

[54] **CONTINUOUS WEB WINDING APPARATUS**

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[57] **ABSTRACT**

The present continuous web winding apparatus has first and second drive rollers for rotating a winding roller from a starting position through an intermediate position to an end position. Winding roller transfer and guide means are provided which form a guide channel at each end of the rollers for receiving journal studs of the winding roller. The guide channels are journaled, preferably to the shaft of the second drive roller, so that the guide channels and with the guide channels the journal studs of the winding roller may rotate about the second drive roller, whereby the studs may rise in these guide channels as the diameter of the winding roller increases toward its completion.

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15 Claims, 3 Drawing Figures

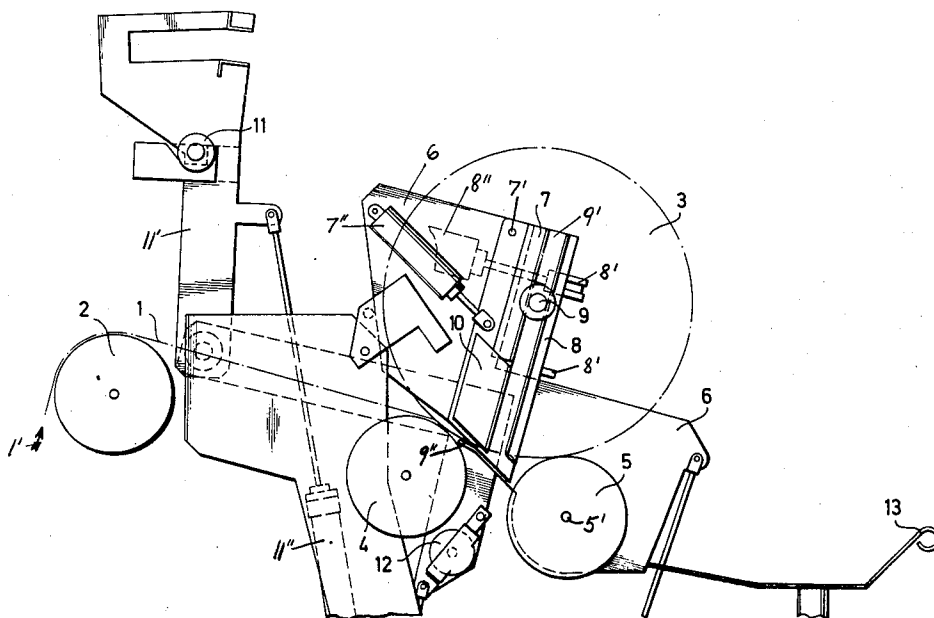
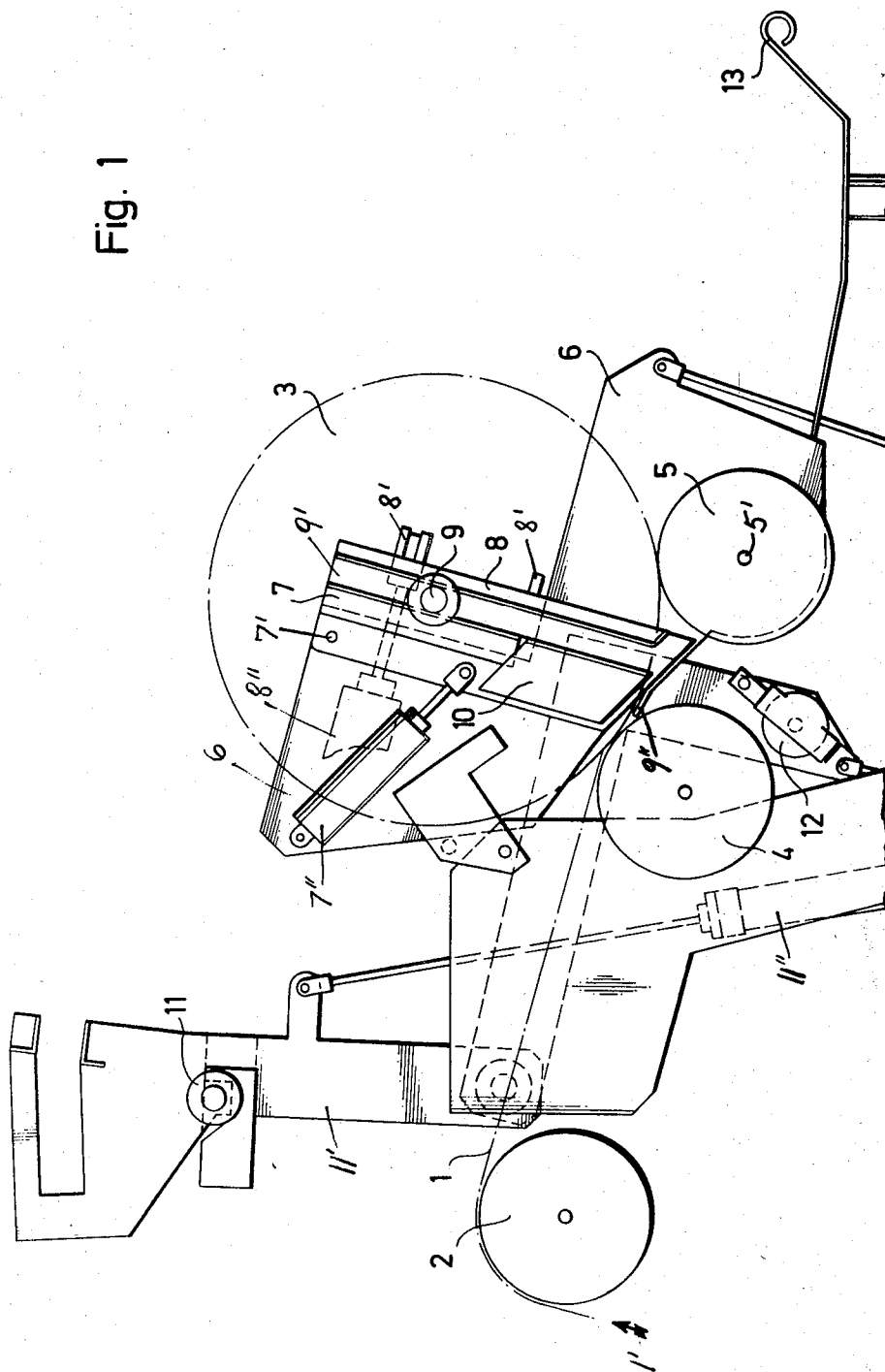


Fig. 1



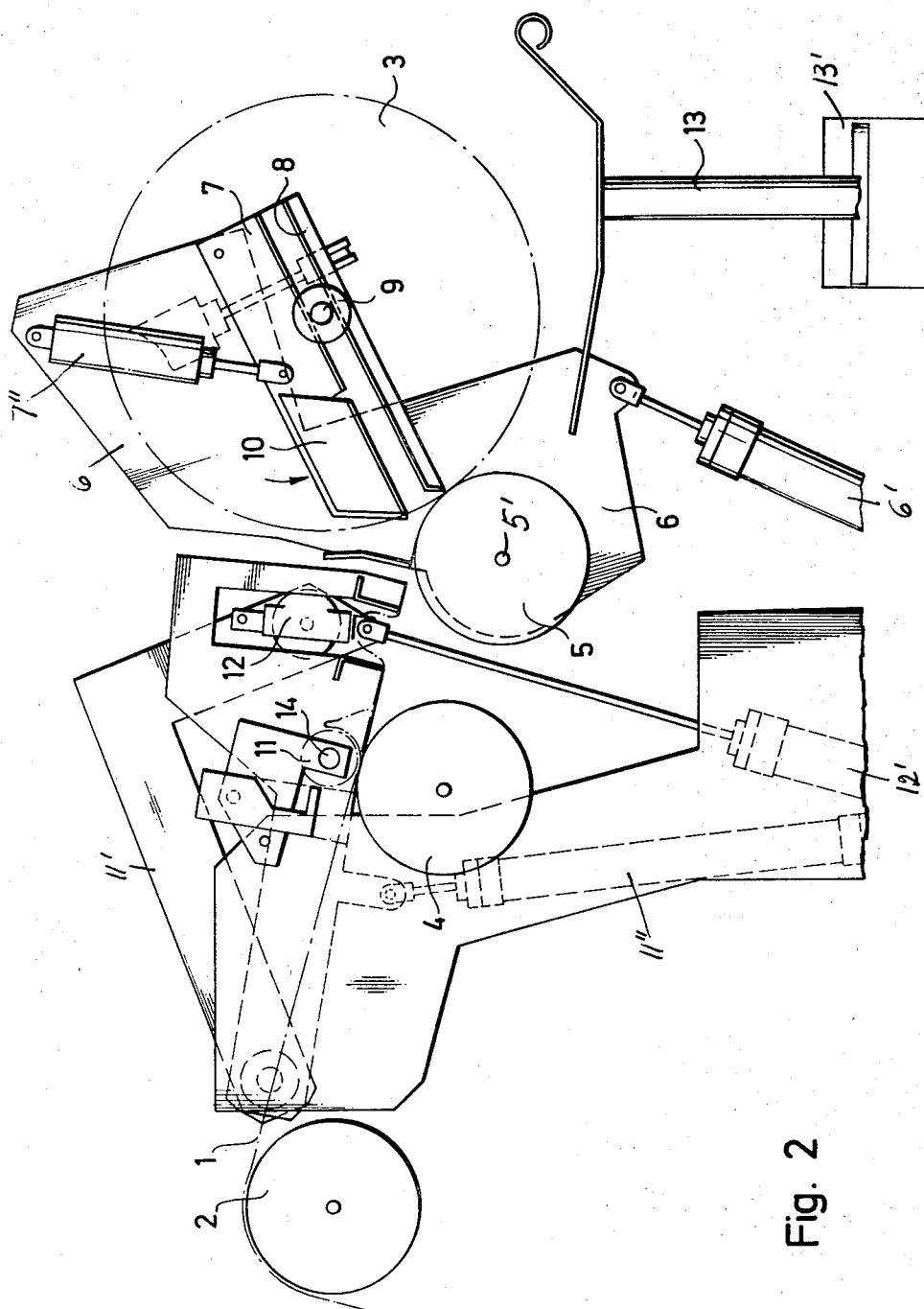
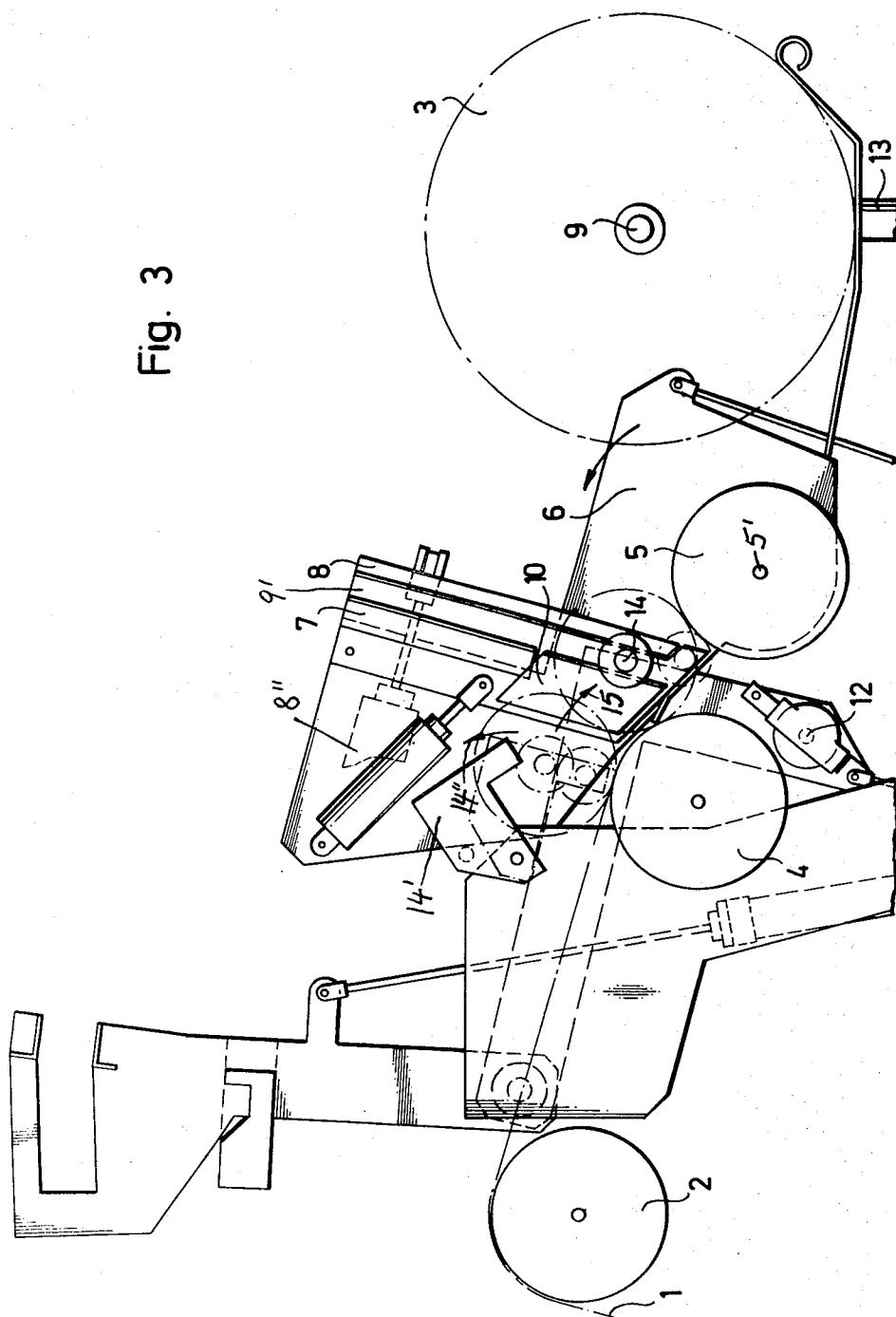


Fig. 3



CONTINUOUS WEB WINDING APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates to a continuous web winding apparatus wherein the winding of the web onto a winding core is started in a starting position by means of a first drive roller. The winding roller is driven in an intermediate position by said first drive roller in cooperation with a second drive roller. The winding roller is driven in its end position by the second drive roller.

Webs of goods which emerge from, for example, textile machines in which the webs have been treated are either stacked in sheets at the end of these machines or the webs are wound on cores or so called winding rollers.

In order to make possible an uninterrupted operation in the winding of the webs, it is known to transfer a winding roller during its winding from a starting position in which the winding roller is driven by a first drive roller, into an end position in which a second drive roller completes the winding. A further winding core may be inserted into the starting position while the second drive roller completes the winding of the preceding winding roller. This type of operation makes it possible to wind the leading end of the web onto the empty cone waiting in the starting position the web is severed at the time of the completion of a preceding winding roller.

In one known type of winding apparatus in which the winding roller is shifted during the winding operation, the winding roller which in its starting position is wound up by a first drive roller, is transferred in the end position upon reaching of a predetermined diameter, whereby the completion of the winding is accomplished by the second drive roller. The winding roller is transferred by means of controlled rocker levers which are brought into cooperating engagement with the shaft ends of the winding roller in response to the latter reaching a predetermined wound diameter. The controlled rocker levers tilt the partially wound winding roller so that it contacts the second drive roller whereby the winding roller is driven until it is completely wound. To accomplish the just described transfer of the winding roller from the starting position into the end position, it is necessary to reduce the winding speed by the speed of the transfer movement. The winding speed of the winding roller is reduced in this apparatus because during the transfer movement the winding roller is not driven by any of the driving rollers. Thus, the winding speed of the winding roller must be accelerated in the end position until the winding speed corresponds again to the supply speed of the web to be wound. However, during the time when the winding speed is accelerated the web is supplied with undiminished speed to the winding apparatus so that a web loop is formed in front of or rather upstream of the second drive roller as viewed in the advance direction of the web, whereby the slack in the web causes the formation of folds or creases.

It has already been suggested to avoid the above mentioned formation of a slack and the resulting loop during the change of the driving in a winding apparatus comprising two drive rollers in order to assure a winding of the web free of creases. This previously proposed apparatus comprises a friction clutch or a controllable

transmission drive for driving the two drive rollers with a higher speed than the speed of a web feed roller so that the web is subjected to a respective tensioning and whereby the web is wound onto the winding roller with the desired winding hardness. Further, in said proposed apparatus the first drive roller for the winding roller is shifted toward the second driving roller during the drive change whereby the web is subjected to an even increased tensioning. This increased tensioning or tension force occurs again when the first drive roller is moved back into its starting position because during this repositioning or resetting of the first drive roller, the length of the web between a guide roller and the first drive roller is lengthened from the length of a hypotenuse into the length of two sides of a triangle. The resulting tensioning strength is not permissible, for example, for sensitive or fine textile webs.

In still another prior art apparatus for the continuous winding of a web onto a winding roller in a starting position by means of a first drive roller and in an end position by means of a second drive roller the winding roller is transferred from the starting position into the end position by one of the driving rollers which is movable for this purpose. The second drive roller is shiftably supported in a tiltable frame in order to provide a compensation of the speed difference. The second drive roller is driven by a chain drive which reduces the drive speed of the second drive roller by the speed of the shifting.

The above described prior art winding devices have the disadvantage that the means for assuring a constant tension of the web as well as a constant web speed require substantial mechanical and electrical equipment which is rather expensive and susceptible to trouble.

OBJECTS OF THE INVENTION

In view of the foregoing, it is the aim of the invention to achieve the following objects singly or in combination:

to avoid the outlined drawbacks of the prior art, specifically to provide a continuously operating web winding apparatus wherein the transfer of a web winding roller from a starting position into an end position is accomplished without a substantial expenditure while nevertheless assuring a constant web tension during the entire operation including the winding roller transfer;

to avoid expensive differential gear means while nevertheless avoiding that the winding roller is subjected to a high tension during the tilting movement;

to avoid any change in the winding roller hardness and/or in the winding roller width or breadth;

to support the winding roller in such a manner that the winding roller itself assumes the function of a differential drive during its transfer from a starting position into an intermediate position, whereby the winding roller remains in rolling contact with the first drive roller and thus the web tension remains constant; and

to provide a guide channel at each end of the journal shaft of the winding roller whereby the guide channel has an inlet end to receive the journal shaft ends and a substantially radially extending portion in which the shaft of the drive roller may rise toward an exit end of the guide channel as the diameter of the winding roller increases toward its completion.

SUMMARY OF THE INVENTION

According to the invention there is provided an apparatus for continuously winding a web onto a winding roller in a starting position in which the winding roller is driven by a first driving roller and in an intermediate position wherein the winding roller is driven by the first driving roller as well as by a second driving roller, and wherein the winding is completed in an end position of the winding roller wherein it is driven by the second drive roller. Guide channel means are arranged laterally relative to the winding roller to receive the ends of the winding roller shaft. The guide means are journaled so that they are tiltable about the second drive roller from the intermediate position to said end position.

The tilting of the guide means, for example, in the form of guide rails forming a guide channel, about the second drive roller has the advantage that a tilting motion of the drive rollers themselves and the means previously required for accomplishing such tilting motion have been obviated. Another advantage of the invention is seen in that the web is not subjected to a high web tension during the tilting motion which high tension heretofore varied the winding roller hardness and/or the winding roller width. Heretofore, it was possible to avoid the varying tension only by means of rather expensive differential gear means.

In the apparatus according to the invention, the winding roller which has been started on the first drive roller rolls, upon its release from the starting position, along a portion of the circumference of the first drive roller due to the weight of the winding roller into an intermediate position, whereby the first drive roller and the winding roller remain in contact with each other. Due to this rolling of the winding roller in contact with a circumferential portion of the first drive roller, the winding roller assumes the function of a differential gear drive because the winding roller rolls along the surface of the first drive roller in a direction opposite to the direction of the winding rotation whereby the winding speed is reduced in accordance with the displacement of the winding roller. As a result, the tension of the web remains constant.

When the winding roller is in the intermediate position, both drive rollers drive the winding roller until as the result of a tilting movement of the guide means about the second drive roller, the winding roller is moved out of contact with the first drive roller while remaining in contact with the second drive roller whereby again the winding roller rolls along a portion of the circumference of the second drive roller in the same manner as has been described above with reference to the transfer from the starting position to the intermediate position. Here again the rolling motion of the winding roller assumes the function of a differential gear whereby the transfer from the intermediate position to the end position of the winding roller again avoids the occurrence of an increased tension in the web being wound.

When the winding roller is in its end position there is sufficient space between the two drive rollers for moving a severing mechanism into action in order to sever the advancing web from the web portion already wound onto the winding roller.

BRIEF FIGURE DESCRIPTION

In order that the invention may be clearly under-

stood, it will now be described, by way of example, with reference to the accompanying drawings, wherein:

FIG. 1 illustrates a schematic side view, the winding roller in its intermediate position and almost completed;

FIG. 2 shows the completed winding roller in its end position while a subsequent winding roller is brought into its starting position; and

FIG. 3 illustrates the transfer of a partially wound winding roller from its starting position into the intermediate position while the completed winding roller is discharged onto receiving means arranged just outside of the winding apparatus.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

For simplicity's sake the figures do not illustrate a frame structure. However, it is to be understood that the illustrated elements are supported in a frame structure which in and of itself is conventional. A web 1, for example, a textile web is advanced in the direction of the arrow 1' by means of a reeling or take-up roller 2. The web 1 is advanced toward and wound onto a winding roller 3 shown in dashed-dotted lines in order not to obscure the essential elements of the invention. As shown in FIG. 1, the winding roller 3 is almost completed in its intermediate position in which it is driven by the first driving roller 4 as well as by the second driving roller 5. The rollers 2, 4 and 5 are supported for rotation in the above mentioned frame.

According to the invention there are provided transfer and guiding means for the shaft ends or studs 9 of the winding roller 3. In the preferred illustrated embodiment these transfer and guiding means comprise at each end of the rollers bracket means 6 which may comprise or which support guide channel forming means 7 and 8. Preferably the brackets 6 are journaled to the shaft 5' of the second drive roller 5. The brackets 6 and with the brackets the guide means 7 and 8 are tilted back and forth from a roller stud receiving position into a roller stud releasing position by actuating means, for example a piston cylinder arrangement 6' shown in FIG. 2. Due to the journaling or tilting movement of the bracket 6, the guide means move along a substantially circular path about the drive roller 5.

The guide channel forming guide means 7 and 8 may comprise a first rail 7 pivoted to the bracket 6 by a pivot shaft 7' and adjustable in its position relative to the bracket by means of an actuator such as a piston cylinder arrangement 7'' whereby the rail 7 is tiltable about an axis extending perpendicularly to the plane defined by the bracket 6, said axis being defined by the pivot shaft or pivot pin 7'. The lower end of the guide rail 7 comprises a flap member 10 which provides receiving or entrance means for the stud 9 into the channel 9' formed by the rail 7 and a further guide rail 8.

The guide rail 8 is preferably a one piece member having a longitudinal axis along which the guide rail is hinged to the bracket 6 by hinge means 8'. The guide rail 8 is connected to actuator means such as a piston cylinder arrangement 8'' shown in dashed-dotted lines since it is arranged behind the bracket 6. The actuator 8'' hinges or tilts the guide rail 8 about an axis extending substantially in parallel or coaxially to the longitudinal axis of the guide rail 8 and thus preferably in a plane defined by the bracket 6 or in a plane extending in par-

allel to the bracket 6. At the lower end of the channel 9' there may be provided a lead in tongue 9'' connected to the bracket 6.

The just described arrangement of the guide rails 7 and 8 with the inlet flap 10 and the lead-in tongue 9'' assures that the stud 9 is automatically received in the guide channel 9' when the winding roller 3 moves from its starting position when it is solely in contact with the drive roller 4, into its intermediate position whereby it comes into contact with both drive rollers 4 and 5. The inlet flap 10 is preferably spring biased so that the studs 9 may push back the flaps 10 which then return into a channel closing position when the studs 9 are properly within the channel 9' whereby the studs 9 are prevented from escaping from the channel 9' except at the outlet end of the channel.

The stud 9 may escape from the channel at the outlet of the channel or the studs 9 may be released from the channel by opening the channel. Such opening is accomplished by tilting the guide rail 8 by means of the actuator 8'' as described above. Thus, it is possible to release the winding roller 3 from the channel 9 at any desired diameter or rather radius of the winding roller 3.

As mentioned, it is advantageous to journal the bracket 6 about the shaft 5' of the second drive roller 5. However, the invention is not limited to this embodiment.

The adjustability of the position of the guide rails 7 and 8 as described above has the further advantage that by adjusting the width of the channel 9' a kind of braking action may be effected on the studs 9 whereby the so called hardness of the winding roller 3 may be controlled. Stated differently, it is possible to wind the web 1 onto the winding roller 3 with winding hardnesses which differ along the diameter of the winding roller 3. In the same manner it is possible due to this adjustment of the angular position of the guide means, to wind winding rollers having different diameters with a constant winding hardness.

As soon as the winding roller 3 has achieved the desired finished diameter, as shown for example in FIG. 2, the brackets 6 are tilted by the piston cylinder arrangement 6' in a clockwise direction whereby the guide rails 7 and 8 are journaled to move about the drive roller 5 and the finished winding roller 3 is brought out of contact with the drive roller 4 but maintained in driving contact with the second drive roller 5 whereby the finished winding roller 3 rolls along a circumferential portion of the second drive roller 5. Thus, the displacement of the finished winding roller 3 from the intermediate position into the end position provides space above the first drive roller 4 so that a new winding core 11 may be brought into winding contact with the first drive roller 4. The new winding core 11 may be shifted into position by a rocker arm 11' operated by a piston cylinder arrangement 11''.

Further, due to the displacement of the winding roller 3 as shown in FIG. 2 there is provided sufficient space between the first drive roller 4 and the second drive roller 5 for bringing a severing mechanism 12 into an operational position. The severing mechanism 12 may be actuated by a piston cylinder arrangement 12' which is preferably in synchronism with the operation of the piston cylinder arrangement 11''.

As soon as the cutting mechanism 12 has severed the web 1, the guide rails 8 are actuated by the piston cylin-

der arrangement 8'' to move out of the position in parallel to the rail 7 whereby the studs 9 of the winding roller 3 are released so that the finished winding roller 3 may be deposited on a roller receiving means such as a table 13. Preferably, a raising and lowering mechanism 13' may be provided for the winding roller receiving table 13 whereby the position of the table is easily adjustable to the diameter of the particular roller being wound. The table 13 may be stationary, however, preferably it will be supported on a movable cart.

As the finished winding roller 3 is deposited on the winding table 13, the winding of the winding core 11 is started by means of the drive roller 4. As soon as the journal studs 14 of the core 11 are released by moving a locking member 14' in the direction of the arrow 14'' the core 11 or now rather the new winding roller moves due to its own weight in the direction of the arrow 15 whereby the new winding roller remains in contact with the drive roller 4 but simultaneously reaches said intermediate position in which it is also in contact with the driving roller 5. As the new winding roller moves into the lower intermediate position, the journal studs 14 push the flap members 10 aside whereby the journal studs 14 are received in the guide channel 9 when the studs come into contact with the rail 8.

The channel 9 is arranged according to the invention so that it extends substantially radially relative to the diameter of the winding roller whereby the studs of the winding roller are enabled to rise up in the guide channel 9' until the desired winding diameter has been reached. At that point of the operation the rails 8 are tilted by means of the piston cylinder arrangement 8'' whereby the studs 14 are released and the new winding roller 11 is deposited on the receiving table 13.

In view of the above description it will be appreciated that the illustrated guide means are arranged on each side or rather at each end of the roller means.

Although the invention has been described with reference to specific example embodiments, it is to be understood, that it is intended to cover all modifications and equivalents within the scope of the appended claims.

What is claimed is:

1. In a continuous web winding apparatus wherein a first drive roller rotates a winding roller in a starting position, wherein a second drive roller is arranged for rotating the winding roller in cooperation with the first drive roller while the winding roller is in an intermediate position, and wherein the second drive roller rotates the winding roller while the latter is in an end position, the improvement comprising guide means for said winding roller positioned adjacent the ends of said rollers, journal means on the axis of said second roller and operatively connected to said guide means, and actuating means arranged for cooperation with said journal means for tilting said guide means back and forth about the axis of said second drive roller whereby the winding roller is transferred from said intermediate position to said end position.

2. The web winding apparatus according to claim 1, further comprising bracket means connected to said journal means, means for attaching said guide means to the respective bracket means, and means for connecting said actuating means to said bracket means.

3. The web winding apparatus according to claim 2, wherein said second drive roller comprises a shaft, said bracket means being journaled to said shaft whereby

the guide means are tiltable about said second drive roller.

4. The web winding apparatus according to claim 1, wherein said guide means comprises a first guide member and a second guide member positioned adjacent each end of said rollers, said guide members forming a guide channel extending substantially radially relative to said winding roller, said winding roller having journal studs at its ends, and means for receiving said journal studs in said guide channel.

5. The web winding apparatus according to claim 4, further comprising bracket means connected to said journal means, said first guide member comprising a first rail, first means for connecting said first rail to the respective bracket means, said means for receiving comprising flap means hinged to one end of said first rail to form an inlet for said guide channel, said second guide member comprising a second rail having a longitudinal axis, and second means for connecting said second rail to said respective bracket member alongside said first rail to form said guide channel.

6. The web winding apparatus according to claim 5, wherein said connecting means comprise means for adjusting the angular position of the respective rail relative to said bracket means.

7. The web winding apparatus according to claim 6, wherein said first connecting means comprise pivot means for pivoting one end of said first rail to said bracket whereby said first rail is rotatable about an axis defined by said pivot means which axis extends substantially perpendicularly relative to said bracket means.

8. The web winding apparatus according to claim 7, further comprising drive means connected to said first rail for pivoting said first rail about said pivot means and for holding the first rail in any desired pivoted position.

9. The web winding apparatus according to claim 6, wherein said second connecting means for connecting said second rail to the bracket means comprise hinge

means for hinging said second rail to the respective bracket whereby said second rail is tiltable about a hinge axis extending substantially in a plane defined by the respective bracket.

10. The web winding apparatus according to claim 9, further comprising drive means connected to said second rail for tilting said second rail about said hinge axis and for holding the second rail in any desired tilted position.

11. The web winding apparatus according to claim 9, wherein said hinge axis extends substantially in parallel or coaxially relative to a longitudinal axis of said second rail.

12. The web winding apparatus according to claim 1, further comprising means for receiving said winding roller in its completed condition, said receiving means being arranged adjacent to said guide means when the latter are in said end position.

13. The web winding apparatus according to claim 12, further comprising means operatively connected to said receiving means for raising and lowering the receiving means.

14. The web winding apparatus according to claim 1, wherein said guide means comprise means for forming a guide channel at each end of said winding roller having a journal stud at each end, each channel having an inlet end for receiving the respective journal stud and an outlet end for releasing the journal stud, means for connecting said guide channel forming means to said journal means whereby the guide channel may be tilted from a stud receiving position into a stud releasing position.

15. The web winding apparatus according to claim 14, wherein said channel comprises a portion extending substantially radially relative to said winding roller between said inlet end and said outlet end whereby said winding roller studs may rise up in said radially extending portion of the channel as the diameter of the winding roller increases.

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