APPARATUS FOR REWINDING SLITTED FILM STRIPS IN A ROLL SLITTING AND REWINDING MACHINE

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ABSTRACT

In a roll slitting and rewinding machine, apparatus for rewinding slitted film strips comprises means for slitting a continuous film to a plurality of strips, a plurality of rewinding cores for rewinding said plurality of strips, respectively, means for driving said cores for rotation, and a plurality of endless belt assemblies cooperating said rewinding cores, respectively, to initiate the rewinding of said slitted film strips onto the respective rewinding cores. Each of said endless belt assemblies comprises an endless belt stretched between a plurality of pulleys and is movable between the first position in which said endless belt is engaged with its cooperating rewinding core in such a manner that said endless belt is pressed at a stretched portion thereof against said cooperating core along its peripheral direction so that said endless belt is moved along with said rewinding core for initiating the wrapping of said slitted film strips around said rewinding core and the second position in which said endless belt is kept apart from its cooperating core.

2 Claims, 3 Drawing Figures
APPARATUS FOR REWINDING SLITTED FILM STRIPS IN A ROLL SLITTING AND REWINDING MACHINE

BACKGROUND OF THE INVENTION

This invention relates to apparatus for rewinding slitced film strips in a roll slitting and rewinding machine and more particularly to apparatus for automatically initiating the rewinding of slitced film strips onto rewinding cores in a roll slitting and rewinding machine.

In conventional roll slitting and rewinding machines the initiation of the rewinding of slitced strips is usually carried out manually. That is, it is conventional to manually wrap the first few turns of slitced strips around the respective rewinding cores. In some cases the leading end portion of the slitced strip is manually stuck by an adhesive on a rewinding core.

The primary object of the invention is to provide a new and improved apparatus for automatically initiating the rewinding of slitced film strips on rewinding cores in a roll slitting and rewinding machine, in which the necessity of the manual operation of sticking slitced film strips on the respective rewinding cores is obviated.

Another object of the invention is to provide a new and improved apparatus for rewinding slitced film strips in a roll slitting and rewinding machine, in which slitced film strips can be rewound on the respective cores without causing unevenness of winding.

A further object of the invention is to provide a new and improved apparatus for automatically initiating the wrapping of slitced film strips around the respective rewinding cores utilizing endless belts pressed against the respective rewinding cores along their peripheral directions.

Other objects and advantages of the invention will become apparent from the following detailed description of the invention.

SUMMARY OF THE INVENTION

Apparatus for rewinding slitced film strips in a roll slitting and rewinding machine according to the invention comprises means for slitting a continuous film to a plurality of strips, a plurality of rewinding cores for rewinding said plurality of strips, respectively, means for driving said cores for rotation, and a plurality of endless belt assemblies cooperating said rewinding cores, respectively, to initiate the rewinding of said slitced film strips onto the respective rewinding cores.

Each of said endless belt assemblies comprises an endless belt stretched between a plurality of pulleys. Each of the endless belt assemblies is moved by appropriate drive means between the first portion in which said endless belt is engaged with its own cooperating rewinding core in such a manner that said endless belt is pressed at a stretched portion thereof against said cooperating core along its peripheral direction so that said endless belt is moved along with said rewinding core for initiating the rewinding of said slitced film strips onto said rewinding core and the second position in which said endless belt is kept apart from its cooperating core.

With the above arrangement according to the invention the slitced film strips which are guided to the rewinding positions are automatically wrapped around the outer peripheries of the respective rewinding cores with the slitced strips being held between the outer peripheries of the respective cores and their cooperating endless belts.

In a preferred embodiment of the invention the rewinding cores are driven independently for rotation, whereby the slitced strips can be rewound on the respective rewinding cores without causing unevenness of winding.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of this invention, reference may be made to the accompanying drawings wherein:

FIG. 1 is a schematic illustration of a roll slitting and rewinding machine which is provided with apparatus for automatically initiating the rewinding of slitced film strips onto the respective rewinding cores according to the invention;

FIG. 2 is a side elevation on an enlarged scale of an endless belt assembly illustrated in FIG. 1, showing the state in which the endless belt assembly is engaged with a rewinding core; and

FIG. 3 is a view of the endless belt assembly similar to FIG. 2, showing the state in which the endless belt assembly is disengaged from a rewinding core.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

Referring now to the drawings, particularly to FIG. 1 in which a roll slitting and rewinding machine is schematically illustrated, a continuous film sheet 11 is supplied from a film supply roll 10 and fed by feed means generally indicated by the reference numeral 12 to a slitter generally indicated by the reference numeral 13. Feed means may comprise a plurality of pairs of feed rollers 14a, 14b; 15a, 15b and 16a, 16b. The reference numerals 17 and 18 indicate guide rollers. The reference numeral 19 generally indicates a cutter positioned between feed means 12 and the slitter 13. The cutter 19 comprises an upper cutting blade 19a and a lower cutting blade 19b which are usually kept apart from each other. The reference numeral 20 indicates a prime mover for driving the feed means 12, the slitter 13 and the rewinding means which will be described hereinafter in detail. The reference numerals 21 and 22 indicate the transmission systems for transmitting the drive power from the prime mover 20 to the feed means 12 and the slitter 13, respectively.

The continuous film 11 is slit by the slitter 13 in a direction of feed into a plurality of strips which are then rewound into separate rewound rolls. The slitting mechanism of the slitter 13 may be any of the conventional ones. The slitced film strips are upwardly and downwardly separated alternately, or in staggered relation, and guided to the upper rewinding position 23a and the lower rewinding position 23b, respectively.

In the rewinding positions 23a and 23b, a plurality of rewinding cores 24a and 24b for rewinding the respective slitced strips 11a and 11b are supported by suitable support means (not shown) which are then rotatably carried by a frame 25. Each of support means are driven for rotation together with its own rewinding core 24a and 24b by a suitable transmission systems 26a or 26b from the prime mover 20. In this manner each of the rewinding cores 24a and 24b are driven for rotation for a rewinding operation. Preferably the rewinding cores 24a and 24b are driven independently from each
other. This may preferably be carried out by allowing each of rewinding core support means to frictionally slip when any overload is applied.

The reference numerals 31a and 31b indicate new rewinding core supply arms. Each of the rewinding core supply arms 31a and 31b is pivotally carried at its one end 32a, 32b and is provided at its other end with a core gripper 33a, 33b. Each of the arms 31a and 31b is swingable about the pivotal end 32a or 32b between a forwarded position and a retracted position. In the forwarded position a new rewinding core is transferred from the gripper 33a and 33b to rewinding core support means at the rewinding position 23a or 23b while in the retracted position a further new rewinding core is supplied manually or mechanically to the gripper 33a or 33b. In FIG. 1 the arm 31a is in the forwarded position while the arm 31b is in the retracted position. However, it should be understood that in the actual operation both the supply arms 31a and 31b are simultaneously moved in the same directions. Each of the supply arms 31a, 31b is provided at its pivotal end 32a, 32b with a pinion gear 34a, 34b which is always engaged with a segment gear 35a, 35b pivotally carried at 36a, 36b. The segment gear 35a, 35b is connected to a piston rod 37a, 37b on an air cylinder 38a, 38b. In this manner the supply arm 31a or 31b is driven for a swing movement between the forwarded position and the retracted position by the air cylinder 38a or 38b through transmission means 37a, 35a and 34a or 37b, 35b and 34b. The reference numerals 39a and 39b indicate the connecting pins for connecting the piston rods 37a, 37b and the segment gear 35a, 35b, respectively.

According to the invention the endless belt assemblies cooperate with the rewinding cores to initiate the rewinding of the slitted film strips onto the respective rewinding cores. In FIG. 1 the upper and lower endless belt assemblies are generally indicated with reference numerals 41a and 41b, respectively. The construction of the endless belt assembly 41a or 41b is illustrated more in detail in FIGS. 2 and 3. Referring to FIGS. 2 and 3 the endless belt assembly 41a or 41b comprises an endless belt 42 stretched between a plurality of pulleys 43, 44, 45, 46, 47 and 48. The pulleys 43, 44, 45, 46 and 47 are rotatably supported by a support frame 49 at their respective fixed position while the pulley 48 is movably supported by an arm 50. The reference numeral 51 indicates a spring provided under tension between the arm 50 and a spring end support 52 which is fixedly mounted on the support frame 49. In this manner the arm 50 with the pulley 48 is always urged by the spring 51 in a counterclockwise direction so that the whole length of the endless belt 42 is always under tension. In case where the endless belt assembly is in the forwarded position as shown in FIG. 2, the endless belt 42 is pressed at a stretched portion between the pulleys 44 and 45 against the peripheral surface of the film rewinding core 24a or 24b along its peripheral direction. The contact pressure, shown by the endless belt 42 and the core 24a or 24b is given by the tension of the belt 42 which is ultimately given by the spring 51. In this manner the endless belt is moved along with the film rewinding core 24a or 24b when the latter is driven by its support means.

It is desirable that the endless belt is in contact with the peripheral surface of the core 24a or 24b with a relatively long length. Preferably the length of the stretched portion at which the endless belt 42 is in contact with the peripheral surface of the core roller 24a or 24b is greater than three quarters of a round of the peripheral surface of the core 24a or 24b.

According to the invention the endless belt assembly 41a or 41b is disengageable from the rewinding core 24a or 24b. In the operative position as illustrated in FIG. 2, the pulley 44 is in a fixed position in which it is in contact with the outer periphery of the rewinding core 24a or 24b via the endless belt 42 therebetween. The pulley 44 is supported by a support arm 55 at its one end. The other end of the arm 55 is connected by a connecting pin 56 to link 57 which is in turn connected by a connecting rod 58 to another link 59. The connecting pin 56 is pivotally carried by the frame 49. The link 57 is substantially parallel to the link 59. The length of the connecting rod 58 may be adjustable. The link 59 is then connected by a connecting pin 60 to a further link 61 which is in turn connected by a connecting rod 62 to a crank 63 pivotally carried by a pivot 64. The crank 63 is connected to a suitable drive source such as a pneumatic cylinder (not shown).

With the arrangement described in the above, if the crank 63 is driven in a counterclockwise direction, the link 61, 59, 57 and the arm 55 are moved in counterclockwise directions, respectively so that the whole endless belt assembly 41a or 41b becomes disengageable from the rewinding core 24a or 24b, if it is moved leftwardly in FIG. 2. The endless belt assembly 41a or 41b is horizontally movable between a forwarded position and a retracted position. In the forwarded position the endless belt 42 is engageable with the outer periphery of the rewinding core 24a or 24b while in the retracted position the endless belt 42 is kept apart from the rewinding core 24a or 24b. FIG. 2 illustrates the state in which the endless belt assembly 41a or 41b is in the forwarded position while FIG. 3 illustrates the state in which the endless belt assembly is disengaged from the rewinding core 24a, 24b. In FIG. 1, the upper endless belt assembly 41a is in the retracted position while the lower endless belt assembly 41b is in the forwarded position. However, it should be understood that in the actual operation both the upper and lower endless belt assemblies 41a and 41b may be simultaneously moved in the same directions between their forwarded and retracted positions.

Preferably, the endless belt assemblies 41a and 41b are driven by pneumatic cylinder means 70a and 70b, respectively. The piston rods 71a and 71b of the pneumatic cylinders 70a and 70b are connected to tables 72a, 72b carrying the upper and lower endless belt assembly groups thereon, respectively. The reference numerals 73a and 73b indicate extensions of the tables 72a and 72b to which the ends of the piston rods 71a and 71b are connected, respectively. The endless belt assemblies 41a and 41b deposited on the tables 72a and 72b are movable together with the respective tables between their respective forwarded and retracted positions. It will be understood that in the forwarded position the endless belt 42 of each of the endless belt assemblies 41a and 41b is in contact with the outer periphery of the rewinding core 24a or 24b with the arm 55 supporting the pulley 44 being in the closed position as shown in FIG. 2, while in the retracted position the endless belt 42 is kept apart from the rewinding core 24a or 24b with the arm 55 supporting the pulley 44 being in the open position as shown in FIG. 3. The
opening operation of the arm 55 and the retraction operation of the endless belt assemblies 41a and 41b may be carried out successively in that order. The forwarding operation of the endless belt assemblies and the closing operation of the arm 55 may also be carried out successively in that order.

In FIG. 1 the reference numerals 80a and 80b indicate table lifters disposed below the rewinding position 23a and 23b, respectively. Upon completion of the rewinding operation, the table lifters, as indicated by the lower one, are lowered to transfer the rewound rolls to the positions for taking them out, respectively.

In the apparatus arranged in the manner described in the above, before starting the rewinding operation, the core supply arms 31a and 31b are turned around the pivotal ends 32a and 32b in a clockwise direction by the driven of the air cylinders 38a and 38b to transfer new rewinding cores to their respective support means at the rewinding positions 23a and 23b. After then the arms 31a and 31b are returned to the original retracted positions assuming a posture of standing by. The endless belt assemblies 41a and 41b with their respective arms 55 in their open positions are then advanced from the retracted positions to the forwarded positions. After each of the endless belt assemblies 41a and 41b reaches its forwarded position, the arm 55 supporting the pulley 44 is moved to its closed position so that the endless belt 42 engages the outer periphery of the rewinding core 24a or 24b to surround it as shown in FIG. 2. The rewinding core 24a, 24b is then driven for rotation. The endless belt 42 is moved along with the rewinding core 24a, 24b. If a leading end portion of a slitted film strip is introduced through the space between the pulleys 44 and 45, it is interposed between the outer periphery of the core 24a, 24b and the endless belt 42 and wrapped around the outer periphery of the core 24a, 24b in a clockwise direction in FIG. 2.

When a film strip is wrapped around the outer periphery of the core 24a, 24b by a given amount, usually for few or several turns, the endless belt assembly 41a, 41b is returned to its original retracted position after its arm 55 is upwardly opened, while the film strip is being continuously wound around the outer periphery of the core 24a, 24b. In this manner the rewinding of a slitted film strip on the rewinding core is automatically initiated. When the film strips are rewound on the respective cores 24a and 24b by a predetermined amount, the film 11 is cut by the cutter 19. After completion of the rewinding operation each of the rewinding core supports releases the cores, respectively. As a result, the rewound film strip rolls with the cores 24a and 24b are placed on the table lifter 80a and 80b, respectively, which are then lowered to transfer the rewound rolls to the discharging positions.

After the rewound rolls are taken out to the outside of the apparatus, the table lifters 80a and 80b are raised to the original positions for receiving rewound rolls. The core supply arms 31a and 31b are then turned clockwise directions to supply new rewinding cores to their respective supply means at the respective rewinding positions 23a and 23b. The previously mentioned wrapping and rewinding operation are repeatedly carried out.

As fully described in the above embodiment, according to the invention since at the start of winding operation the belts of the plurality of belt wrappers surround the outer peripheries of a plurality of cores and are rotated in operative relation to the rotation of the cores, slitted strips can be automatically wrapped around the outer peripheries of cores without manually sticking them to the cores, and since said cores are rotated independently of each other, film strips can be wrapped around cores without causing unevenness of wrapping.

What we claim is:

1. Apparatus for rewinding slitted film strips in a roll slitting and rewinding machine comprising means for slitting a continuous film to a plurality of strips, a plurality of rewinding cores for rewinding said plurality of strips, respectively, means for driving said cores for rotation, a plurality of endless belt assemblies engageable with said rewinding cores, respectively, to initiate the rewinding of said slitted film strips onto the respective rewinding cores, each of said endless belt assemblies comprising an endless belt stretched between a plurality of pulleys and means for moving each of said endless belt assemblies between a first position in which said endless belt is engaged with its own cooperating rewinding core, said endless belt being pressed at a stretched portion thereof against said cooperating core along its peripheral direction so that said endless belt is moved along with said rewinding core for initiating the rewinding of said slitted film strips onto said rewinding core, and, a second position in which said endless belt is kept apart from its cooperating core.

2. Apparatus for rewinding slitted film strips according to claim 1, in which said plurality of rewinding cores are driven independently for rotation.