Feb. 26, 1924. 1,484,842

H. E. NICHOLS ET AL

SLITTING AND REWINDING MACHINE

Filed May 7, 1923 2 Sheets-Sheet 1

Fig. 1.

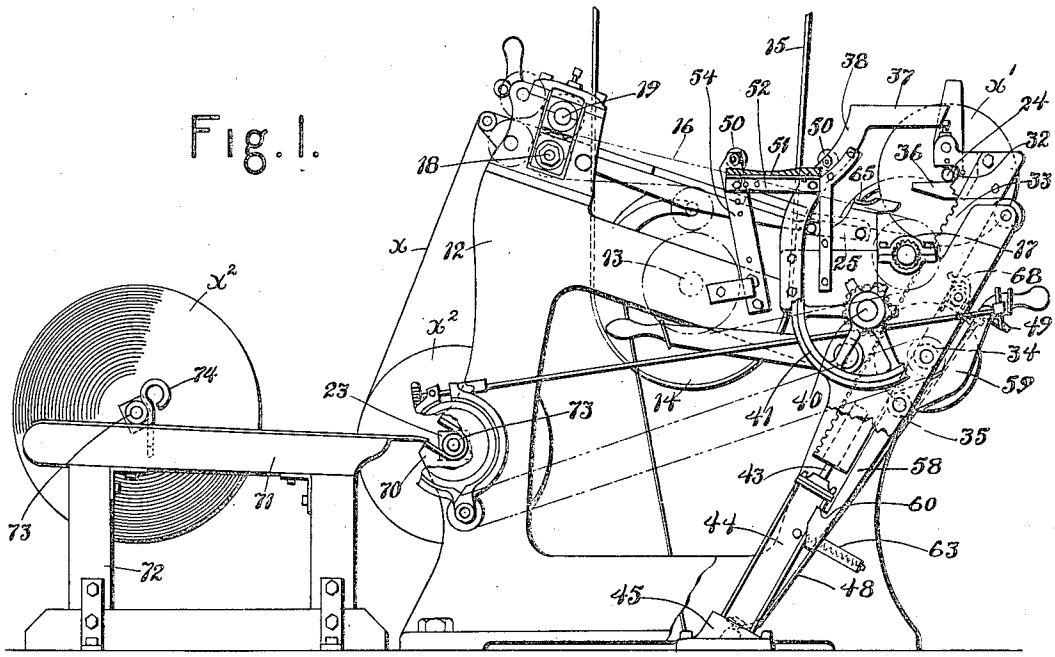


Fig. 2.

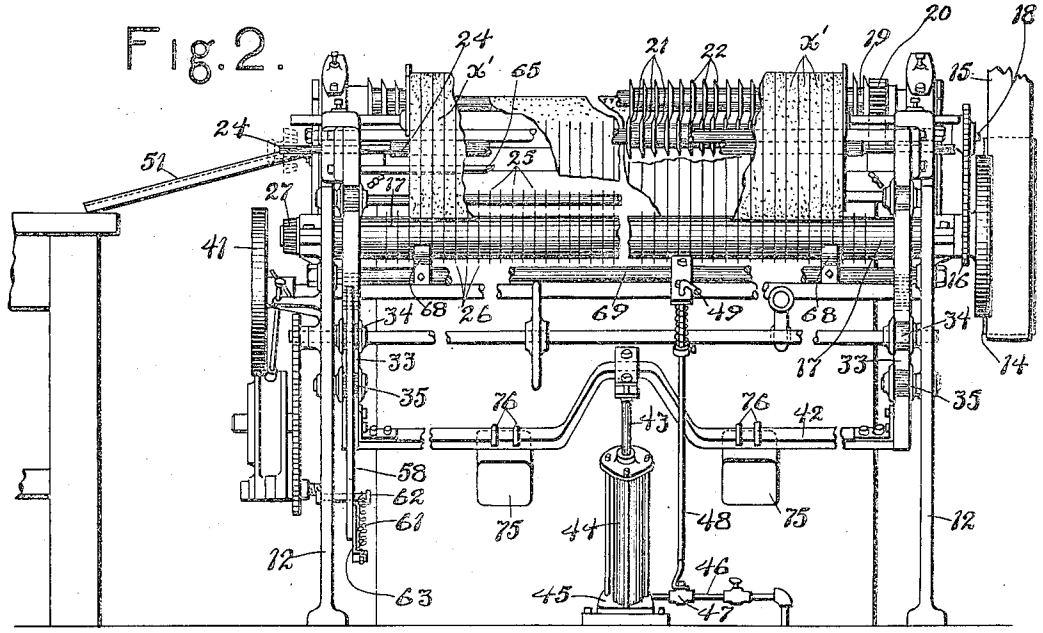
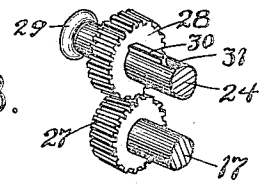


Fig. 3.



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Fig. 4.

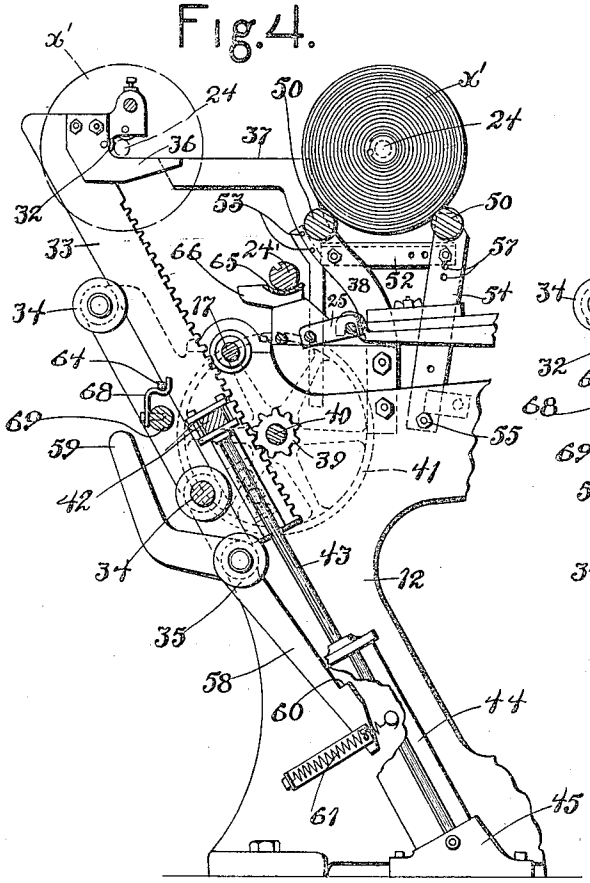


Fig. 5.

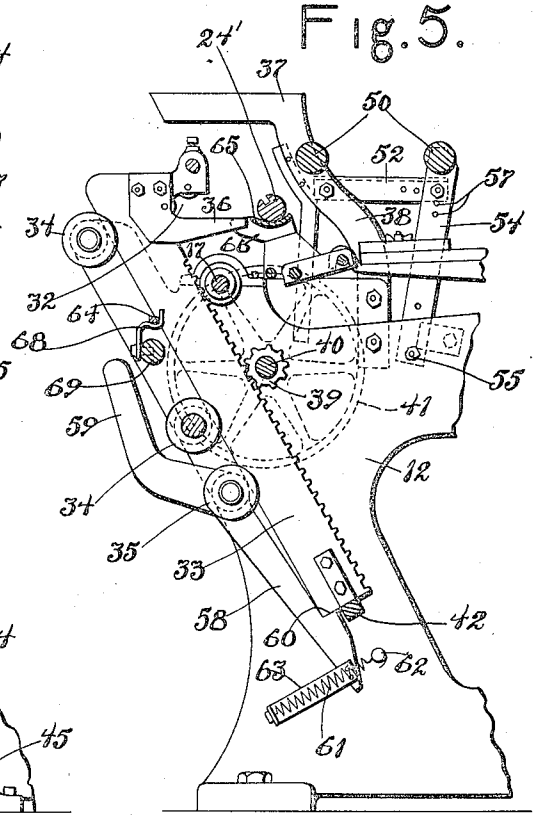


Fig. 6.

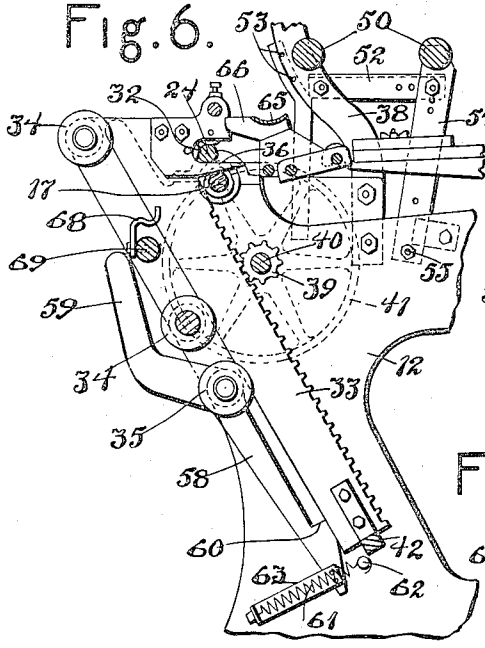


Fig. 7.

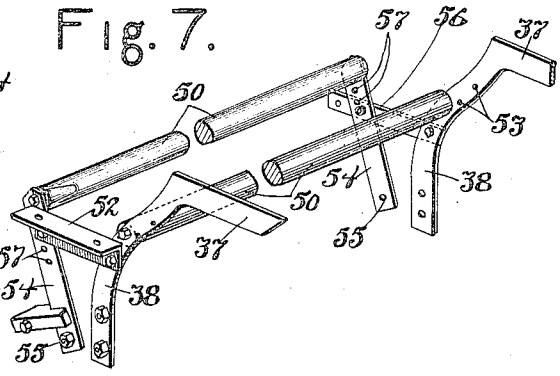
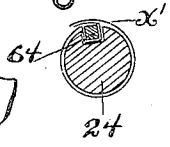


Fig. 8.



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UNITED STATES PATENT OFFICE.

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SLITTING AND REWINDING MACHINE.

Application filed May 7, 1923. Serial No. 637,054.

To all whom it may concern:

Be it known that we, HAROLD E. NICHOLS, EDWARD J. O'CLAIR, and WINTHROP L. PERRY, citizens of the United States, and residents of Nashua, in the county of Hillsborough and State of New Hampshire, have invented certain new and useful Improvements in Slitting and Rewinding Machines, of which the following is a specification.

This invention relates to machines for converting a comparatively wide web of sheet material such as paper or cloth into a plurality of narrow strips in the form of coils or small rolls. Such mechanisms are commonly known as slitting and rewinding machines, and several different types thereof are well known.

No machines of this character are really continuous in operation. They may run continuously and at quite a high speed so long as the supply or web roll is not exhausted and during the slitting and re-winding of strips into coils of predetermined diameters, but frequent stoppages are necessarily effected. Most of the stoppages and consequent idleness of the machine are to enable the completed coils to be removed and permit the operator to connect the ends of the strips to a fresh arbor for the next coils. Further idleness is due to the necessary occasional replenishment of the supply. When a supply roll is exhausted the machine must be stopped during the removal of the core of the exhausted roll, the placing of a fresh roll in position, and the piecing together (as by suitable adhesive) of the ends of the two webs. The supply roll is so large and heavy that the replenishment just referred to is not easily effected.

It will be readily understood that since the purpose of the machine is to produce coiled strips, the element of time during which the machine is stopped for the reasons explained must be considered in the cost of production. In other words the overhead expense of the plant and the time cost of the attendants must enter into the cost of producing the coils just as much when the machine is idle for effecting the changes referred to as when the machine is actually doing the slitting and re-winding.

The object of the present invention is to increase the effective speed of operation of machines of the type referred to, by means of mechanisms which materially reduce the time required for removing completed coils, starting fresh coils, and substituting supply rolls for exhausted web rolls.

Of the accompanying drawings which illustrate our improvements as applied to a known type of slitting and re-winding machines;

Figure 1 is a side elevation of the complete machine, partly broken out and in section.

Figure 2 is an elevation from the right of Figure 1, and showing partly broken away coils of slitted material.

Figure 3 is a perspective detail view of a temporary gear connection hereinafter described.

Figure 4 is a sectional elevation of some of the parts, viewed in the opposite direction from that of Figure 1, and on a larger scale.

Figures 5 and 6 are views similar to Figure 4 but illustrating the parts in different positions.

Figure 7 is a perspective view, partly broken out, of the cradle which receives and temporarily supports the coils.

Figure 8 is a sectional representation of a winding arbor, the beginning of a coil thereon, and the locking strip or cotter pin thereof.

Similar reference characters designate similar parts in all of the views.

The frame of the machine is indicated at 12. Mounted in suitable bearings is a shaft 13 (Fig. 1) having a pulley 14 driven by a belt 15. A sprocket chain 16, indicated by dotted lines in Figure 1, engages sprocket wheels carried by the main shaft 13, and by the shaft of the winding roll 17, and by one of a pair of cutter shafts 18, 19. Said two cutter shafts have the usual gear connections 20 (Fig. 2) so that both are driven.

Cooperating with the disk cutters 21 of the lower shaft 18 are the disk cutters 22 of the upper shaft 19, said cutters acting to divide into strips the paper or other sheet material x which is drawn through the machine in the usual manner as described, for instance, in Letters Patent 723,375 granted

March 24, 1903, to L. F. Fales. The paper web is drawn from a supply roll x^2 mounted on a core or shaft 23 and after the slitting is wound into coils x' on the winding arbor 24.

In the machine of the type illustrated, the strips pass between thin guides 25 and then between thin flanges 26 of the driven winding roll 17 and up to the winding arbor 24 for coiling. For a purpose presently explained, the shaft of the winding roll 17 which is constantly driven by the chain 16 as above described has at one end (Figs. 2 and 3) a slightly tapering pinion 27, while an oppositely tapered pinion 28 having a knob 29 is removably mounted on the arbor 24 and engaged by a small key 30 of the latter, preferably yieldingly mounted in a recess 31 of said arbor.

During the operation of the machine, the diameter of the coils on winding arbor 24 gradually increases, the rotation of said arbor being first effected through the medium of the pinions 27, 28. This is because at first the strips are leading to the arbor 24 between the flanges 26 of the roll 17 as above explained. When the coils reach a sufficient diameter to exceed the diameter of the flanges 26, the coils of the strips create enough friction to effect rotation, the attendant removes the pinion 28 by means of its knob 29. Continued rotation of the arbor and consequent coiling of the strips is then effected by the frictional bearing of the coils on the winding roll between its flanges 26. As indicated in Figure 2, the increase in the diameter of the coils x' causes the arbor to rise.

Each end of the arbor extends into a rearwardly open bearing 32 (see Figures 1, 4, 5 and 6) at the upper end of a rack bar 33 suitably mounted to slide in the frame with its straight edge riding against rolls 34, 35. Extending rearwardly from the bearing 32 of each rack bar is a ledge 36. To cooperate with the two ledges, to provide a track as hereinafter explained, there are two rails 37 the integral supporting arms 38 of which are rigidly connected to the frame of the machine.

The teeth of the rack bars are engaged by pinions 39 carried by a shaft 40 having a hand wheel 41 by means of which the rack bars may be manually shifted up or down if occasion renders such operation desirable. To enable such movements to be effected quickly however, we employ pneumatic mechanism such as presently described.

During the coiling or re-winding operation, the upward thrust of the arbor 24, due to the increasing diameter of the coils, causes the rack bars to slide upward. When the desired limit of the size of the coils has been reached and the power disconnected in the usual manner, it is desirable to raise the arbor and its coils to a higher position prior to severing the strips in the usual manner by a manually operated cutting implement.

The lower ends of the rack bars are rigidly connected by a bar 42, having an upwardly bent mid-length portion to which is coupled a piston rod 43, said rod extending into a cylinder 44 rigidly mounted on a block or base 45. As the cylinder and the piston therein may be of any preferred type similar to an air pump it is unnecessary to illustrate the interior structure. A pipe 46 having a valve 47 leads from a source of compressed air to the lower part of the cylinder. An operating rod 48 having a handle 49 is connected to the valve 47. The valve is, preferably, of a well known type which, by turning it one way compressed air is admitted to the cylinder to effect a lifting of the rod 42, the two rack bars 33, and the arbor and its coils mounted in the bearings 32, and by turning it the other way will permit the air in the cylinder to escape and the consequent lowering of the parts just described. The mechanism just described constitutes a pneumatic motor which, at the will of the operator, will effect a quick lifting of the rack bars to the position shown in Figure 4 which indicates the limit of upward movement thereof. Assuming now that when so lifted there was a coil-loaded arbor in the position indicated by dotted lines in Figure 4, the operator now cuts across the strips which will then be leading down from the coils. The coils are in a conveniently accessible position for this operation. If the material is gummed paper, he will, before cutting, run a moist brush lengthwise of the series of coils and lay the cut ends of the strips thereonto, thereby confining the coils. He then rolls the arbor 24 over the track provided by the ledges 36 onto the track provided by the rails 37, (said ledges closely overlapping the ends of the rails) and the coils land on two parallel smooth bars 50 which form a cradle to receive the coils and their arbor. The cradle serves to retain the series of coils in the form of a cylinder, with the arbor 24 extending through the center thereof.

At one end of the cradle, and in line therewith, is a slideway 51 preferably inclined as indicated in Figure 2 and concaved as indicated in Figure 1. At its inner end it is supported by a flanged brace member 52 (Figs. 1 and 7) and at its outer end may bear on a suitable table. An instant after the coils and arbor arrive in the cradle from the tracks 36, 37, an attendant pushes them along the cradle and over the slideway or chute 51 onto the table for disassembling. All this operation, from the time when the coiling is stopped until arrival on the table, is readily effected in a few seconds of time.

To enable the cradle to properly receive

and then permit cylindrical groups of coils of widely different diameters to be slid along it onto the chute 51, the two bars 50 are mounted so as to be adjustable relatively to each other. In the embodiment of the invention illustrated such adjustment is provided by mounting the end pins or journals of one bar in holes 53 in the rigid arms 38 (Figs. 5, 6 and 7) there being several holes in each arm. The other bar has its end pins or journals mounted in holes in the upper ends of two arms 54 pivoted to the frame at 55. Braces 52, 56 (Fig. 7) are connected at one end to the rigid arms 38 and at the other end have suitable pins or bolts entering holes 57 in the pivoted arms 54. By means of the holes 53 in the rigid arms 38 the height of the cradle bar 50 over which the coils must pass to reach the position indicated by full lines in Figure 4 may be varied to suit the work to be done, and by means of the pivoted arms 54 and their holes 57 and the braces 52, 56, the other cradle bar can be secured at a greater or lesser distance from the one which is carried by the fixed arms 38.

The reasons for employing two rolls 34 in addition to the usual roll 35 against which the back of each rack bar bears is to render it certain that each rack bar will be backed by two rolls whether in its upper or lower position as indicated by comparing Figures 4, 5 and 6. The structure is such that the lower one of the two rolls 34 can never be passed by the lower end of the rack bar. The rack bars can only be raised to a limit determined by the pneumatic motor, and the lower rolls 34 are in position above the limit of upward movement of the lower ends of the rack bars.

While the parts are in the position shown in Figure 4 the attendant rolls the completed set of coils and their arbor from the dotted to the full line position illustrated in Figure 4, and the attendant then actuates the handle 49 to cause the valve 47 to permit air to escape from the cylinder 44 so that the bar 42 and the two rack bars with their track ledges 36 may descend. In order that such automatic descent may be temporarily arrested at the point indicated in Figure 5, for a purpose presently described, we provide a latch arm 58 pivoted on the stud of roll 35 and having a handle 59. The latch arm has a shoulder 60, and a spring 61 connecting a fixed pin 62 with a bracket strip 63 of the latch arm tends to hold the latch arm with its shoulder 60 in the path of movement of one of the rack bars as shown by comparing Figures 4, 5 and 6.

It is not necessary to employ a latch arm 58 for each rack bar 33. This is partly due to the bar 42 which connects the two rack bars, and more particularly due to the shaft 40 having two pinions 39 engaging the two racks. Therefore, if one rack bar is arrested by the latch 58 the other rack bar is correspondingly arrested because of the cross bar 42 and the shaft 40 with its pinions 39.

The object of this device will now be explained. The arbors 24 on which the coils are wound have key ways in which the ends of the strips are confined by means of a strip engaging or locking rod 64 (Fig. 8) at the beginning of a coiling operation. When the coils and arbors are disassembled as hereinbefore mentioned, as by pulling out the rod 64 and sliding the coils off from the arbor, said arbor and its rod 64 are free to be used for another coiling operation. In order that these may be in quickly accessible position for use as soon as one set of coils and their arbor have been pushed onto the cradle bars 50, we provide an arbor holder 65 preferably in the form of a shallow trough supported by the frame of the machine just below the cradle and between it and the position occupied by the ledges 36 when the latter are in the position shown by Figure 5. As shown in said figure the ledges 36 are then substantially flush with ledges 66 which project from the arbor holder 65. This is due to the latch arm 58. Therefore, the moment that the automatic downward movement of rack bar is arrested by the latch arm 58 the attendant can roll the spare arbor 24′ from the holder 65 directly to operative position in the bearings 32. The strip ends resulting from the cutting at the completion of the preceding set of coils are laid across the key way of the arbor and a rod 64 pressed to position as indicated in Figure 8 and secured by the usual sliding rings not necessary to illustrate. When the spare arbor 24′ is placed in the holder 65, its rod 64 is also placed in a quickly accessible position. The temporary holder for said spare rod 64 comprises a pair of hook-shaped brackets 68 supported by a tie rod 69.

Referring now to Figure 5, and assuming that while the parts are in the position illustrated by said figure the arbor and strip engaging rod have been removed from their holders and that the strip ends have been engaged therewith as indicated in Figure 8, all of which is quickly effected owing to the accessibility of the arbor and rod, the attendant pushes the handle 59 of the latch arm backward so as to shift the shoulder 60 away from its arresting position. Then the rack bars automatically descend to the position shown in Figure 6 and the next coiling operation begins.

It will now be understood that the two rack bars, with their connecting bar 42, constitute a carriage having bearings 32 for successively employed winding arbors, and that by means of the motor 44, 43, said carriage may be quickly raised to the position shown in Figure 4 for delivering of a com-

pleted set of coils, then lowered to the position shown in Figure 5 for assembling the necessary members for the next coiling operation, and then lowered to the position shown in Figure 6 for beginning said next coiling operation. The reason for preferring a pneumatic motor with connections such as illustrated is that during the lowering of the carriage the air in the cylinder 44, although escaping fairly rapidly, still acts as a cushion to prevent a too rapid descent of the carriage.

As shown in Figure 1, the frame has rearwardly open bearings 70 for the shaft or core of the roll x which is supplying the material that is being slitted and coiled.

As has been stated, usually one supply roll contains enough material for a number of sets of coils. The supply roll is heavy and difficult to manipulate. It is practically impossible to so proportion the supply rolls, relatively to the number of sets of coils that can be made from each one, that a supply roll will be exhausted simultaneously with the completion of a set of coils. Therefore it is necessary, in order to avoid waste, to piece the web of a fresh supply roll onto the end of the web drawn from an exhausted roll. In order that the piecing and the placing of the fresh supply roll in position may be quickly effected, we extend the lower portions of the bearings rearwardly far enough to support a second supply roll. Such extensions might be integral with the bearings but as a matter of construction it is more convenient to form them as separate strips 71 mounted on a rigid stand 72 which is so secured relatively to the frame 12 as to practically form a part thereof. The top side rails of the stand and the strips 71 thereon form an exposed track or rails preferably inclined, for the projecting ends of the core or shaft of a second supply roll. Mounted on said projecting ends are small rolls 73. By suitable means such as removable pins 74, the said second supply roll is retained in the position shown in Figure 1 until the web roll in the bearings 70 is exhausted. Then the ends of the two web rolls are joined adhesively, the exhausted core is removed from the bearings, the pins 74 removed and the second supply roll is then rolled along the exposed track 71 directly into the bearings and slitting and coiling resumed. This substitution is effected in a few seconds of time and then while the slitting and coiling is proceeding, a new supply roll is mounted on the track and held ready by the replaced pins 74.

Another feature of our invention which, however, has no bearing on the matter of saving time, relates to means for varying the pressure on the coils x'. The two rack bars 33 and their connecting bar 42 (Fig. 1) constitute a frame which is gradually lifted as the coils increase in diameter. Sometimes, owing to characteristics of the material being operated upon, it is desirable to vary the weight of this frame as a whole so as to increase or diminish the pressure of the coils against the winding roll 17, and sometimes it is desirable to effect more pressure at one end of the series of coils than at the other end. To effect such variations, we employ weights 75 having hooks 76 adapted to removably engage the bar 42 to vary the total weight. When one or more of such weights is slid along the bar toward one side of the machine the result is to effect more pressure of the coils on the winding roll at or near one end than at or near the other end.

As the operations of the different parts of the machine have been explained in connection with the description of the structure of said parts, it is unnecessary to describe the operation of the machine as a whole. It is to be noted however that, besides effecting a large saving of time in the production of a given number of completed coils, no labor of lifting is required to effect delivery of the coils and their arbors. The pneumatic motor effects the lifting of each completed set of coils to position for severing the strips and sealing down the outer ends thereof and after that the attendant simply rolls the arbor and its coils over the track 36, 37, onto the cradle support and then slides it along the smooth bars 50 thereof onto and along the slideway 51 for disassembling.

We do not limit ourselves to the specific type of machine illustrated in the accompanying drawings, as the several features of improvements pointed out in the appended claims are capable of being embodied in slitting and re-winding machines of other types.

Having now described our invention, we claim:

1. In a slitting and re-winding machine, a movable carriage having bearings for a winding arbor a support in fixed elevated position for receiving and facilitating the delivery of an arbor carrying a completed set of coils, and a motor for raising the carriage to a point to permit discharge of the arbor and its coils onto said support.

2. In a slitting and re-winding machine, a movable carriage having bearings for a winding arbor, a support in fixed elevated position for receiving and facilitating the delivery of an arbor carrying a completed set of coils, and a pneumatic motor for raising the carriage to a point to permit discharge of the arbor and its coils onto said support.

3. In a slitting and re-winding machine, a pair of slidingly mounted bars having bearings for a winding arbor and having a connecting cross bar, and a pneumatic mo-

tor connected to said cross bar to vary the elevation of the arbor bearings.

4. In a machine of the character described, a movable carriage having bearings for a winding arbor, means for effecting winding of sheet material on the arbor while the carriage is in one position, an elevated support for the material after it is wound, means for shifting the carriage to position adjacent to said elevated support, and means for guiding the wound arbor from the carriage to said support.

5. In a machine of the character described, a movable carriage having bearings for a winding arbor, means for starting winding of sheet material on the arbor while the carriage is in one position, a support for the material after it is wound, means for shifting the carriage to another position adjacent to said support, means for guiding the wound arbor from the carriage to said support, and a slideway leading from said support to a position for disassembling.

6. In a machine of the character described, a carriage having bearings for a winding arbor, a pneumatic motor for elevating the carriage from a lower to a higher position, means for starting winding of sheet material on the arbor while the carriage is in a lower position, an upper support for a completed set of coils, and a track for directing said set to the support from the carriage when the latter is in elevated position.

7. In a machine of the character described, a carriage having bearings for a winding arbor, a pneumatic motor for elevating the carriage from a lower to a higher position, means for starting winding of sheet material on the arbor while the carriage is in a lower position, an upper cradle comprising a pair of smooth parallel bars provided with means for relatively adjusting them, and a track for directing a completed set of coils from the carriage to the cradle.

8. In a machine having means for slitting sheet material and coiling the strips on an arbor, a carriage for elevating a completed set of coils, said carriage having arbor bearings provided with ledges extending therefrom, rails in position to be in alinement with said ledges when the carriage is elevated, and a support for receiving the coils and their arbor from the rails.

9. In a machine having means for slitting sheet material and coiling the strips on an arbor, a carriage for elevating a completed set of coils, said carriage having arbor bearings provided with ledges extending therefrom, rails in position to be in alinement with said ledges when the carriage is elevated, and a support for receiving the coils and their arbor from the rails, said support being adjustable relatively to the rails.

10. A slitting and re-winding machine having a carriage provided with bearings for a winding arbor, means for shifting the carriage from a lower arbor-coiling position to an upper delivering position, and permitting it to return to lower position and means for temporarily arresting downward movement of the carriage at a point above the position for starting coiling, said arresting means being movable to permit the carriage to descend to its said lower position.

11. A slitting and re-winding machine having a carriage provided with bearings for a winding arbor, means for shifting the carriage from arbor-coiling position to an upper delivering position, and a manually operable latch in the path of downward movement of a portion of said carriage to temporarily arrest the carriage at a point above its arbor-coiling position.

12. In a machine having means for slitting sheet material and coiling the strips on an arbor, a carriage comprising a pair of connected inclined slidingly mounted bars having bearings for a winding arbor, means for elevating the carriage to a predetermined elevation for removal therefrom of a completed set of coils, and upper and lower bearing rolls for said bars, the lower bearing rolls being above the limit of upward movement of the lower ends of said bars.

13. A slitting and re-winding machine having a carriage provided with bearings for a winding arbor, means for shifting the carriage from arbor-coiling position to an upper delivering position, means for positively holding the carriage temporarily in an intermediate position of elevation and an arbor holder in position of proximity to the bearings when the carriage is in said intermediate position.

14. A slitting and re-winding machine having a carriage provided with bearings for a winding arbor, means for shifting the carriage from arbor-coiling position to an upper delivering position, an arbor holder in position of proximity to the bearings when the carriage is in a lower position, and supports leading from said holder to enable an arbor to be rolled therefrom directly to said bearings.

15. In a machine having means for slitting sheet material and coiling the strips on arbors provided with strip-engaging rods, a carriage provided with bearings for an arbor, means for raising and lowering the carriage, means for positively holding the carriage temporarily in an intermediate position of elevation and holders for an extra arbor and rod, said holders being in proximity to the bearings when the carriage is in said intermediate position.

16. In a machine having means for slitting sheet material and coiling the strips on

arbors provided with strip-engaging rods, a carriage provided with bearings for an arbor, means for raising and lowering the carriage, holders for an extra arbor and strip-engaging rod, said holders being in proximity to the bearings when the carriage is in a lower position, and means for temporarily arresting the carriage at a point above its lowermost position and with its bearings in line with said arbor holder.

17. In a slitting and re-winding machine, a pair of slidingly mounted bars having bearings for a winding arbor and having a connecting cross bar, a winding roll in position for coils on the arbor to bear on the said roll, and weights removably mounted on said cross bar.

18. In a slitting and re-winding machine, a pair of slidingly mounted bars having bearings for a winding arbor and having a connecting cross bar, a winding roll in position for coils on the arbor to bear on the said rolls, and weights mounted on said cross bar and movable longitudinally thereof.

In testimony whereof we have affixed our signatures.

HAROLD E. NICHOLS.
EDWARD J. O'CLAIR.
WINTHROP L. PERRY.

Witnesses:
MYRON BUSWELL,
V. E. NUNEY.