

June 22, 1954

J. D. HASKELL
WEB ROLL WINDER

2,681,771

Filed Oct. 16, 1952

2 Sheets-Sheet 1

FIG-1

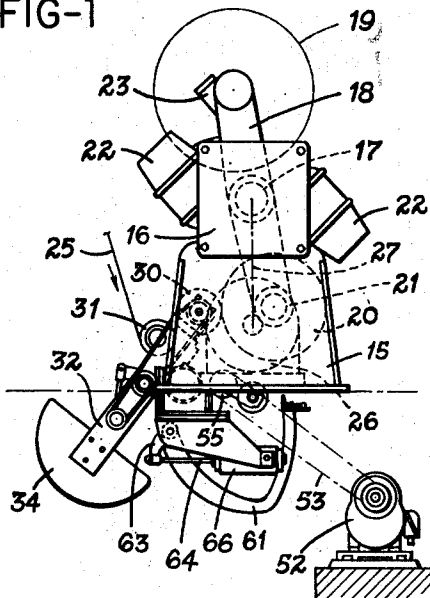


FIG-2

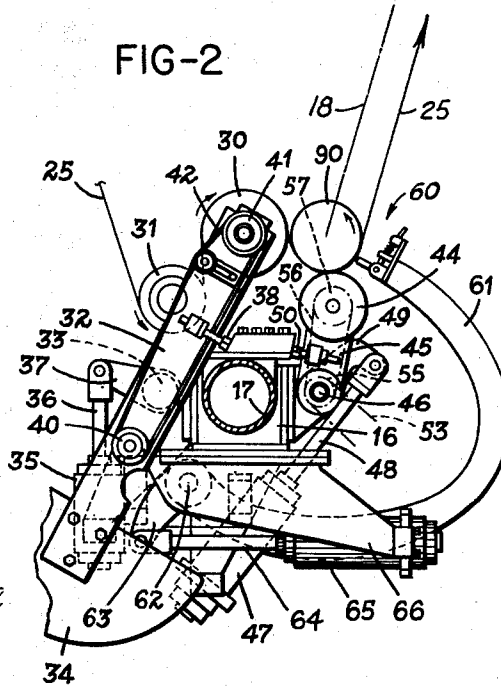


FIG-3

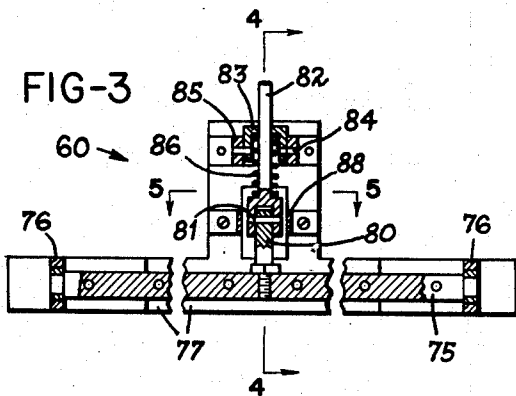


FIG-4

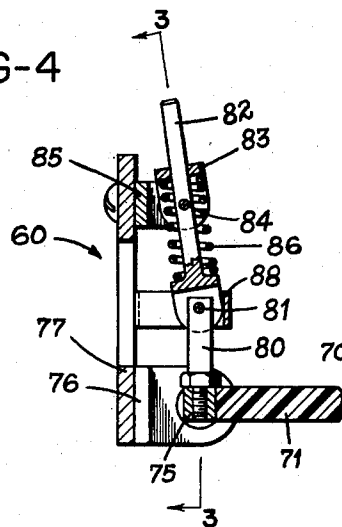
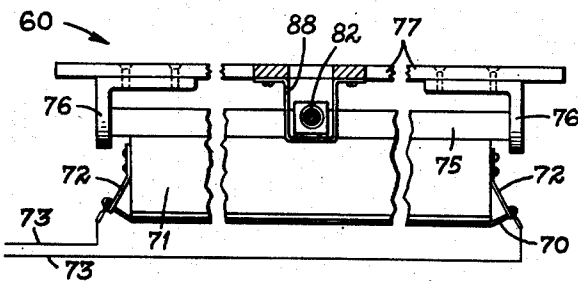


FIG-5



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FIG-6

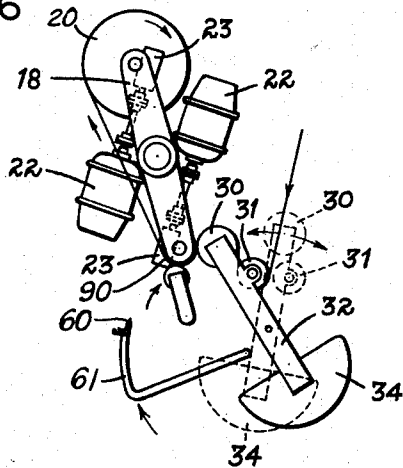


FIG-7

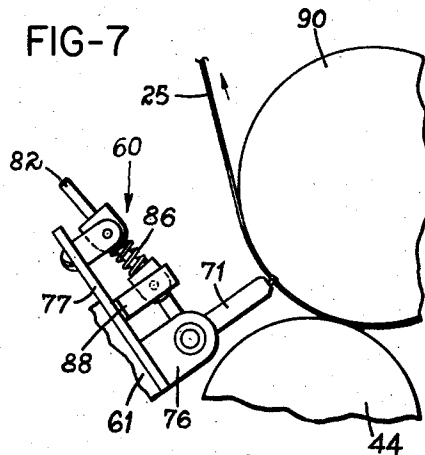


FIG-8

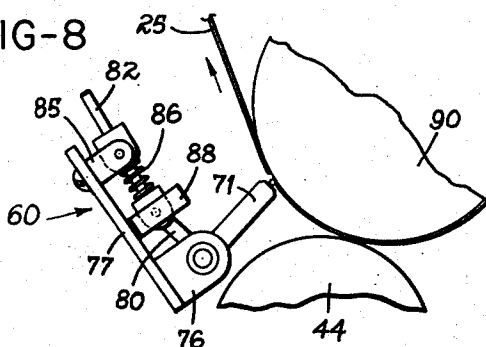


FIG-9

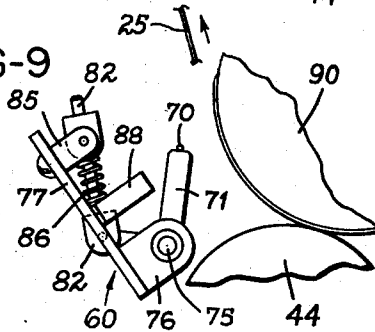


FIG-10

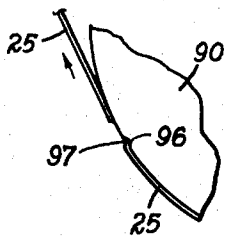


FIG-11

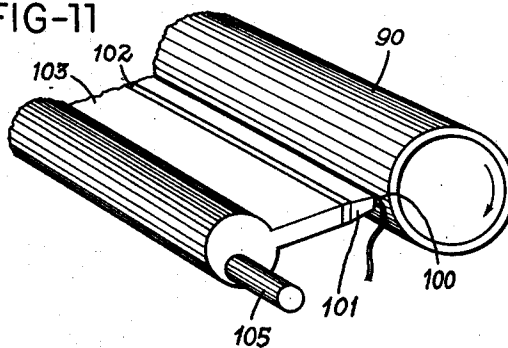
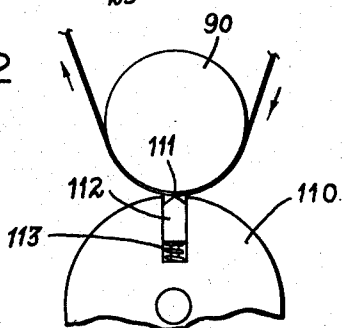


FIG-12



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WEB ROLL WINDER

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6 Claims. (Cl. 242-56)

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This invention relates to winders for web materials, and it has special relation to continuous winding apparatus for thermoplastic web materials such as plastic film.

The invention is especially concerned with the transfer of the web material from a completed roll in a continuous winder to a new core to start winding thereon without reduction in speed. It is important in handling such materials, particularly in the case of thin plastic film, to establish an even start of the web on the core without having the material fold back on itself, since if there is a fold back or like objectionable edge condition on the starting end of the web on the core, the resulting uneven thickness of material on the core tends to emboss, wrinkle or otherwise undesirably impress the succeeding layers of material wound thereover. This condition is especially noticeable in handling thin or soft plastic film, since fold back on the core may result in impressing a sufficient number of layers of the film in the roll to spoil a considerable length of film.

It is accordingly a primary object of the present invention to provide apparatus and a method for continuously winding a thermoplastic web material which will effect smooth and even severing of the web from the full roll and simultaneous transfer of the severed leading end of the web to a new core by applying heat and pressure across the portion of the web engaging the new core in such manner that the web is evenly severed and simultaneously the resulting severed leading end of the web is softened sufficiently to cause it to adhere to the new core and to start winding thereon.

Another object of the invention is to provide a continuous winder for thermoplastic web materials wherein the mechanism for transferring the advancing web from a full roll to a new core includes an elongated knife element which is heated to a temperature capable of softening about the web and which cooperates with the new core by compressing the web against the core in such manner as to soften and sever the web passing from the core to the full roll and to cause the resulting cut leading end of the web to adhere to the new core and to start winding thereon.

It is also an object of the invention to provide such continuous winding apparatus in which the heated knife element is caused to move with the web and the new core for a sufficient interval to cause severing and transfer of the web to the core and is then rapidly retracted from the core

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to assure a smooth and even start of the new roll.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings—

Fig. 1 is a somewhat diagrammatic view in side elevation showing a continuous winder constructed in accordance with the invention and shown in winding position;

Fig. 2 is an enlarged fragmentary view further illustrating the winder of Fig. 1 and showing the parts in roll starting position;

Fig. 3 is an enlarged detail view in section on the line 3—3 of Fig. 4 showing the cutoff mechanism of the winder;

Figs. 4 and 5 are sections on the lines 4—4 and 5—5 respectively of Fig. 3;

Fig. 6 is a diagrammatic view illustrating the position of certain of the main parts of the winder at the beginning of the roll starting operation;

Figs. 7, 8 and 9 are fragmentary views illustrating successive stages of the roll starting operation;

Fig. 10 is an enlarged fragmentary view further illustrating the roll starting operation;

Fig. 11 is a fragmentary view in perspective showing another construction of cutoff mechanism in accordance with the invention; and

Fig. 12 is a fragmentary elevational view illustrating a further construction of cutoff mechanism in accordance with the invention.

Referring to the drawings, which illustrate preferred embodiments of the invention, Fig. 1 illustrates somewhat diagrammatically a continuous winder of the general type referred to above. The base frame indicated generally at 15 and 16 supports a reel including a shaft 17 and a pair of arms 18 at each end of the shaft adapted to carry a plurality of cores on which the web material is to be wound, and Fig. 1 shows the reel as supporting a full roll 19 and a partially wound roll 20 on a core 21. The reel arm 18 at the back of the winder also supports a pair of motors 22 connected through transmissions 23 with core supports, such as spindle noses (not shown), to drive the cores at the same surface speed as the advancing web 25 to be wound. The reel shaft 17 is rotatably supported on the frame 15 and is provided with means such as the motor 26 and driving connection shown diagrammatically at 27 in Fig. 1 for rotating the reel to carry successive new cores to the roll starting position while simultaneously carrying the filled roll to

the top position shown in Fig. 1 for removal and replacement by an empty core.

The web 25 is guided to the winding roll around an anvil roll 30 and a guide roll 31 both carried by arms 32 pivotally mounted in the frame by a rock shaft 33 and carrying counter-weights 34 at their lower ends. Movement of arms 32 between their retracted position indicated in dotted lines in Fig. 6 and their normal operating position is controlled by a fluid pressure cylinder 35 mounted on the frame and connected with shaft 33 through the piston rod 36 and lever 37. An adjustable stop 38 on one or both of the arms 32 engages a portion of the frame as shown in Fig. 2 to locate the arms 32 in their desired operating position. The arm 32 at the front of the winder is also shown as carrying a yardage counter 40 driven by roll 30 through a sheave 41 and belt 42 for registering the amount of web material wound on each roll.

The anvil roll 30 acts as an upper enveloper roll during roll changing, and there is also a lower enveloper roll 44 carried by arms 45 which are pivotally mounted in the frame by a rock shaft 46 controlled by a hydraulic cylinder 47 having its piston rod 48 pivoted to an arm 49 secured to shaft 46. An adjustable stop 50 on one or both of the arms 45 engages a portion of the frame as shown in Fig. 2 to locate arms 45 with roll 44 in its desired position for roll changing. The roll 44 is driven at the same surface speed as the web by a motor 52 connected through chain 53 with a double sprocket 55 on shaft 46 from which a chain 56 drives sprocket 57 on the journal of roll 44.

The knife assembly for severing the web and effecting transfer of the cut web to a new core is indicated generally at 60 and is carried on the ends of a pair of curved arms 61 pivoted on the frame at 62. Each arm 61 acts effectively as one arm of a bell crank lever having its other arm 63 connected to the piston rod 64 of a fluid pressure cylinder 65 supported in the frame by brackets 66. Cylinders 65 are operable as shown to swing the knife arms between their retracted position shown in Fig. 1 and their operating position shown in Fig. 2 for roll starting.

The knife assembly 60 is shown in detail in Figs. 3-5, and it includes an element 70 capable of being heated by electric current to a temperature sufficiently high to soften the web material to be wound on the winder, satisfactory results having been obtained with this element 70 formed of 18-gauge Nichrome wire. The knife element 70 is mounted on a plate 71 of heat and electric insulating material such as Transite, and it is supported at its ends by flat spring brackets 72 bolted to the plate 71. Electrical conductors 73 lead from the knife element 70 to any suitable current source for developing the desired high temperature in element 70.

The supporting plate 71 for knife element 70 is bolted or otherwise secured to a shaft 76 pivoted in brackets 76 mounted on a supporting plate 77 which is in turn mounted in any suitable way on the ends of the knife arms 61. A stud 80 is mounted at one end in shaft 75, and its other end is pivoted at 81 in the yoke-shaped end of a spring guide 82 extending through a yoke member 83 pivoted at 84 in a bracket 85 bolted or otherwise secured to the supporting plate 77. A spring 86 is mounted on spring guide 82 between the yoke-shaped end thereof and the yoke member 83 to bias the linkage formed by the parts 80 and 82 for over-center or toggle action, and

bracket 83 straddles the pivotal connection of these parts to limit the forward movement of the toggle pivot. With this arrangement, upward or counterclockwise movement of the part 71 as viewed in Fig. 4 will be resisted by spring 86 until the parts 80 and 82 pass over dead center, whereupon the spring 86 will then act to move part 71 quickly upward.

Figs. 1 and 6-10 illustrate diagrammatically the operation of the winder to wind a roll of the web material and then to effect transfer of the web from a full roll to a new core. Fig. 1 illustrates an intermediate stage of the winding operation, with the roll 20 partly wound, and during winding the motor 26 is intermittently actuated to index the reel in proper direction to maintain desired spacing between roll 30 and the surface of the web on roll 20. This movement may be effected by the operator through manual control of motor 26, or the indexing may be automatic through the operation of one or more suitable limit switches.

In a continuous winding operation, while the roll 20 is being wound, the full roll indicated at 19 in Fig. 1 is removed and a new core 90 is mounted in place thereof in the arms 19. When it is desired to change to the new core from the roll 20 being wound, the operator may press a start button, or the change may be started automatically by an electric impulse from the counter 40. The first step in roll changing is to start the new core rotating by means of its drive motor 22 and to bring it up to the same surface speed as the web. Cylinder 35 is then actuated to swing arms 32 and rolls 30 and 31 to the position shown in Fig. 6 in which they will be out of the path of the reel, and motor 26 is actuated to rotate the reel in clockwise direction as viewed in Fig. 6, during which movement the new core 90 will be carried into engagement with the web passing from anvil roll 30 to the winding roll 20. Next cylinder 35 is actuated in the reverse direction to return arms 32 and roll 30 to their normal positions, and similarly cylinder 47 is actuated to swing arms 45 to their operating position in which roll 44 is supported in contact with the web against core 90.

With the several parts in these positions as shown in Fig. 6, cylinders 65 are actuated to advance the knife arms 61 and knife assembly 60, and the parts are so proportioned and controlled as shown that this movement will cause the knife element 70 to be carried directly towards core 90 and into pressure engagement with the portion of the web passing around the core, desirable results having been obtained with the knife assembly being pressed against the core with sufficient force to indent the outer surface thereof as shown at 96 in Fig. 10. With the knife element 70 heated to a sufficient temperature to soften the portion of the web in engagement therewith, for example a temperature of the order of 1000° F. when the web material is vinyl chloride film of the order of 0.003 to 0.006 inch in thickness, there will be an effectively immediate softening of the web such that the tension thereon provided by the winding action of the roll 20 will cause it to part along its line of engagement with knife element 70 as indicated in Figs. 8 and 9. At the same time, since core 90 is rotating, its pressure engagement with knife element 70 will cause the knife plate 71 to pivot with shaft 75 in such manner that the knife element will move for a short interval with the core as shown in Figs. 7 and 8.

This movement of the knife element will continue until the parts 80 and 82 pass over dead center, causing plate 71 to snap upward and thus to move the knife element rapidly away from the core. However, the interval of joint travel of the knife element and the core is sufficient at the temperature of the knife element to soften the severed leading end of the web and to cause this softened portion to adhere directly to the core as indicated at 97 in Fig. 10. As a result, the leading end of the web will begin to wind on the core as shown in Fig. 9, and since the start is uniformly straight and even along the entire length of the core on the straight line provided by the knife element 70, foldback or other non-uniform edge conditions are prevented, and the desired smooth start is obtained.

It will be apparent that the knife assembly may be of other constructions and still provide the desired essential action of applying heat and pressure along substantially a line extending across the web and lengthwise of the core to sever the web and to soften and cause adhesion of the resulting severed leading end of the web to the core. For example, in Fig. 11 the knife element 100 is carried by a block 101 of Transite or like insulating material mounted through a resilient pad 102 on a holding member 103 having journals 105 adapted for mounting on the plate 77 or directly on the knife arms 51. With this arrangement, the initial operation of the device will be the same as already described, and with the knife element held against the core 90, there will be the desired temporary movement of the knife element with the core while the supporting member pivots on its journal 105 and until this movement carries the knife element out of contact with the core.

Fig. 12 shows another arrangement of parts for effecting roll starting in accordance with the invention in which the roll 110 may correspond to the lower enveloper roll 44 or may be an additional rider roll adapted to be brought into engagement with the new core 90. Within the roll 110 is a knife assembly comprising a wire or like knife element 111 carried by an insulator block 112 provided with a resilient mounting 113 within the roll 110. In operation, the knife assembly will normally be held retracted within roll 110 and will be actuated in timed relation with the other parts of the roll starting mechanism, for example by means of a solenoid control mounted within roll 110, to cause the knife element to be ejected into pressure engagement with the web and core in the same manner as described in connection with the other forms of the invention. Thus in each case heat and pressure will be applied along a line across the web and will be maintained for a sufficient interval to cause the web to part and to soften the resulting leading end of the web for adhesion to the rotating core without foldback or other uneven edge conditions.

While the methods of forms of apparatus herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise methods and forms of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In a continuous winder for thermoplastic web material, apparatus for transferring the advancing web from a full roll to a new core com-

prising an elongated knife element extending the full width of the web, means for heating said knife element to a temperature capable of softening the web, means for moving said core into engagement with the opposite side of the advancing web from said knife element, means for rotating said core at substantially the surface speed of the web, means for moving said heated knife element into contact with the portion of the web engaging said rotating core to sever the web and simultaneously to soften the severed leading end of the web sufficiently to cause adhesion thereof to said rotating core, and means for thereafter separating said knife element from said core.

2. In a continuous winder for thermoplastic web material, apparatus for transferring the advancing web from a full roll to a new core comprising an elongated knife element extending the full width of the web, means for moving said core into engagement with the opposite side of the advancing web from said knife element, means for rotating said core at substantially the surface speed of the web, means for moving said knife element into contact with the portion of the web engaging said rotating core, means for maintaining said knife element heated to a temperature sufficient to soften the web to cause severing of said web upon said movement of said knife element into contact therewith, and means for causing said knife element to move temporarily with said core at substantially the speed of the web to soften the severed leading end of the web sufficiently to effect adhesion thereof to said rotating core and thereafter causing said knife element to separate from said core.

3. Continuous winding apparatus for thermoplastic web material comprising a reel for supporting a winding roll and a new core adapted to have the web wound thereon, means for driving said winding roll and said core at substantially the same surface speed as the web, a frame supporting said reel for rotation to carry said core to a roll starting position, means for guiding the web to said winding roll across the path of said core to cause the web to engage the surface of said rotating core, an elongated knife element carried by said frame on the opposite side of the web from said core and extending the full width of the web, means for heating said knife element to a temperature capable of softening the web, means for moving said heated knife element into contact with the portion of the web engaging said rotating core to sever the web and simultaneously to soften the severed leading end of the web sufficiently to cause adhesion thereof to said rotating core for winding thereon, and means for thereafter separating said knife element from said core.

4. Continuous winding apparatus for thermoplastic web material comprising a reel for supporting a winding roll and a new core adapted to have the web wound thereon, means for driving said winding roll and said core at substantially the same surface speed as the web, a frame supporting said reel for rotation to carry said core to a roll starting position, an elongated knife element carried by said frame and extending the full width of the web, means for guiding the web to said winding roll between said knife element and said core to cause the web to engage the surface of said rotating core at said roll starting position, means supporting said knife element for movement between a retracted

position and an advanced position wherein said knife element is in contact with the portion of the web engaged by said rotating core in said roll starting position thereof, means for heating said knife element to a temperature capable of softening the web to cause severing of the web upon movement of said knife element into engagement therewith, and means forming a movable mounting for said knife element on said supporting means causing movement of said heated knife element with said core for a limited interval to soften the severed leading end of the web sufficiently to cause adhesion thereof to said rotating core and thereafter causing said knife element to separate from said core.

5. In a continuous winder for thermoplastic web material, apparatus for transferring the advancing web from a full roll to a new core comprising a frame supporting said core for movement into engagement with the advancing web, means for rotating said core at substantially the surface speed of the web, an elongated knife element located on the opposite side of the web from said core and extending the full width of the web, means for heating said knife element to a temperature capable of softening the web, means for supporting said knife element on said frame for movement between a retracted position and an advanced position wherein said knife element is in contact with the portion of the web engaged by said rotating core, and means forming a movable mounting for said knife element on said supporting means causing movement of said knife element with said core for a limited interval to sever the web and simultaneously to soften the severed leading end of the web sufficiently to cause adhesion thereof to said rotating core and thereafter causing said knife element to separate from said core.

6. In a continuous winder for thermoplastic web material, apparatus for transferring the advancing web from a full roll to a new core comprising a frame supporting said core for movement into engagement with the advancing web, means for rotating said core at substantially the surface speed of the web, an elongated knife element located on the opposite side of the web from said core and extending the full width of the web, means for heating said knife element to a temperature capable of softening the web, means supporting said knife element on said frame for movement between a retracted position and an advanced position wherein said knife element is in contact with the portion of the web engaged by said rotating core, means forming a pivotal mounting for said knife element on said supporting means to cause said knife element to move for a limited interval with said core and the web through engagement of the rotating core therewith in order to sever the web and simultaneously to soften the severed leading end of the web sufficiently to cause adhesion thereof to the rotating core, and said knife element being spaced from the axis of said pivotal mounting to cause continued pivotal movement of said knife element to effect separation thereof from said core.

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