

April 15, 1958

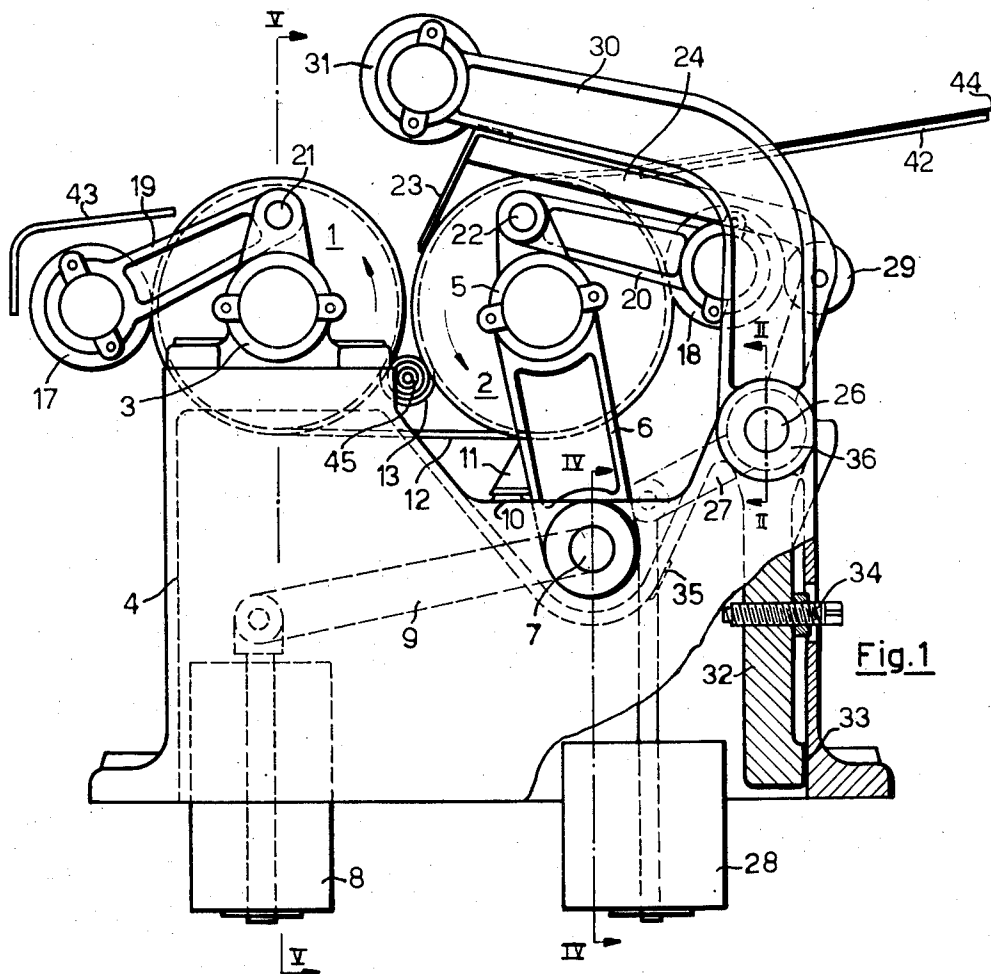
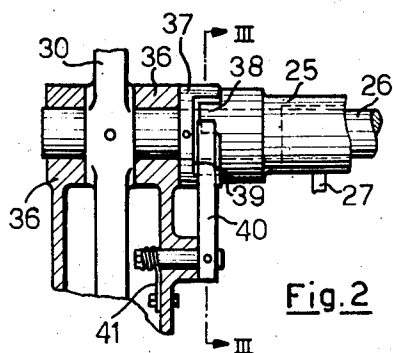
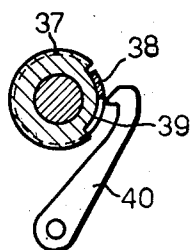
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2,830,775

CORELESS WINDING OF WEBS

Filed Jan. 20, 1955

3 Sheets-Sheet 1



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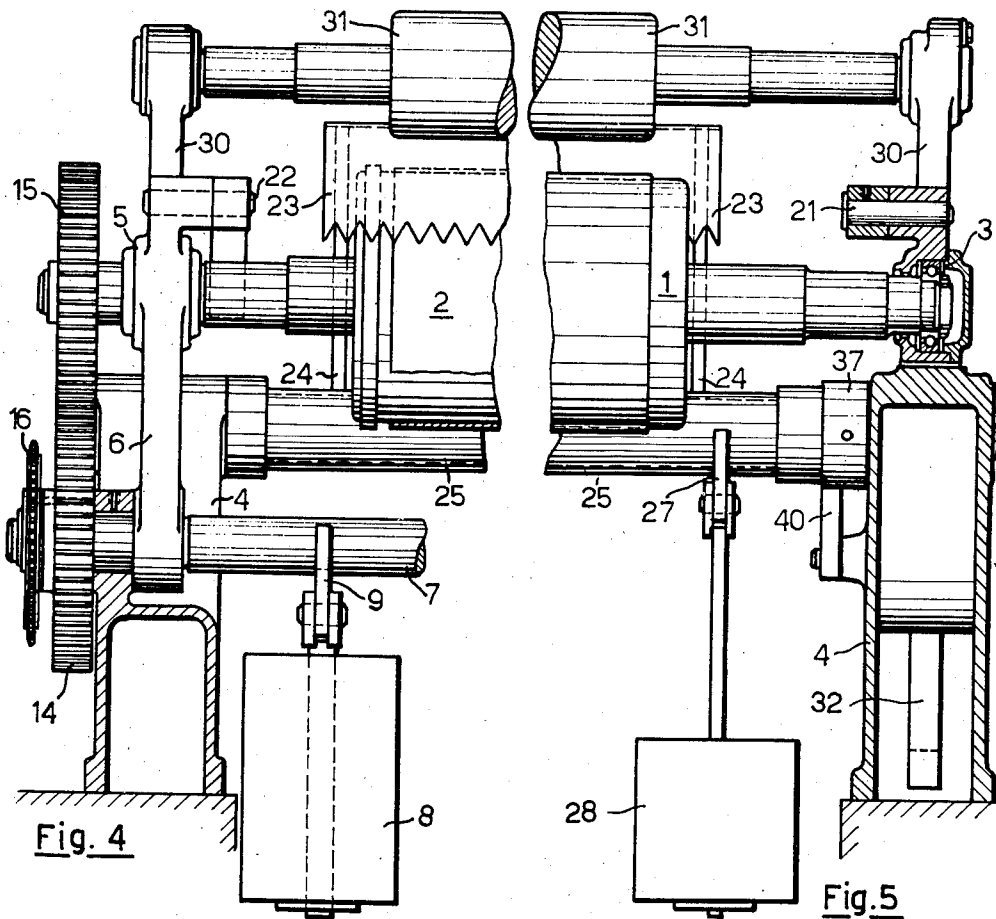
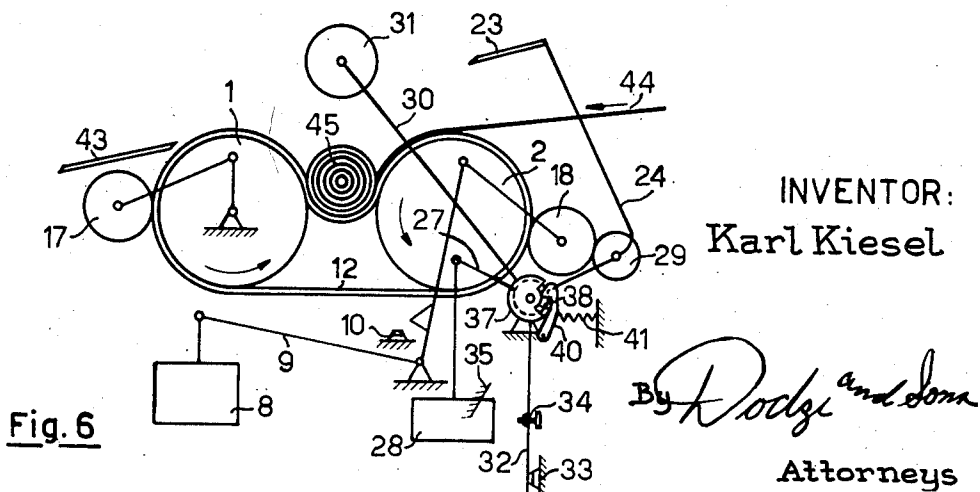
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CORELESS WINDING OF WEBS

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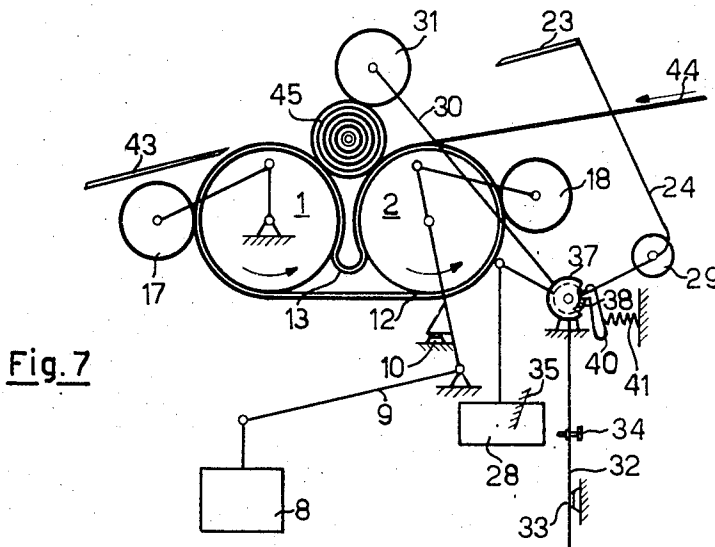
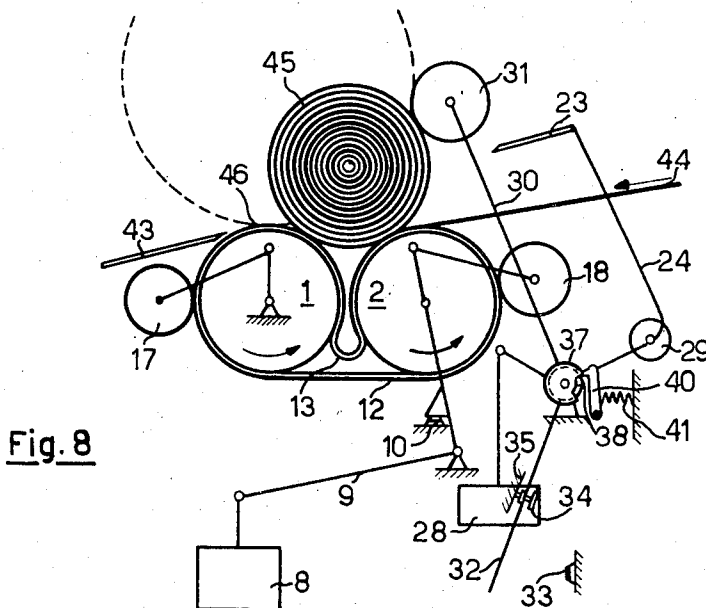
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CORELESS WINDING OF WEBS

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3 Sheets-Sheet 3



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2,830,775

CORELESS WINDING OF WEBS

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4 Claims. (Cl. 242—56)

In the manufacture of cellulose, mechanical wood pulp and the like, the last stage of an extensive process involves the working out of the fibres on a so-called pulp drying machine in the form of a continuous fleece or a web. The drying may proceed so far that a substantially 100% dry content of the web is attained, but in many cases it is limited to about 40–45% and the web is wound in this wet state. This may be performed on so-called reels, but arrangements are known in which the coiling is effected without reels, that is to say, a coreless winding is effected. In such cases, three rollers so co-operate that a self-winding action takes place in the gap between them. However, operation with such winding devices has not been satisfactory, since it has been difficult, more especially at the beginning of a new roll, so to guide the web that the beginning of the roll is correctly formed.

An apparatus is also known in which the web of cellulose, mechanical wood pulp or the like is positively guided by an endless belt guided around two supporting rollers, but in which the winding takes place on a reel. In this apparatus also, the winding must be commenced by hand and in the case of high-speed machines, in which the roll changing takes place at intervals of a few minutes, this involves numerous manipulations which impose a high strain on the operators. Moreover, in such cases the winding of the webs necessitates the use of reels, which in themselves constitute a disadvantage as compared with coreless winding, since the reels must be withdrawn from the moist rolls at each roll change, and this cannot be effected without difficulty.

The present invention relates to an apparatus in which the winding of the moist web takes place positively without a reel, that is to say, a coreless winding is effected. The invention affords substantial technical advantages over the known apparatus. The improved apparatus permits high winding speeds and since the beginning of the winding and the ejection of the finished rolls takes place automatically and without danger, rolls of large diameter may be formed without excessive physical strain on the operators.

In accordance with the invention, the apparatus comprises two supporting rollers, one of which is fixedly mounted and the other displaceably mounted, an endless band or apron being so passed around the two rollers as to form a loop in which the roll is automatically formed and, as it increases in size, the roll rises as a result of the outward displacement of the displaceably mounted roller and the consequent tightening of the band or apron.

A constructional form of the apparatus according to the invention is illustrated by way of example in simplified form in Figs. 1, 2, 3, 4 and 5 of the accompanying drawings, in which—

Fig. 1 shows a side view of the apparatus.

Fig. 2 shows a section through a detail on line II—II of Fig. 1.

Fig. 3 shows a section on line III—III of Fig. 2.

Fig. 4 shows a section through the rear portion of the apparatus on line IV—IV of Fig. 1.

Fig. 5 shows a section through the front portion of the apparatus on line V—V of Fig. 1.

Figs. 6, 7, 8 show successively, in simplified diagram,

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the continuous formation of the roll in the loop and the manner in which it rises and finally is ejected.

The apparatus comprises two supporting rollers 1 and 2 arranged side by side and having parallel axes of rotation. The roller 1 is supported in bearings 3 which are fixed on a frame 4. The roller 2 is supported in bearings 5 fixed to arms 6 which are rigidly connected to a shaft 7. The shaft 7 is pivotally mounted in the frame 4, so that the roller 2 is guided in an arcuate path about the axis of the shaft 7. The axis of the shaft 7 is situated below the supporting roller 2, so that a displacement of the supporting roller 2 in a substantially horizontal direction is afforded. A loading weight 8 acts on a lever 9 which is rigidly connected to the shaft 7. By the action of the weight 8 the supporting roller 2 is pressed in a yielding fashion toward an end position which is defined by an abutment 10 fixed to the frame 4, a projection 11 of one of the arms 6 striking against said abutment.

With this position of the supporting roller 2 a small intermediate space between the two rollers is left. A pliable endless band 12 is passed around the two supporting rollers 1 and 2 so that the upper strand of said band sags between the supporting rollers to a point below their axes of rotation and forms a loop 13.

The apparatus is driven by way of a spur wheel 14 which is rotatably mounted on the shaft 7 on the back side of the apparatus as shown in Fig. 4. The spur wheel 14 transmits the rotational movement to a spur wheel 15 rigidly connected to the roller 2 and guided therewith about the centre of the shaft 7. The spur wheel 14 may be actuated by a chain drive, the links of the chain engaging with the teeth of a sprocket 16 rigidly connected to the spur wheel 14. The supporting roller 1 is driven by the pliable band 12, the lower strand thereof being thereby tightened. In order that this band 12 may never slip on the supporting rollers, the two supporting rollers 1 and 2 are subjected to the action of two adhesion-increasing loading rollers 17 and 18 mounted on arms 19 and 20 which are adapted to swing about pivots 21 and 22. The rollers 17 and 18 bear on the band passed around the supporting rollers 1 and 2, and press it against these rollers.

The apparatus further comprises a blade 23 secured to rods 24 which are rigidly connected to a sleeve 25. The sleeve 25 is loosely mounted on a shaft 26 (Fig. 2). Rigidly connected to said sleeve is a lever 27 loaded at its outer end by a weight 28.

The rods 24 carry a guide roller 29 which, by the action of the weight 28, is pressed against the loading roller 18 associated with the supporting roller 2. The blade 23 is then held in a position substantially tangential to the supporting roller 2 on the side thereof which faces the roller 1, a gap being left between the roller 2 and the blade 23 sufficient for the passage of a web of cellulose, mechanical wood pulp or the like.

Rigidly connected to the shaft 26 are two rods 30 carrying at their outer ends a loading roller 31. The roller 31 is adapted to swing about the centre of the shaft 26 between an upper and a lower end position. A lever 32 is rigidly connected to one of the rods 30. In the lower end position of the roller 31 the lower end of the lever 32 strikes against an abutment 33 provided in the frame 4. The loading roller 31 is then held slightly above the rollers 1 and 2 having its axis substantially in a vertical plane between the two rollers 1 and 2. The upper end position of the roller 31 is defined by an adjustable limiting device consisting of a screw threaded bolt 34 provided on the lever 32 and a coacting abutment 35 on the frame 4. In its upper end position the loading roller 31 is nearer to the supporting roller 2 than to the supporting roller 1.

The shaft 26 is supported in bearings 36 provided

in the frame 4. A ring 37 adjacent the sleeve 25, is rigidly connected to the shaft 26. The sleeve 25 comprises an axially projecting cam 38 (Figs. 2 and 3) which extends into a recess 39 in the said ring 37, said recess being so formed as to allow limited angular motion of the sleeve relatively to the ring. A pawl 40 loaded by a spring 41 is adapted to engage in the recess 39 in a certain position of the sleeve and the ring.

In addition, a plate 42 and a support 43 are provided for guiding the web to be wound and the finished roll.

When a web 44 of cellulose or mechanical wood pulp or the like is guided on to the roller 2 around which the band 12 is passed, the web is carried along with the said band and guided by the blade 23 into the loop 13 (Fig. 1), in which it winds into a roll. A roll 45 of cellulose, mechanical wood pulp or the like is thus formed which, as it increases in size, is subjected to a pressure between the rollers 1 and 2, which effects a compact winding from the outset and results in the roller 2 being outwardly shifted. The band 12 is thus increasingly tensioned and the roll 45 rises between the rollers 1 and 2 (Fig. 6). When the points of contact of the roll lie above the centres of the rollers, the loading weight 8 so acts on the roller 2 that the latter moves back toward the roller 1, whereby in the first place the band 12 again forms the loop 13 between the rollers 1 and 2, and in the second place the constantly increasing roll 45 bears on the two rollers 1 and 2 and reaches engagement with roller 31 (Fig. 7).

In order that the roll 45 may remain tightly wound, the loading roller 31 is caused to act continuously from above on the roll 45 and is positively swung out as the roll 45 increases in size until the adjustable limiting device 34 provided on the lever 32 connected to the rod 30 fixes the upper terminal position of the loading roller 31 at the abutment 35. The said loading roller in turn exerts a pressure on the roll 45 so that the point at which it bears on the roller 1 is gradually shifted to the summit 46 (Fig. 8) of the said roller, and on passing this summit it automatically rolls off forwardly over the support 43. By reason of the adjustability of the limiting device 34, it is possible to choose the instant of this rolling off in dependence upon the diameter and consequently upon the weight of the roll 45, according to requirements.

When the roller 2 swings outward as the roll 45 increases in size, it carries with it the loading roller 18. On reaching a particular point, the latter acts on the guide roller 29, which is mounted on the rods 24 holding the blade 23. As a result of this action, the blade 23 is lifted.

When the blade is lifted, the cam 38 is moved into the position shown in Fig. 6, while the pawl 40 loaded by the spring 41 engages and thus prevents the blade 23 from falling back. When the supporting roller 2 swings back, the blade 23 thus remains in the lifted position (Fig. 7). Only when the roll 45 becomes larger and the loading roller 31 is thus swung outward, the ring 37 also rotates further and presses the pawl 40 back with the upper edge of the recess 39. The blade 23 is thus then held up, not by the pawl 40, but by the upper edge of the recess 39 in the ring 37.

However, as soon as the roll 45 reaches its maximum diameter and rolls over the support 43, and the loading roller 31 swings back into its lower end position defined by the abutment 33, the ring 37, the cam 38, the sleeve 25 and the rods 24 also follow this movement and the blade 23 forces the web 44 of cellulose, mechanical wood pulp or the like through, severs the web and at the same time resumes its function of guiding the web 44. The latter is conveyed by the endless band 12 into the loop 13, automatically winds into a roll therein and thus forms the beginning of a further coreless roll 45. The swinging roller 2 and the blade 23 may be loaded, for example, by springs instead of by the weights 8, 28. In addition, the endless band or apron 12 may consist of a number

of juxtaposed narrow endless strips instead of being formed in one piece.

The scheme of mounting the second roller and other shiftable components of the machine on parallel arms is preferred because this offers accurate guiding and low frictional resistance. However, certain of these components and notably the movable roller could be guided in other ways without significant change of function.

What is claimed is:

1. In apparatus for winding webs into coreless rolls, the combination of a base; a first roller carried by said base and rotatable thereon about a normally fixed horizontal geometrical axis; a movable support defining a substantially horizontal geometrical axis parallel with said normally fixed axis, said movable support being guided in substantially horizontal translatory motion toward and from said fixed geometrical axis; a second roller carried by said movable support and rotatable about the geometrical axis defined thereby; stop means limiting approach of the second roller toward the first, to establish a narrow minimum interval between said rollers; an endless band trained around said rollers and of such length relatively to the diameters of the rollers as to limit the maximum separation thereof, and to form, at the limit of approach thereof, a loop in the upper run of the band which depends through and beyond the inter-roll interval and is above the lower run of the band when the latter is straight; means serving to cause the band to engage each of said rollers frictionally in all relative positions of the rollers; yielding means urging the second roller toward the first; driving means operable to rotate one of said rollers, which therefore is called the live roller, in the direction to maintain the lower run of the band in tension whereby the band and the other roller, which therefore is called the idling roller, are driven by the live roller; web-guiding means approximately tangent to the live roller and arranged to direct a web into said loop; means operable by motion of the second or movable roller from and back toward the first roller and serving to withdraw said guiding means, said motion being caused by growth of the coreless roll in said loop and its consequent rise to a final position in which it is supported above both rollers; and means for ejecting the coreless roll, when it has reached said final position.

2. The combination defined in claim 1 in which the means for ejecting the coreless roll comprises yieldingly biased guiding means, and a loading roller so guided thereby as to engage the forming coreless roll laterally and displace it over the crest of the idling roller when the coreless roll attains a chosen size.

3. The combination defined in claim 2 in which the web-guiding means comprises a severing blade; means for guiding said blade in a path between a lower web-guiding position and a higher inactive position, from which it tends to gravitate to said guiding position through a web-severing position; means operated by motion of the second or movable roller to move the blade to its inactive position; a latch for retaining the blade in the last named position; and mean for releasing said latch actuated by motion of said loading roller, as the latter moves in its roll-displacing function.

4. The combination defined in claim 3 in which the movable support for the second roller, the guiding means for the loading roller, and the means for guiding the web-severing and web-guiding blade, each take the form of corresponding pairs of connected parallel arms.

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