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WINDING MACHINE FOR PAPER ROLLS

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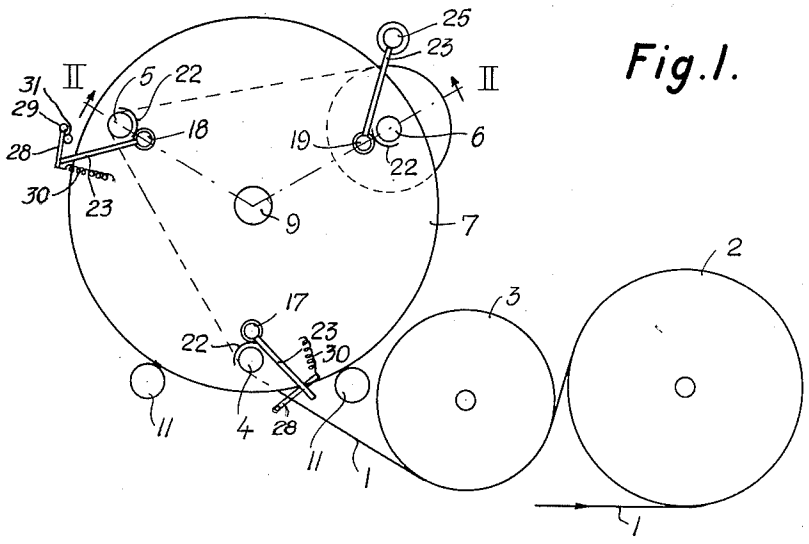
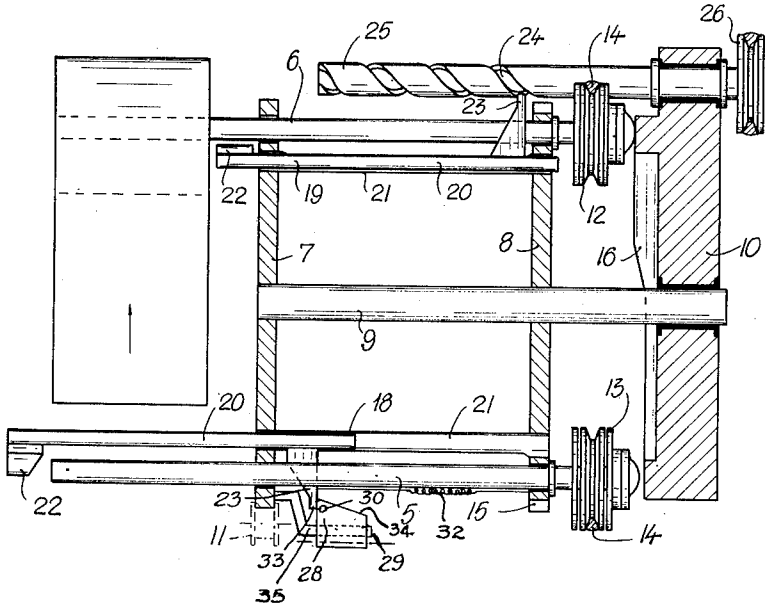


Fig. 1.

Fig. 2.



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WINDING MACHINE FOR PAPER ROLLS

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5 Claims. (Cl. 242—56)

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The present invention relates to improvements in machines for the winding of paper rolls and the object of the invention is to provide a machine which is completely automatic so that the winding of consecutive rolls may be effected without stopping the machine and with an absolute certainty as to uniform winding and constant roll size.

According to the invention this is achieved by providing the machine with two or more winding spindles for the consecutive winding of paper rolls and with means associated with each spindle for the automatic cutting of the paper web, gluing of the free, cut portion of the paper web and expulsion of the finished roll. In a machine which is made in this manner the winding of a roll will be effected on one spindle and at the moment when this roll has reached the desired dimension the paper web is cut at that spindle on which the winding of the next roll is immediately commenced, while the cut portion is glued to the completed roll and the latter pushed off its spindle.

Each spindle may be adapted for individual drive, the number of revolutions per time unit being automatically decreased in accordance with the increase in diameter of the roll which is wound, so that the velocity of the paper web may be held approximately constant during the entire winding process.

In order to cut the paper web at the end of the winding process of each roll, and expel the completed roll, a device may be provided in association with each winding spindle, which device when moving in one direction along the spindle axis pushes out the completed roll and when moving in the other direction cuts the paper web. Conveniently the devices in connection with the various spindles may be so interconnected that the paper web is cut at that spindle which, in the direction of rotation of the drum, succeeds the spindle on which the winding process is about to be completed, and the cutting device may also conveniently be so formed that the remaining portion of the paper web after the cutting is guided around the empty spindle for the commencement of the winding of a fresh roll.

On the accompanying drawing the principle of the machine and an embodiment of the same are diagrammatically shown.

In the drawing Figure 1 is a principal diagram of a winding machine according to the invention, in side elevation, and Figure 2 shows the essential parts of a machine of this type, in a sectional view along the line II—II of Figure 1.

In the drawing 1 is the paper web to be wound. It is carried over drive and guiding rolls 2 and 3 respectively and then over the spindles 4 and 5 to the spindle 6 on which the winding is effected.

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The spindles 4 to 6 are carried in the end plates 7 and 8 of a drum structure which is supported by a shaft 9 carried in a frame 10, and by a set of rollers 11 at the end plate 7 remote from the frame 10. The spindles 4 to 6 may be rotated through friction clutches, of which two, 12 and 13, are shown, by means of a belt 14 which preferably is common to all three spindles. The end plate 8 of the drum nearest to the frame 10 is provided with a toothed rim 15 so that the drum may be rotated relatively to the frame 10. The friction clutches of the various spindles 4 to 6 are operated by means of the variable pressure of an annular cam member 16 on the frame 10, for the adjustment of the spindle velocity in accordance with the height of the cam 16, so as to cause the belt 14 to drive each individual spindle at a speed which decreases during winding of a paper roll thereon, whereas the speed of each spindle is temporarily increased at the moment of the cutting of the web upon completion of the winding of a roll upon the preceding spindle, in order to effect a strain in the web 1 to facilitate the adhering of the web to the surface of the spindle whose speed is thus increased. Th clutch 13 of that spindle which is in the position of spindle 4 in Figure 1 is disengaged.

Adjacent to each of the spindles 4 to 6 cutting and expulsion devices 17, 18 and 19 are provided in the drum. Each of these devices consists of an axial bar 20 which may be moved in its direction of length in a tube 21 which is solidly mounted in the end plates 7 and 8. At the free end the bar 20 is provided with a cutting device 22 having an arcuate blade as shown in Figure 1 and a blunt abutting face 27 on the side remote from the edge. The other end of the bar 20 is provided with a projection 23 which engages the threads 24 of a threaded pin 25 which is rotated through a combined belt pulley and friction clutch 26 similar to the clutches 12 and 13. By the rotation of the pin 25, of which there is only one provided near to the position occupied by the winding spindle 6 at the moment when the winding of a roll is about to be completed, the bar 20 is moved to the left in Figure 2 and will be held in this extreme position by means of a spring actuated abutment of any convenient type for instance that shown in the drawing. It should be noted that the structure shown is merely disclosed by way of illustration and forms in itself no part of the present invention. As shown in the drawing, the abutment 28 may be in the form of a latch-like member pivotally mounted at 29 by means of a bracket 35 carried on the rotatable drum structure and is under the influence of a spring 30, the other end of which is connected to the said drum structure. In operative position the abutment is arranged as shown in connection with the spindle 4 in Figure

1 and 5 in Figure 2. When during the rotation of the drum structure the spindle 4 arrives in the position occupied by the spindle 5 in Figure 2, the abutment 28 is engaged by a stop member 31 mounted in the machine frame, to the effect that the abutment 28 is swung outwardly relatively to the member 23 against the force of the spring 30, thereby releasing the bar 20 to be moved quickly to the right in Figure 2 under the influence of a spring 32. By further movement of the drum structure the abutment 28 is disengaged from the stop member 31 and is free to engage the right face (Figure 2) of the member 23. When the bar 20 is again moved to the left, the point 33 of the member 23 rides on the inclined top surface 34 of the member 28, which latter is resiliently mounted so that the point 33 may override the top of the member 28. A device for the gluing of the free end of the paper web to the completed paper roll is also to be provided. This device may be of any convenient construction and is therefore not shown in the drawing.

The machine operates in the following manner, presuming that all parts are in the positions shown in the drawing, where the winding of a paper roll is nearly completed on the spindle 6:

The paper web 1 runs from a supply roll, which is not shown, over the pulling roller 2 and the adjusting and guiding roller 3 and then around the spindles 4 and 5, the friction clutches of which are disengaged so that the spindles are only acting as guiding rollers, whereupon the paper web is wound on the spindle 6. During the winding of this roll the drum carrying the spindles is performing a slow rotating movement, thereby moving the spindle 6 on which the winding is effected from the position occupied by the spindle 5 in Figure 1 to the position it is shown to occupy on the drawing, wherein the projection 23 on the bar 20 of the expulsion device 19 will enter into engagement with the thread 24 of the pin 25. At the same time the cutting device 18 associated with the spindle 5 is released from its holding abutment, so that the cutting device under the influence of a spring force will move very quickly to the right in Figure 2 and cut the paper web. Due to the arcuate shape of the knife blade the advancing edge of the remaining portion of the paper web is turned rearward and started around the spindle 5 so as to start the winding of a fresh roll. At the same time the friction clutch 13 of this spindle is operated by the cam 16 to the effect that the spindle is now positively driven with a number of revolutions corresponding to a peripheral velocity of the spindle which is about 10 per cent greater than the linear velocity of the paper web at the cutting moment. Thus the paper web will be carried along and will adhere to the spindle, to the effect that the winding is commenced. This adhesion will be increased by the electrostatic charge of the paper web set up by the friction against the spindle. At the same time as these actions are performed in connection with the spindle 5, the pin 25 has by its rotation carried the expulsion device 19 to the left in Figure 2, to the effect that the completed paper roll is pushed off the spindle 6. The free portion of the paper web which is just cut at the spindle 5 is in the meantime glued to the rest of the roll by means of a gluing device of any convenient type, whereas the expulsion device 19 will be caught in its extreme left position and held there by means of the abutment mentioned.

During these operations the drum carrying the spindles has continued its slow turning movement and has, when the fresh roll is completely wound on the spindle 5, arrived exactly at that position which is occupied by the spindle 6 in the drawing, the cam 16 having produced such a decrease of the speed of revolution of the spindle 5 that the velocity of the paper web is maintained substantially constant. In this position the projection 23 of the expulsion device 17 will engage the thread 24 whereupon the whole process will be repeated.

It will be appreciated that, by means of a machine according to the present invention one roll is automatically wound consecutive to the other, no other manual action being required than the introduction of a new paper web when the supply roll is run out.

The dimensions of the individual rolls will always be exactly the same, the velocity of the paper web as well as that of the drum being constant.

I claim:

1. An automatic winding machine for making paper rolls comprising a plurality of winding spindles for the consecutive winding of one roll after another, a rotatable drum structure supporting the said spindles extending freely from one end face of the said structure, means for continuously rotating said drum, means associated with each of the said spindles for cutting of the paper web upon completion of the winding of a roll and expulsion of the completed roll along the length of the winding spindle and means for actuating said expulsion means when the associated spindle reaches a predetermined position in the rotation of said drum, said last means comprising a helically threaded rotating member and a projection on said expulsion means adapted to engage said helical thread.

2. An automatic winding machine for paper rolls comprising a plurality of winding spindles for the consecutive winding of one roll after another, a rotatable drum structure supporting the said spindles extending freely from one end face of the said structure, means for continuously rotating said drum, a friction clutch associated with each of the said spindles, a common cam edge member governing the engagement pressures of each of the said friction clutches, means associated with each of the said spindles for cutting of the paper web upon completion of the winding of a roll and expulsion of the completed roll along the length of the winding spindle, and means for actuating said last means when the associated spindle reaches a predetermined position in the rotation of said drum.

3. An automatic winding machine for paper rolls comprising a plurality of winding spindles for the consecutive winding of one roll after another, a rotatable drum structure supporting the said spindles extending freely from one end face of the said structure, means for continuously rotating said drum, a gudgeon arranged centrally at one end of the said drum structure and roller means arranged peripherally at the other end of the said drum structure serving to support the drum structure, a friction clutch associated with each of the said spindles, a common cam edge member governing the engagement pressures of each of the said friction clutches, means associated with each of the said spindles for cutting of the paper web upon completion of the winding of a roll and expulsion of the completed roll along the length of the winding spindle, and means for actuating said last means when the associated

spindle reaches a predetermined position in the rotation of said drum.

4. An automatic winding machine for paper rolls comprising a plurality of winding spindles for the consecutive winding of one roll after another, a rotatable drum structure supporting the said spindles extending freely from one end face of the said structure, means for continuously rotating said drum, a friction clutch associated with each of the said spindles, a common cam edge member governing the engagement pressures of each of the said friction clutches, a rotatable pin mounted in the machine frame parallel to and adjacent to the position occupied by the spindle on which the winding of a roll is about to be completed, and means associated with each of the said spindles for cutting of the paper web upon completion of the winding of a roll and expulsion of the completed roll along the length of the winding spindle, the said rotatable pin being provided with means positively engaging the said cutting and expulsion means so as to control the movements of the same.

5. An automatic winding machine for paper rolls comprising a plurality of winding spindles for the consecutive winding of one roll after another, a rotatable drum structure supporting the said spindles extending freely from one end face of the said structure, means for continuously rotating said drum, a friction clutch associated with each of the said spindles, a common cam edge member governing the engagement pressures of each of the said friction clutches, a rotatable pin mounted in the machine frame parallel to and adjacent to the position occupied by the spindle on which the winding of a roll is about to be completed, a reciprocating bar member extending parallel to and adjacent to each of the said spindles and carrying at one end a member provided with a cutter edge serving as a cutting means and an oppositely located blunt edge serving as expulsion means, the said bar member carrying at the other end a laterally extending projection, the said pin member being provided with an external screw threaded recess engaging the said projection on the said bar member upon completion of the winding of a roll on the spindle appertaining to the same so as to make the bar member perform an expulsive action on the said roll.

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