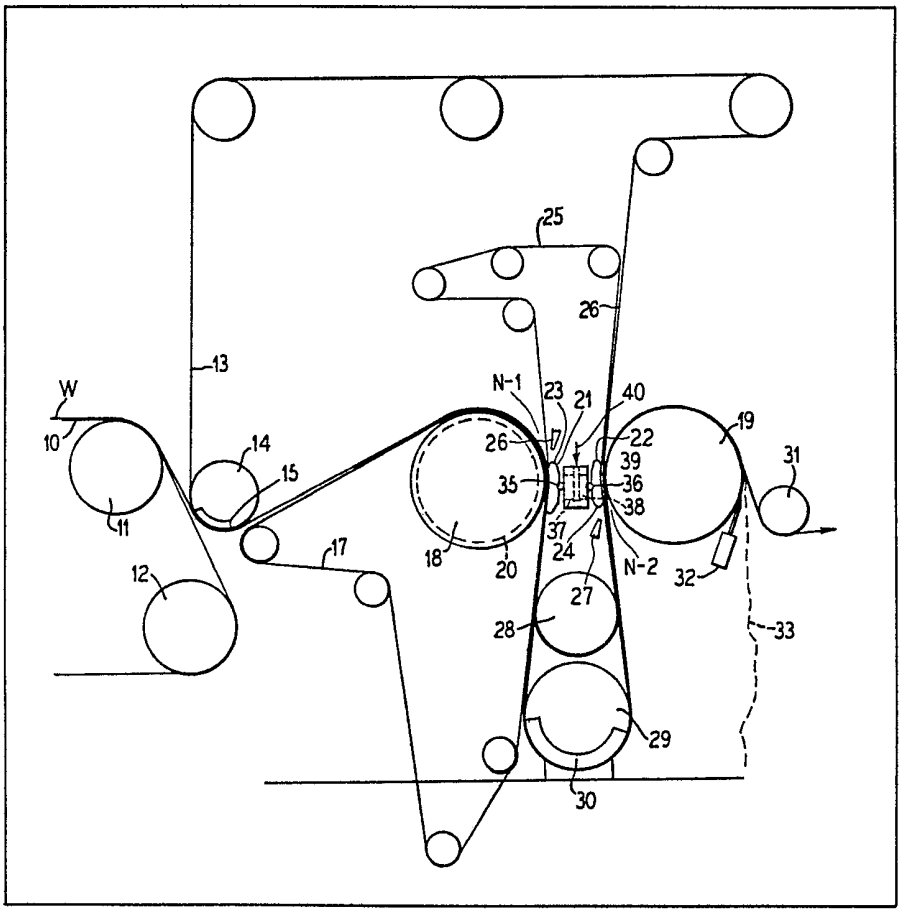
(12) UK Patent Application (19) GB (11) 2 127 449 A

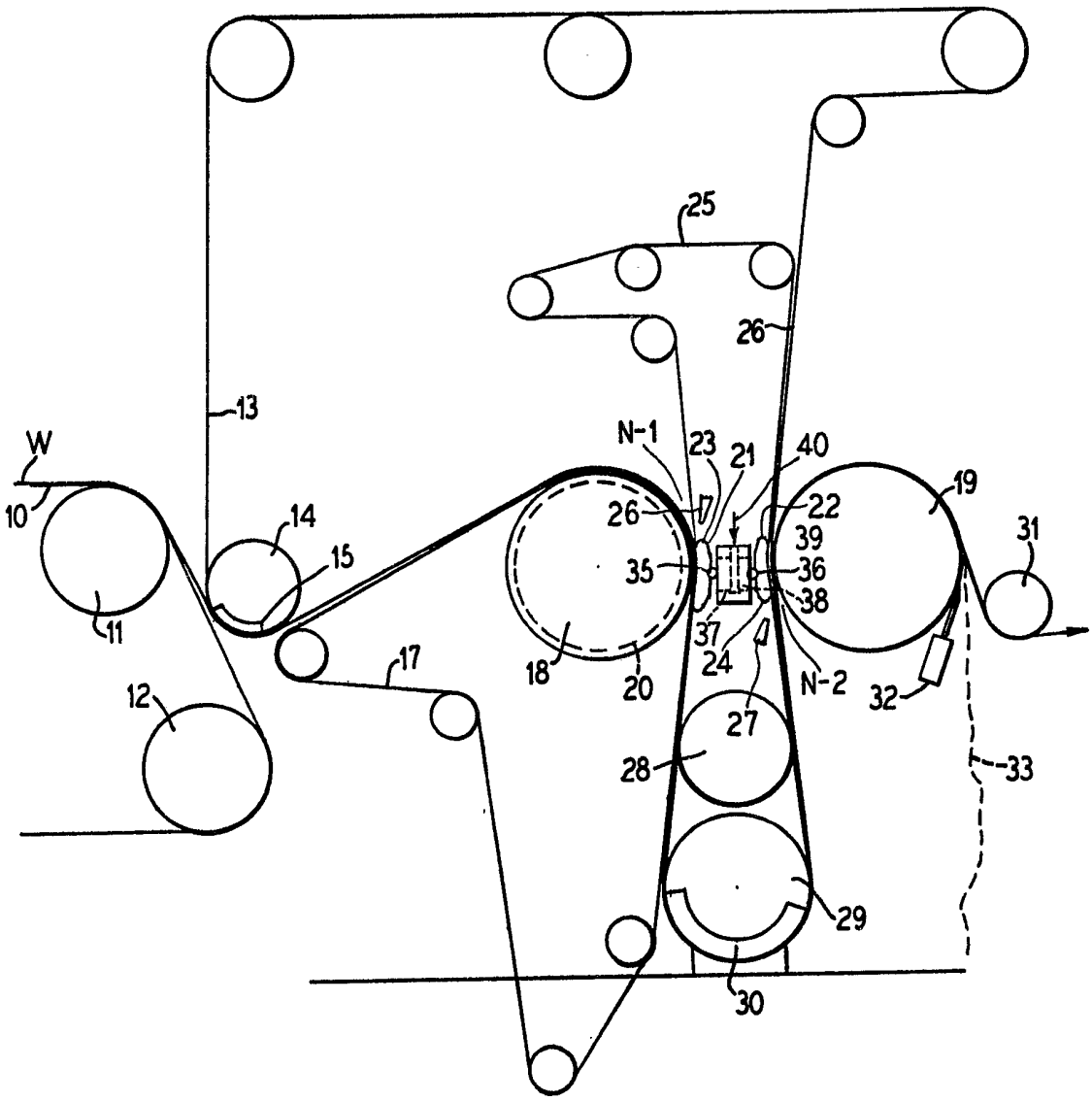
(21) Application No **8325581**
(22) Date of filing **23 Sep 1983**
(30) Priority data
(31) **426611**
(32) **29 Sep 1982**
(33) **United States of America (US)**
(43) Application published **11 Apr 1984**
(51) **INT CL³ D21F 3/04**
(52) Domestic classification **D2A** 7B14
(56) Documents cited **None**
(58) Field of search **D2A**
(71) Applicant **Beloit Corporation (USA—Wisconsin), Beloit, Wisconsin 53511, United States of America**
(72) Inventor **Jan Ingemar Bergstrom**
(74) Agent and/or Address for Service **Gerald Carter, 27 Imperial Square, Cheltenham GL50 1RQ**

(54) **Press arrangement**

(57) A press mechanism for removing liquid from a travelling fibrous web in a papermaking machine includes a pick-up carrier felt 13 receiving the web W from a forming wire 10, a second felt 17 sandwiching the web therebetween, the first carrier felt passing successively through a first downwardly extending elongate press nip N—1 and thereafter immediately through an upwardly extending elongate press nip N—2, each of said press nips being formed between centrally located shoes 21, 22 urged apart toward the nips and outer press rolls 18, 19 with a single belt 25 passing successively through the nips, and the second press roll 19 for the second nip being a smooth surface roll for the transfer of the web with the web being taken off on the downrunning side of the second smooth surface roll.



GB 2 127 449 A


25
26
13
W
10
N-1
23
21
40
19
14
15
26
22
39
31
35
36
38
11
37
24
17
18
20
N-2
32
12
27
28
33
29
30

SPECIFICATION

Press arrangement

The invention relates to an improved method and mechanism for pressing water from a travelling paper web, and more particularly to a press arrangement known as an extended press wherein the web is subjected to pressing pressures for a longer period of time than in the usual arrangement wherein it passes between two opposed press rolls.

Further, the invention relates to a method and structure wherein the web is carried from the forming section of the papermaking machine and is taken down through a vertical nip through a first extended press and is carried on the same carrier felt up through a vertical nip in a second extended nip press and thereafter transferred to a press roll which forms part of the second nip. The nips are constructed so that the residence time of the web in the nip is increased over that wherein the web is merely passed through a roll couple. Other structures have been provided heretofore which have had as an objective to increase the time over which the web is subjected to a pressure and yet permit the web to continue movement at a speed necessary in a high speed papermaking machine. Such structures have met with degrees of success and are exemplified by the disclosures in U.S. Patent Specifications Nos. 3,748,225, 3,783,097, 3,797,384, 3,798,121, 3,804,707, 3,808,092, 3,808,096, 3,840,429, and 3,853,698. The devices and methods discussed by these previous specifications have utilised the knowledge that the static application of mechanical pressure to wet paper mat can reduce the moisture content in the mat to below 40%. Under the dynamic short-term mechanical pressing which occurs in the usual paper machine where the web is run between a series of nips formed between press roll couples, it is difficult to maintain moisture levels below 60%. Attempts to obtain increased dryness in the conventional roll couples are usually made by increase in press nip pressures, but a plateau is soon reached where major increases in roll loading result in relatively small decreases in moisture.

As is known, it is far more efficient to remove water in the press section of a paper machine than in the thermal dryer section and significant reduction in energy costs and significant reduction in space needed for the dryer drum section of the machine are achieved for every fraction of a percent of moisture that can be additionally removed in the press section. The difficulty of removing moisture in the press section is increased with increase in machine speed because limiting factors are reached in press nip pressures in that compacting and crushing of the web results with higher nip pressures and resultant higher hydraulic pressures within the paper mat. The most feasible way that has been discovered to increase water removal at high speeds has been to increase the residence time of the web in the press or pressure time to allow more time for the water to flow within and out of the paper mat and for the hydraulic pressure to dissipate.

Constructions have been made which utilise mechanical principles to improve the compactness of the pressing arrangement and to reduce the mechanical framework needed for the elongated press structure. One such structure is shown in U.S. Patent Specification No. 4,201,624, where the web is first passed through an upwardly extending elongate nip and then carried downwardly through a succeeding nip. However, disadvantages have occurred in this and other structures in that it has been difficult to transfer the web at high speeds and with breakage, it is difficult to get rid of the broke.

It is accordingly an object of the present invention to provide an improved high speed extended nip press wherein an improved structural arrangement is achieved which permits the web to be carried directly from the forming machine through first and second extended nips and transferred immediately from the second nip in a manner so that if the web breaks, it can travel downwardly for easy handling of the broke. As is known to papermakers, when the web is travelling at the high speed found in today's papermaking machines, any web breakage can result in disastrous effects in that the excessive paper will immediately pile up in high accumulations and can damage or destroy successive mechanical parts in the paper machine as well as presenting a risk to life and limb of the attendant who is operating the papermaking machine.

A further object of the invention is to provide an improved arrangement for an extended nip papermaking machine wherein the web is first pressed in a double felted nip, and wherein the second nip is so arranged so that the web is carried and handled in an improved fashion.

A further object of the invention is to provide an improved extended nip press utilising first and second extended nips wherein the structure is so arranged as to cancel out opposed forces and reduce the amount of framework and support structure that is needed.

According to the invention there is provided a press mechanism for removing liquid from a travelling fibrous web delivered on a travelling wire, comprising: a felt guided in pick-up relationship to the wire for receiving the web; a first elongate downwardly extending press nip formed between a travelling belt element and a first press surface movable with the belt element; a first stationary backing member extending along said elongate nip supporting the belt element and applying a pressing force to the belt element during its travel through the nip urging it toward said first press surface; said felt travelling downwardly through said first press nip; a second elongate upwardly extending press nip formed between a travelling belt element and a second press surface movable with the belt element; a second stationary backing member extending along the second elongate nip urging the belt element toward the second press surface during

its travel through the second nip; and means for receiving liquid pressed from the web in the second nip.

The invention also provides a method of removing liquid from a travelling fibrous web by applying pressing forces to the web comprising the steps of: passing a relatively wet web on a carrier felt through a first downwardly extending elongate press nip, carrying the web on the carrier felt and immediately thereafter carrying the web through an upwardly extending elongate second press nip with the press nips including a travelling belt passing therethrough and pressing shoes with relieved leading edges pressing against the belt in the nip and means for delivering liquid to the leading edge of the shoes to form a dynamic hydraulic layer of fluid between the belt and shoe in the nip; and means for carrying the web away from the second nip.

A preferred feature of the invention is that the web is carried from a forming section and passed in a downward direction through a double felted nip and carried by the first carrier felt up through a second nip and removed from the second nip on a smooth surface roll which provides the pressure for the second nip and taken off that roll on the downrunning side.

The following is a more detailed description of an embodiment of the invention, reference being made to the accompanying drawing which is a somewhat schematic side elevational view showing the elements of a paper machine press.

As shown in the drawing a web W is formed in a forming section of a papermaking machine such as between a twin wire or on a fourdrinier wire and is shown being carried from the forming machine on a wire 10 to be transferred to the press section. The forming wire 10 passes down over a couch roll 11 and over a turning roll 12.

On the downrunning side of the roll 11 the web is picked off the wire by a pick-up or carrier felt 13. The felt is brought into web transfer relationship with the wire by a pick-up roll 14 having a suction pick-up gland 15 therein which aids in the transfer of the web W to the undersurface of the felt 13.

After the web is transferred to the felt 13, it is sandwiched against the felt by a second felt 17 which is guided up beneath the first carrier felt 13 so that the web is then carried through the first nip in double felted water removal relationship.

The press section has a first vertical downrunning extended nip N-1, and a successive uprunning vertical second extended nip N-2.

The first nip N-1 is formed between a first outer press surface which is provided by a cylindrical roll 18 having a relieved surface preferably in the form of annular grooves 20 to help in the transfer of water into the second felt 17 and into the grooves at the first press. Because the web normally is quite wet at the first press, the doubled felted support and the grooved roll will accommodate the relatively large flow of water.

The first nip is completed by a shoe 23 at the other side of the nip. A travelling belt 25 which is of a strong material such as reinforced rubber used in extended nip presses passes through both of the nips and is suitably guided by rolls and in particular is carried on a turning roll 28 following the first nip prior to its entering the second nip.

For the pressing dewatering force within the nip, the first shoe 23 is pressed toward the nip with a predetermined controllable pressure, and the shoe is provided with a relieved leading edge at 21. Hydraulic fluid is delivered by a nozzle 26 along the full length of the shoe so that the hydraulic fluid is carried into the nip over the shoe surface, and the belt is supported by a dynamic hydraulic layer of liquid. This liquid builds up in pressure from the relieved leading edge along the shoe and the hydraulic pressure continues along the length of the shoe so as to provide a continuous pressing force over a relatively long extended time and length of travel of the web. The hydraulic pressure, of course, is applied against the impervious rubber belt which presses the web between the two felts 13 and 17 in the extended nip N-1 as the web is travelling downwardly.

Following the first nip, the web continues travelling downwardly and is transferred to the first felt 13 by a felt turning roll 29 which is a perforate suction roll and has a gland 30 therein extending to where the first felt 13 is turned away from the second felt 17 so as to ensure web transfer. The web is carried along around the turning roll 29 on the first felt and carried up into the second nip N-2.

The belt travels following its turning roll 28 up into the second nip which is formed between a second outer press surface provided by a cylindrical solid surface smooth roll 19. The second nip N-2 is completed by a shoe 22 which has a relieved leading edge 24. The shoes 23 and 22 are concavely shaped so as to conform essentially to the curvature of the rolls 18 and 19, and are supported on roll pins 35 and 36 so that the shoes are pivotally supported. A force is developed for pressing the shoes against the nip by pistons 37 and 38 which are situated in a cylinder with a pressure chamber 39 therebetween to which hydraulic pressure 40 is delivered so that the shoes are pressed apart with equal and opposite forces. Since these forces oppose each other, the supporting structure for the shoes need only be sufficient to carry their weight and their opposed forces for creating a nip pressure are cancelled. A nozzle 27 is provided ahead of the second shoe to direct hydraulic fluid along its length at its relieved leading edge 24 so that a dynamic hydraulic layer of liquid forms between the nip and the shoe.

On the offrunning side of the second nip, the web will follow the smooth surface roll 19 and the carrier felt 13 travels upwardly separating from the roll 19.

The web travels over the top of the roll 19 and is led off the roll by a separating guide roll 31. This roll 31 is located on the downrunning side of the roll 19 so that if web breakage occurs at this location, the web will travel downwardly as

indicated by the dotted line web indication 33. A doctor blade 22 is mounted in close adjacency to the roll 19 on the downrunning side to separate the web from the roll in the event breakage should occur. Since this is the first open draw for the web, while it is fairly dry at that location, this is the location where breakage can occur. The web is otherwise completely supported through its entire travel through the press, and as will be noted, the press being arranged vertically is relatively compact and takes a relatively small amount of machine room.

In operation, the wet web W is carried on the forming wire and transferred to the first felt 13 and thereafter sandwiched by the second felt 17 to be carried downwardly in doubled felted relationship through the first vertical downwardly extending nip N-1. The web follows the first carrier felt around the perforated felt turning and web transfer roll 29, and is carried on the surface of the felt 13 up into the vertical second nip N-2. If the web should be lost or breakage occur at the point of the turning of the felt, the web will be travelling downwardly and can be easily transferred to the broke pit. The web then passes upwardly through the second nip and is transferred to the smooth outer surface of the roll 19 where the web is removed from the smooth surface roll by the transfer roll 31. In the event of breakage at this first open draw, the web would travel downwardly to a broke pit as indicated by the dotted line indication 33.

CLAIMS

1. A press mechanism for removing liquid from a travelling fibrous web delivered on a travelling wire, comprising: a felt guided in pick-up relationship to the wire for receiving the web; a first elongate downwardly extending press nip formed between a travelling belt element and a first press surface movable with the belt element; a first stationary backing member extending along said elongate nip supporting the belt element and applying a pressing force to the belt element during its travel through the nip urging it toward said first press surface; said felt travelling downwardly through said first press nip; a second elongate upwardly extending press nip formed between a travelling belt element and a second press surface movable with the belt element; a second stationary backing member extending along the second elongate nip urging the belt element toward the second press surface during its travel through the second nip; and means for receiving liquid pressed from the web in the second nip.

2. A press mechanism according to claim 1, wherein said belt elements comprise portions of a looped endless press belt having first and second guide rolls in the ends of the press belt.

3. A press mechanism according to claim 1 or claim 2 wherein said first and second movable press surfaces are provided by first and second press rolls respectively pressing against said belt elements, and wherein said stationary backing members have an inner surface essentially conforming to the curvature of the press rolls.

4. A press mechanism according to claim 1, wherein said stationary backing members are opposite one another and there are provided force applying means between said backing members applying forces thereto so that the reaction forces of said force applying means are opposed.

5. A press mechanism according to claim 4, wherein said force applying means comprise opposed pistons between said backing members with pivotal connections between each piston and a respective one of said backing members, and fluid pressure means applying a force to said pistons so that the forces applied are equal and opposite.

6. A press mechanism according to any of claims 1 to 5, wherein each backing member comprises a shoe having a relieved leading edge, and means are provided for delivering lubricating fluid to the relieved edges of each of the shoes for forming a dynamic layer of hydraulic fluid between the shoe and belt element in each of the nips.

7. A press mechanism according to any of claims 1 to 6 and including a second felt guided into sandwiching relationship with the first felt to carry the web therebetween, guide means separating the second felt from the first felt, between the first and second nips, and means for guiding the web after it has passed through the second nip.

8. A press mechanism according to claim 7, wherein the second felt is a single looped felt passing through the first and second nips, and said guide means comprise a turning roll positioned within the felt loop between said first and second nips with a suction gland therein for causing the web to travel with the felt from said first to said second nip.

9. A press mechanism according to claim 7 or claim 8, wherein said first and second felts sandwich the web in a double felted pressing relationship in said first nip.

10. A press mechanism according to any of claims 1 to 9, wherein said second outer press surface is a smooth surface roll and the web is transferred to the roll following the second nip; means being provided for removing the web from the roll on the downrunning side thereof so that with web breakage as it leaves the roll it will be moving in a downward direction for collecting the broke.

11. A press mechanism according to claim 10, including a doctor on the downrunning side of the roll for removing the web from the surface of the roll in the event of web breakage.

12. A press mechanism according to any of claims 1 to 11, wherein said belt elements comprise stretches of a single looped one-piece belt which is guided by a turning roll from the offrunning side of the second nip.

13. A method of removing liquid from a travelling fibrous web by applying pressing forces to the web comprising the steps of passing a relatively wet web on a carrier felt through a first

downwardly extending elongate press nip; carrying the web on the carrier felt and immediately thereafter carrying the web through an upwardly extending elongate second press nip with the press nips including a travelling belt passing therethrough and pressing against the belt in the nip and means for delivering liquid to the leading edge of the shoes to form a dynamic hydraulic layer of fluid between the belt and shoe in the nip; and means for carrying the web away from the second nip.

14. A method according to claim 13, wherein the web is carried away from the second nip on a smooth surfaced roll which forms the pressing means opposite the shoe in the second nip and the web is removed on the downrunning side of the smooth surfaced roll so that with breakage the web will be travelling in a downward direction for the removal of broke.

15. A press mechanism for removing liquid from a travelling fibrous web substantially as hereinbefore described with reference to the accompanying drawing.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1984. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.