer to the paper web. This is exactly the effect which is achieved with the transfer belt in the paper machine according to the invention and which is not achieved with a press felt as described in DE-195 48 747 due to rewetting of the paper web after the last press nip in the press section which prevents satisfactory adhesion. Neither can it be achieved, or only to a minor extent, with a transfer belt as described in US-5,393,384 for the reason stated above. The compressibility of the transfer belt used in the paper machine according to the invention results in lower specific pressure at the adhesion point, which in turn results in increased rate of operation, i.e. higher production rate. This property also results in increased vaporization of water from the soft paper web, i.e. quicker drying of the soft paper web on the Yankee dryer, which also contributes to higher efficiency in the process. The increased efficiency can either be used to increase machine speed or to reduce energy consumption while maintaining the same production volume.

The invention is described in more detail in the following with reference to the drawings.

Figure 1 shows a paper machine according to a first embodiment of the invention.

Figure 2 shows a paper machine according to a second embodiment of the invention.

Figure 3 shows a paper machine according to a third embodiment of the invention.

Figure 4 shows a paper machine according to a fourth embodiment of the invention.

Figures 1-3 show schematically parts of a paper machine for manufacturing a fibrous web 1 of soft paper such as tissue and other sanitary paper products. Each of the paper machines comprises a wet section 2, a press section 3 and a drying section 4.

The wet section 2 comprises a headbox 7, a forming roll 8, an endless, carrying, inner clothing 9 and an endless, covering outer clothing 10 consisting of a forming fabric. The inner and outer clothings 9 and 10 run, each in its own loop, around a plurality of guide rolls 11 and 12, respectively.

The drying section 4 comprises a drying cylinder 5 covered by a hood 30. The drying cylinder is suitably a Yankee dryer. At the outlet side of the drying section a creping doctor 21 is arranged to crepe the fibrous web 1 off the Yankee dryer 5. An application device 31 is provided for applying of a suitable adhesive on the envelope surface of the Yankee dryer 5 immediately before the transfer nip.

The press section 3 comprises a shoe press with a shoe press roll 14 and a counter roll 19, these rolls 14 and 19 forming an extended press nip with each other. The press section also comprises an endless press felt 15 which runs in a loop around guide rolls 6, and an endless, substantially impermeable transfer belt 16. The substantially impermeable belt 16 runs in a loop around the counter roll 19, a transfer roll 17 and a plurality of guide rolls 18. The transfer roll 17 forms a transfer nip with the Yankee dryer 5 with low linear pressure, i.e. about 30-60 kN, through which transfer nip the substantially impermeable belt 16 thus passes.

In the embodiments shown in Figures 1 and 2 the press section 3 also includes a roll press, the rolls of which consisting of a suction press roll 13 and said counter

roll 19 to form a press nip through which the substantially impermeable belt 16 and the press felt 15 pass together with the fibrous web 1. After this initial press nip, the press felt 15 is conducted away from the fibrous web 1 and the substantially impermeable belt 16 in a side loop around the suction press roll 13 and two guide rolls 32. The press felt 15 rejoins the fibrous web 1 and the substantially impermeable belt 16 immediately before the extended press nip. If desired, suction devices may be arranged within this side loop of the press felt 15 in order to increase the capacity of the press felt to absorb water at the entrance to the extended press nip.

In the embodiments shown in Figures 1 and 3 the inner clothing 9 of the wet section 2 is a felt conveyed to the press section 3 to be also used as press felt 15 and which thus runs in a loop back to the forming roll 8.

In the embodiment shown in Figure 2 the inner clothing 9 of the wet section 2 is a fabric, in which case the press felt 15 runs around a pick-up roll 20 arranged close to the loop of the fabric 9 so that press felt 15 and fabric 9 run in contact with each other to transfer the fibrous web from the fabric 9 to the press felt 15. The pick-up roll 20 may be provided with a suction shoe (not shown). Alternatively the pick-up roll and suction shoe may be replaced by a pick-up suction box.

Figure 4 shows schematically parts of a paper machine according to a further embodiment of the invention. It is similar to that shown in Figure 1 with the exception that the press felt 15 is not led in a side loop between the two press nips, but instead accompanies the counter roll 19 so that the fibrous web 1 is held enclosed between the substantially impermeable belt 16 and the press felt 15. This embodiment can be used when there is little risk of rewetting of the fibrous web.

In the embodiments according to Figures 1-4 the counter roll 19 is a smooth roll and is arranged in a loop of the substantially impermeable belt 16. In an alternative embodiment (not shown) of the press section according to Figure 3, the positions of rolls 14 and 19 are reversed, i.e. the shoe press roll 14 is arranged in a loop of the substantially impermeable belt 16 and the counter roll 19 in the loop of the press felt 15. In such a configuration the counter roll may be a suction roll, a grooved roll or a blind-drilled roll.

The substantially impermeable and elastically compressible transfer belt 16 is of the type described in US-5,298,124, for instance. The substantially impermeable belt 16 used in the paper machines according to the invention is compressible under the influence of the press forces prevailing in the press nips. The substantially impermeable belt 16 thus assumes an uncompressed state upstream and downstream of a press nip and a compressed state when it passes a press nip, the surface, the web-carrying surface, facing the fibrous web having a high degree of roughness in the uncompressed state of the substantially impermeable belt and a lower degree of roughness in the compressed state of the substantially impermeable belt so that the web-carrying surface in the compressed state of the substantially impermeable belt is sufficiently smooth for a continuous liquid film to be formed on the web-carrying surface when the substantially impermeable belt, together with press felt and fibrous web, passes through the press nip and so that the web-carrying surface in the uncompressed state of the substantially impermeable belt is sufficiently rough to permit the continuous liquid film to break up after the substantially impermeable belt has expended in thickness direction. More specifically, the substantially impermeable and elastically compressible transfer belt consists of an endless carrier,

alternatively including a joinable seam, with a polymer coating on its web-contacting surface having a hardness of 50-97 Shore A, the polymer coating having a degree of roughness in uncompressed state of R_z = 2-80 m, measured in accordance with ISO 4287, Part I, and being compressible to a lower degree of roughness of R_z = 0-20 m when a linear load of 20-220 kN/m is applied on the substantially impermeable belt, and also has the ability to be recovered to its uncompressed degree of roughness when the pressure exerted on the substantially impermeable belt ceases. The R_z-value is more specifically the ten-point height which is defined in said ISO norm as the average distance between the five highest peaks and the five deepest volleys in the reference length measured from a line parallel to the mean line and not crossing the surface profile. The substantially impermeable transfer belt preferably has an air permeability of less than 6 m^3/m^2/minute, measured in accordance with the procedure described in "Standard Test Method for Air Permeability of Textile Fabrics, ASTM D 737-75, American Society of Testing and Materials".

As stated in said US-5,298,124, the polymer coating of the substantially impermeable belt may advantageously comprise a polymer composition such as acrylic polymer resin, polyurethane polymer resin and polyurethane/polycarbonate polymer resin composition. The polymer coating may also contain particles of filler with a different hardness from the polymer material and which may consist of kaolin clay, polymer material or metal, preferably stainless steel.

The transfer belt included in the paper machine according to the invention is manufactured in the manner also described in US-5,298,124. Thanks to the use of the above polymer composition, a surface layer is achieved on the belt which is elastically compressible. After the

actual surface working in the manufacturing process a surface is obtained which gives a controlled topography. The compressibility and topography of the surface layer are not noticeably affected by possible wear during operation. The dense polymer surface is easy to keep clean and can stand being cleaned with a doctor blade directly on the belt surface. To ensure that the belt will not age at the edge portions running against the Yankee dryer outside the paper web, this must be taken into consideration when selecting material and the combinations which withstand heat best must be chosen. Otherwise edge cooling must be effected by spraying water on the edge, for instance, immediately before or after passage of the Yankee dryer.

The carrier in the transfer belt is endless and includes also types of base elements which can in some way be made endless. The term also particularly covers an openable base element provided with a seam, which element is made endless first when it is installed in the paper machine with the aid of a suitable seam. The carrier may consist, for instance, of a multi-layered woven fabric produced from polymer monofilaments such as polyester, polyamide and the like. The base element may also consist of a fibrous web (non-woven) held together by binder, combined wound yarns, polymer foil/film, warp knitting or the like. The requirement is that the carrier is form-stable both in machine direction and transverse thereto, so that it contributes to stability of the belt upon mechanical stress in these directions.

If the carrier is to be completely enclosed in the polymer coating, this can either be applied on one side with complete bleeding through to the reverse side, or it may be applied first on one side and then on the other. Configurations may occur requiring particularly thin belts, in which case it may be advisable to apply the coating only from one side with restricted

through-bleeding. In this case it is essential that the non-coated surface of the base element is wear-resistant and easy to keep clean.

The paper machine according to the invention, with single-felted press nip(s), produces a fibrous web with a high dry solids content before the drying section, i.e. up to 55%, which should be compared with the dry solids contents of up to 45% achieved with paper machines in use today. This improvement can be utilized either to run the paper machine at a higher production or to reduce the energy consumption in the drying section. It also enables a reduction in the diameter of the drying cylinder.

With the embodiments shown and described a guide roll may be arranged if desired in the loop of the substantially impermeable belt 16 immediately before the transfer roll 17.

With the embodiments shown and described a transfer member is used consisting of the transfer roll 17. According to an alternative embodiment (not shown), the transfer roll is replaced by the substantially impermeable belt itself which is allowed to run around a predetermined part of the drying cylinder, e.g. within a sector angle of 30-60, to form an extended transfer nip with the drying cylinder.

CLAIMS

1. A paper machine for manufacturing a fibrous soft paper web (1), including:

- a wet section (2) having a headbox (7); a forming roll (8); and inner and outer clothings (9, 10) running around the farming roll (8), between which clothings the fibrous web (1) is formed;

- a press section (3) having at least one shoe press. having a shoe press roll (14) and a counter roll (19), said rolls forming an extended press nip, a substantially impermeable belt (16) and a press felt (15), the substantially impermeable belt (16) and the press felt (15) running through the extended press nip with the fibrous web enclosed therebetween; and

- a drying section (4) having a drying cylinder (5) and a transfer member (17) which, together with the drying cylinder (5), forms a transfer nip for transfer of the fibrous web to the drying cylinder (5), characterized in that

a) the substantially impermeable belt (16) comprises a carrier with a compressible polymer coating on the side facing the paper web, having a hardness in the range from 50 to 97 Shore A, which polymer coating has a web-contacting surface with a pressure-responsive, recoverable degree of roughness, the web-contacting surface having a degree of roughness in unloaded state of $2m<Rz<80$ m, measured in accordance with ISO 4287, Part I, and a lower degree of roughness of $O<Rz<20$ m when the polymer coating is compressed by linear load from 20 to 220 kN/m on the

substantially impermeable belt as measured in a non-extended press nip;

b) the press felt (15) is arranged to carry the fibrous web (1) to the press section (3) from the forming roll(8)or from a point situated downstream of the forming roll (8) and upstream of the press section (3);

c) the substantially impermeable belt (16) and the web-carrying press felt (15) are arranged to run together not until they enter the press section (3) to enclose the fibrous web (1) between them, the substantially impermeable belt (16) being arranged to run directly to the press section;

d) the substantially impermeable belt (16) is arranged to run from the shoe press to the drying cylinder (5) to carry the fibrous web (1) to said transfer nip;

e) the press felt (15) is arranged to run in a direction away from the substantially impermeable belt (16) at a point immediately after the extended press nip and before a water film formed in the extended press nip on the substantially impermeable belt (16) breaks up; and

f) a device (31) for applying adhesive is arranged before said transfer nip to apply a continuous adhesive layer on the envelope surface of the drying cylinder (5) and/or on the fibrous web (1).

2. A paper machine as claimed in claim 1, characterized in that said inner clothing (9) in the wet section constitutes a felt, and that this felt is arranged to run through the press section and there to be used also as its press felt (15).

3. A paper machine as claimed in claim 1, characterized in that said inner clothing (9) in the wet section is a fabric, and that a pick-up device (20) is arranged in the loop of the press felt upstream of the press section in order to transfer the fibrous web (1) from the fabric (9) to the press felt.

4. A paper machine as claimed in any one of claims 1 to 3, characterized in that the press section also includes a roll press arranged upstream of the shoe press and including a suction press roll (13) arranged in the loop of the press felt (15), and a counter roll (19) arranged in the loop of the substantially impermeable belt (16).

5. A paper machine as claimed in claim 4, characterized in that the counter roll (19) of the shoe press also is the counter roll (19) of the roll press.

6. A paper machine as claimed in claim 4 or 5, characterized in that the press felt (15) is guided away from the fibrous web (1) in a side loop around the suction press roll (13) and at least one guide roll (32), which side loop extends from the press nip of the roll press to the extended press nip of the shoe press.

7. A paper machine as claimed in any one of claims 1 to 6, characterized in that the air permeability of the substantially impermeable belt (16) is less than 6 $m^3/(m^2/min)$, measured in accordance with the procedure described in "Standard Test Method for Air Permeability of Textile Fabrics, ASTM D 737-75, American Society of Testing and Materials".

8. A paper machine as claimed in any one of claims 1 to 7, characterized in that the transfer member consists of a transfer roll (17) arranged in the loop of the substantially impermeable belt (16).

9. A paper machine as claimed in any one of claims 1 to 7, characterized in that the transfer member consists of the substantially impermeable belt (16) that runs around a predetermined part of the drying cylinder (5) to produce an extended transfer nip.

10. A method of manufacturing a fibrous soft paper web (1) in a paper machine, said paper machine including:

- a wet section (2) having a headbox (7); a forming roll (8); and inner and outer clothings (9, 10) running around the forming roll (8), between which clothings the fibrous web (1) is to be formed;

- a press section (3) having at least one shoe press having a shoe press roll (14) and a counter roll (19), said rolls forming an extended press nip, a substantially impermeable belt(16) and a press felt(15),the substantially impermeable belt(16)and the press felt (15) running through the extended press nip with the fibrous web enclosed therebetween; and nip with the

- a drying section (4) having a drying cylinder (5) and a transfer member (17) which, together with the drying cylinder (5), forms a transfer nip for transfer of the fibrous web to the drying cylinder (5),

characterized by the steps of

a) pressing the paper web in said extended press nip with the aid of a substantially impermeable belt (16) that includes a carrier and a compressible polymer coating on the

side facing the paper web, and compressing said polymer coating;

b) carrying the fibrous web (1) to the press section (3) by the press felt (15) from the forming roll (8) or from a point situated downstream of the forming roll (8) and upstream of the press section (3);

c) running the substantially impermeable belt (16) and the web-carrying press felt (15) separately before they enter the press section (3) to enclose the fibrous web (1) between them, and running the substantially impermeable belt (16) directly to the press section;

d) carrying the fibrous web (1) to said transfer nip by the substantially impermeable belt (16) from the shoe press to the drying cylinder (5);

e) running the press felt (15) in a direction away from the substantially impermeable belt (16) at a point immediately after the extended press nip and before a water film, that is formed on the substantially impermeable belt (16) in the extended press nip, breaks up ; and

f) applying a continuous adhesive layer on the envelope surface of the drying cylinder (5) and/or on the fibrous web (1) by means of an adhesive applying device (31) at a point before said transfer nip.

11. A method as claimed in claim 10, characterized by using a felt as said inner clothing (9) in the wet section, running that felt through the press section, and using that felt also as the press felt (15) of the press section.

12. A method as claimed in claim 10, characterized by transferring the fibrous web from said inner clothing (9), which is in the form of a fabric, to the press felt (15) by means of a pick-up device (20) arranged in the loop of the press felt upstream of the press section.

13. A method as claimed in any one of claims 10 to 12, characterized by dewatering the fibrous web first in a roll press of the press section, said roll press being arranged upstream of the shoe press and including a suction press roll (13) arranged in the loop of the press felt (15) and a counter roll (19) arranged in the loop of the substantially impermeable belt (16).

14. A method as claimed in claim 13, characterized by guiding the press felt (15) away from the fibrous web (1) in a side loop running around the suction press roll (13) and at least one guide roll (32), said side loop extending from the press nip of the roll press to the extended press nip of the shoe press.

15. A method as claimed in any one of claims 10 to 14, characterized by using a substantially impermeable belt (16) having an air permeability that is less than 6 $m^3/(m^2/min)$, measured in accordance with the procedure described in "Standard Test Method for Air Permeability of Textile Fabrics, ASTM D 737-75, American Society of Testing and Materials".

16. A method as claimed in any of claims 10 to 15, characterized by using the substantially impermeable belt (16) also as said transfer member that runs around a predetermined part of the drying cylinder (5) to produce an extended transfer nip.

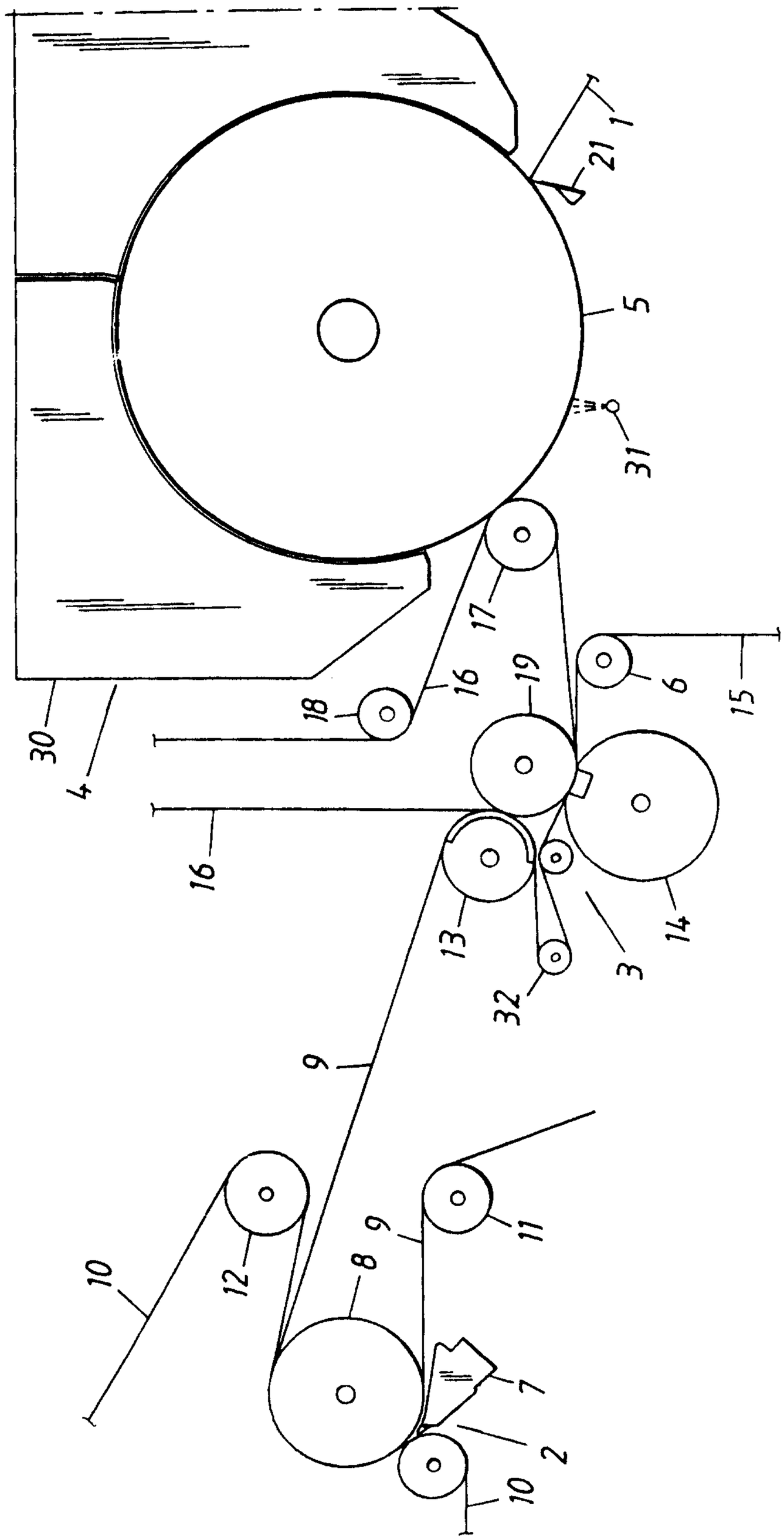

Fig 1

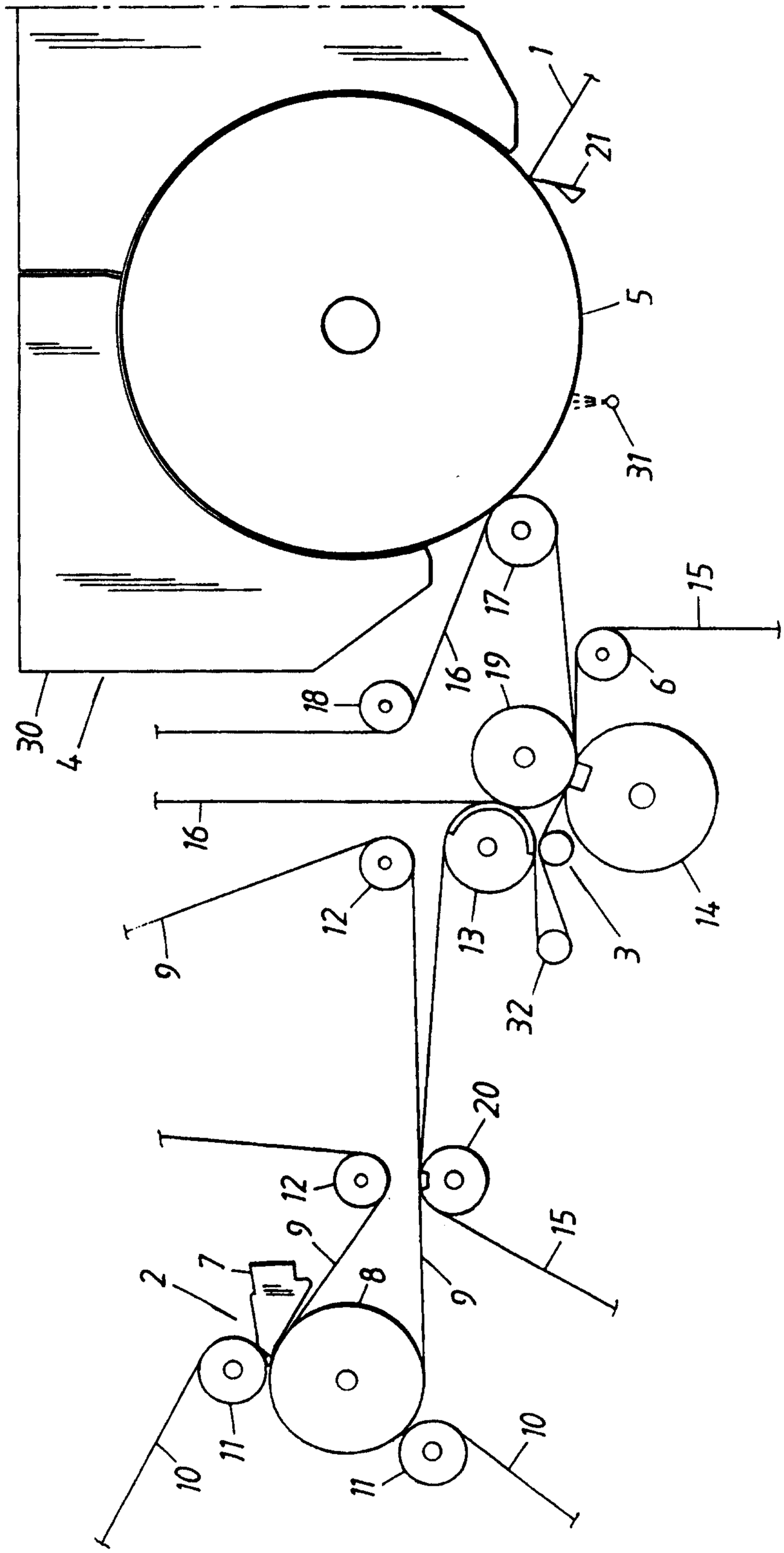
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Fig. 2

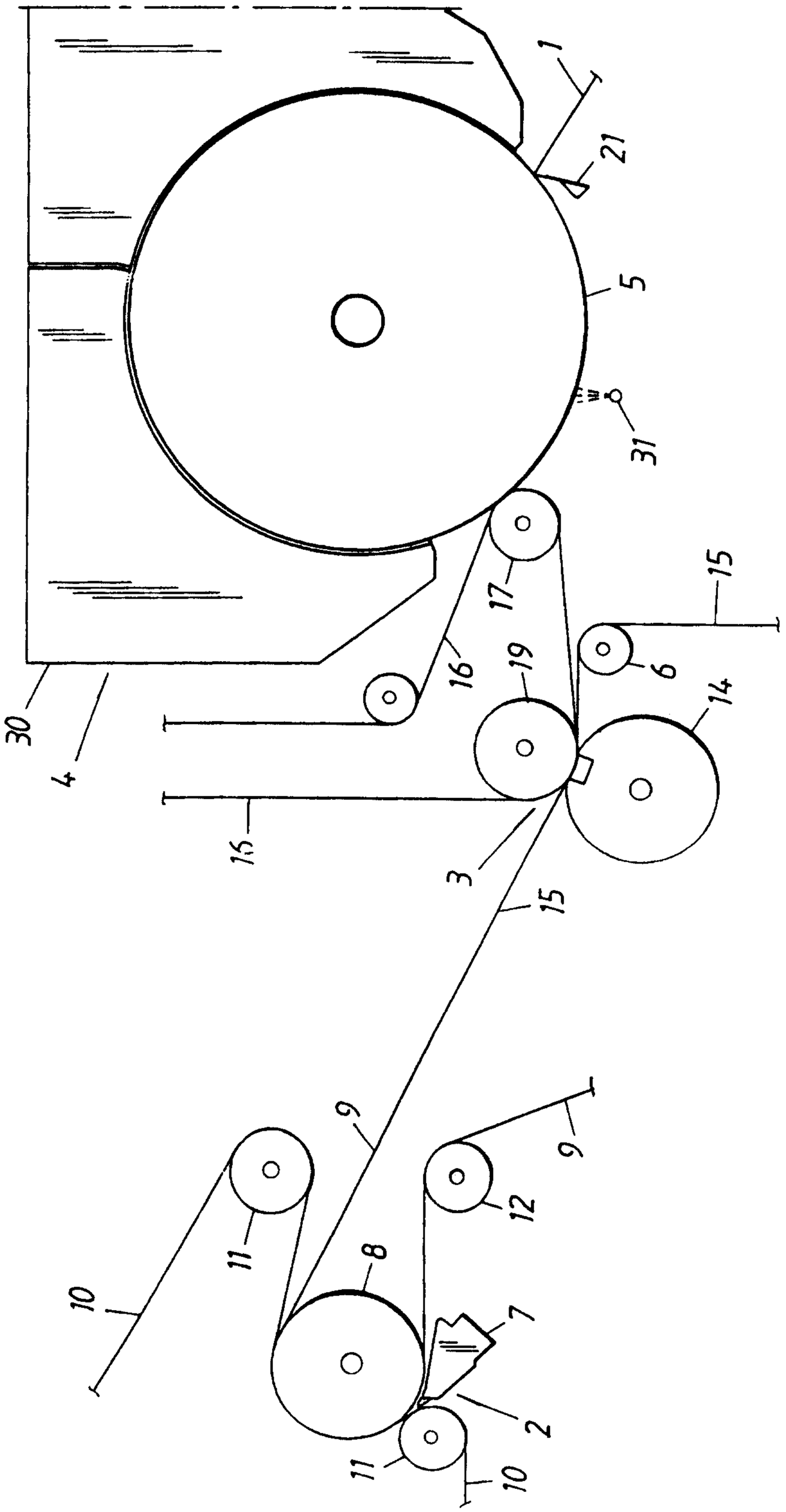


Fig. 3

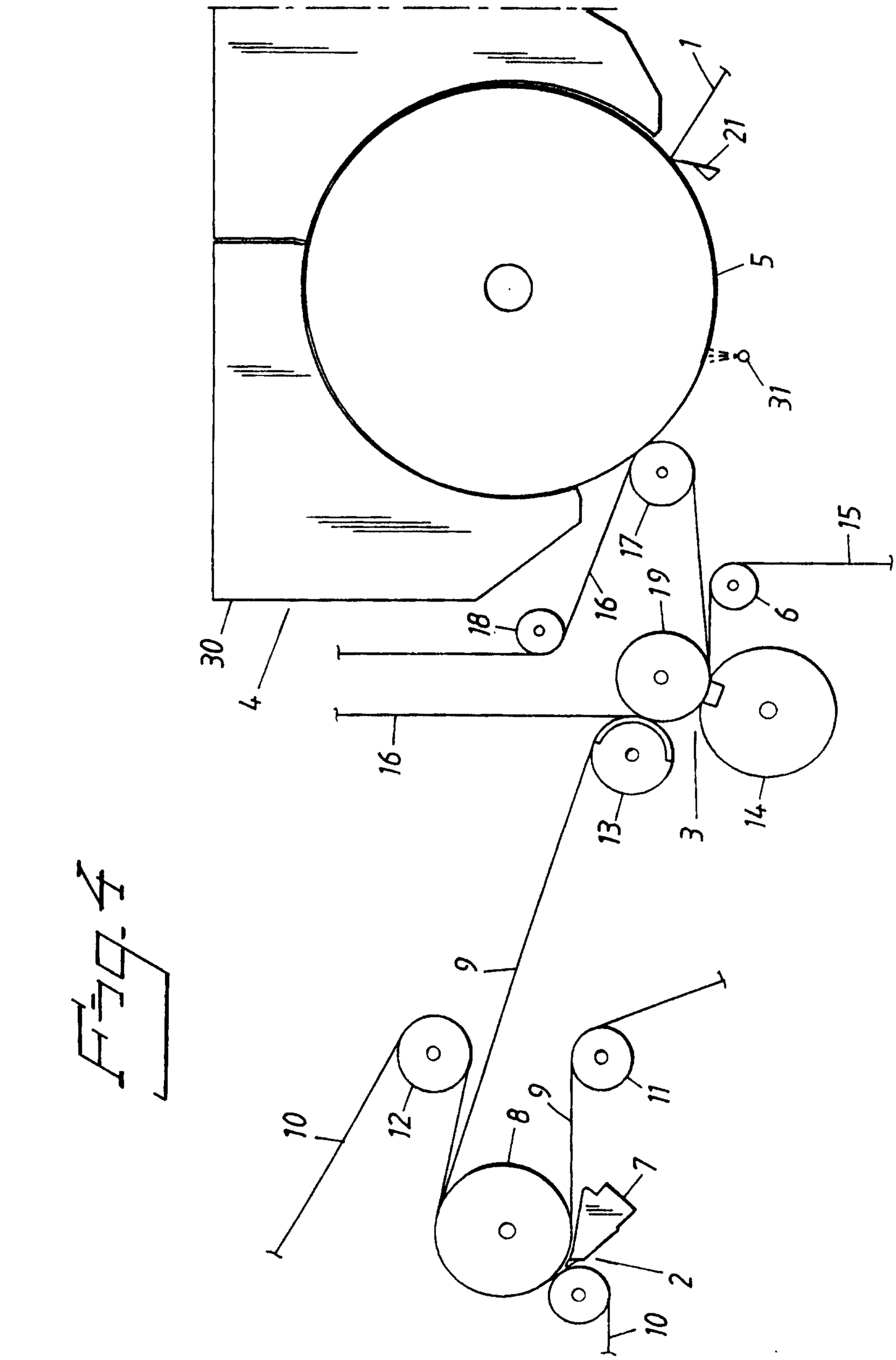
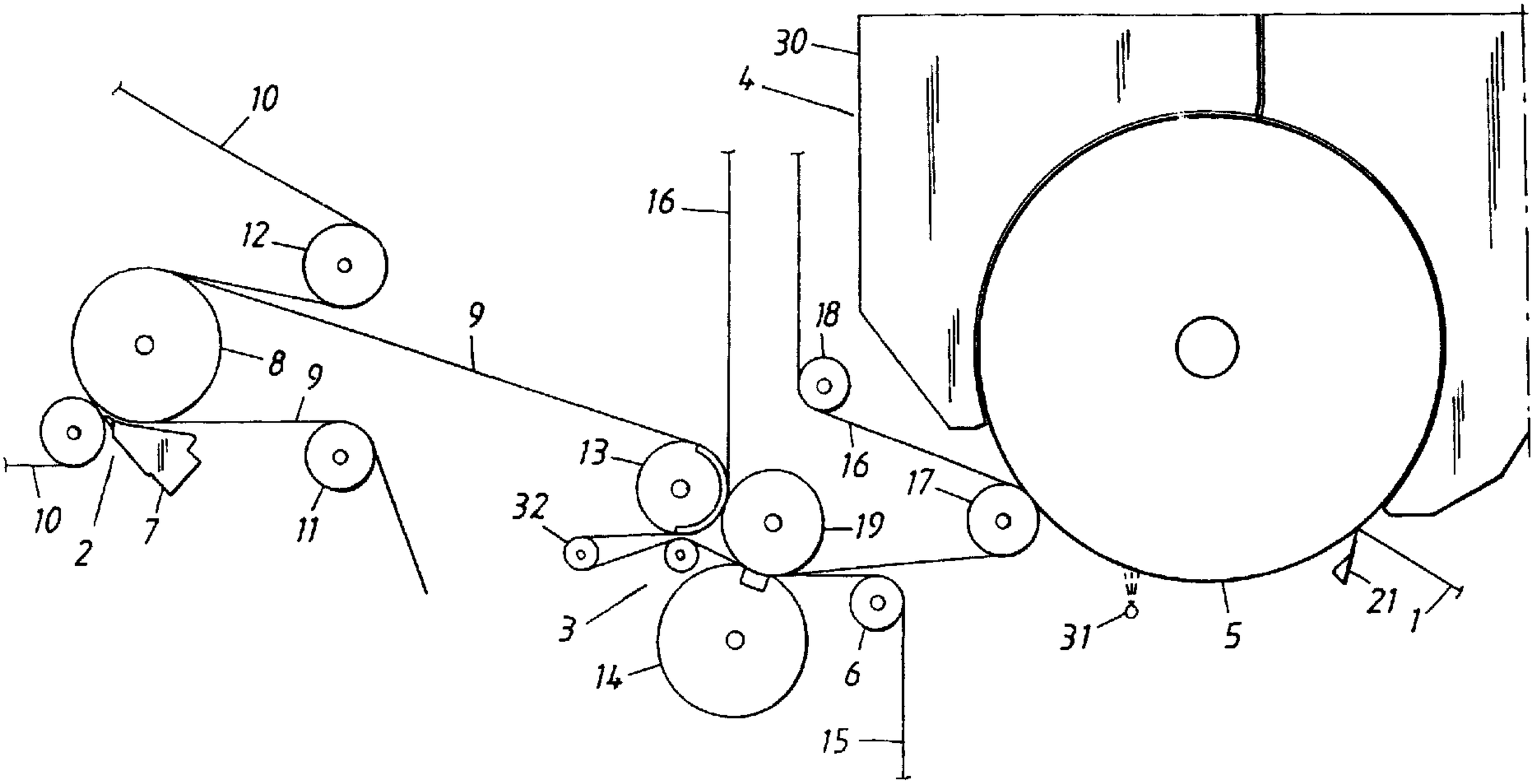


Fig. 4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