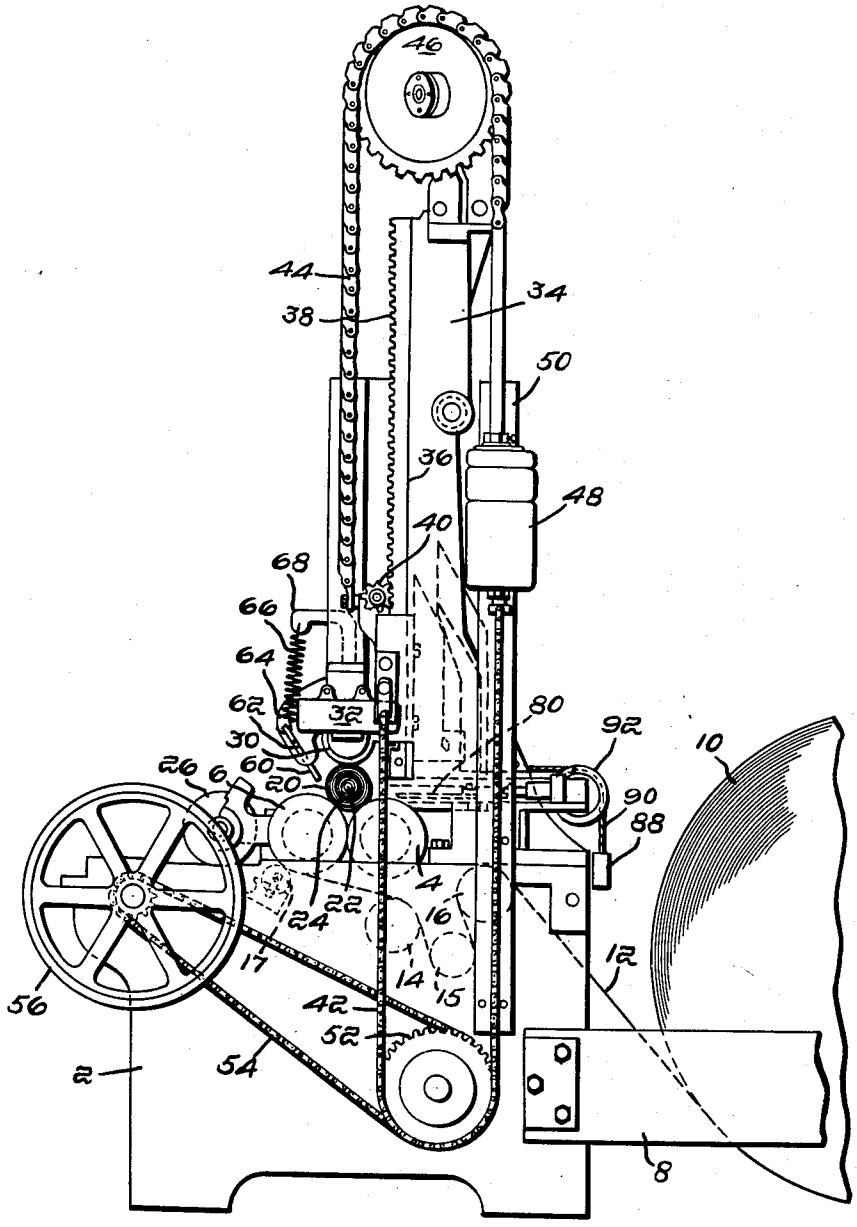
Feb. 23, 1954 L. PRIEST 2,670,152

REWINDING MACHINE

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Fig. 1.



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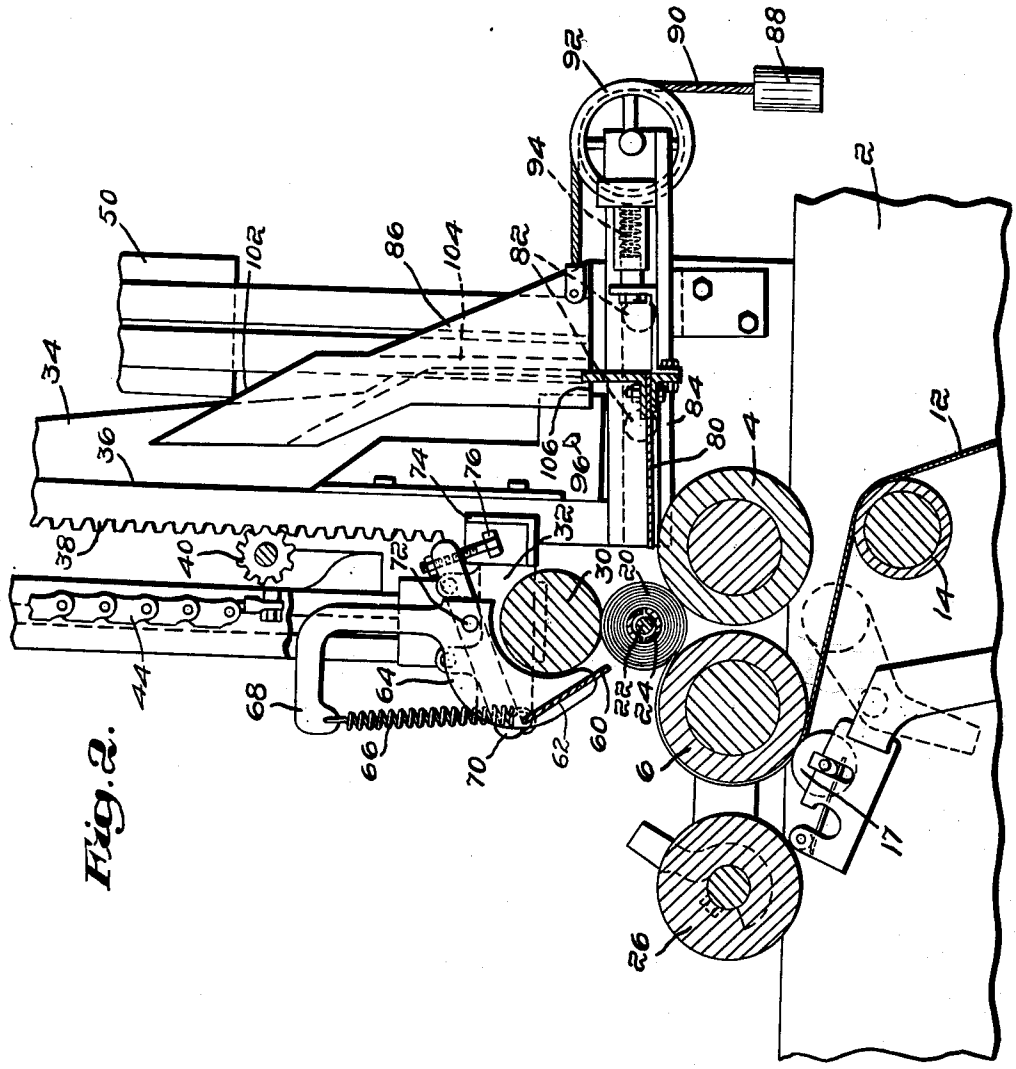


Fig. 2.

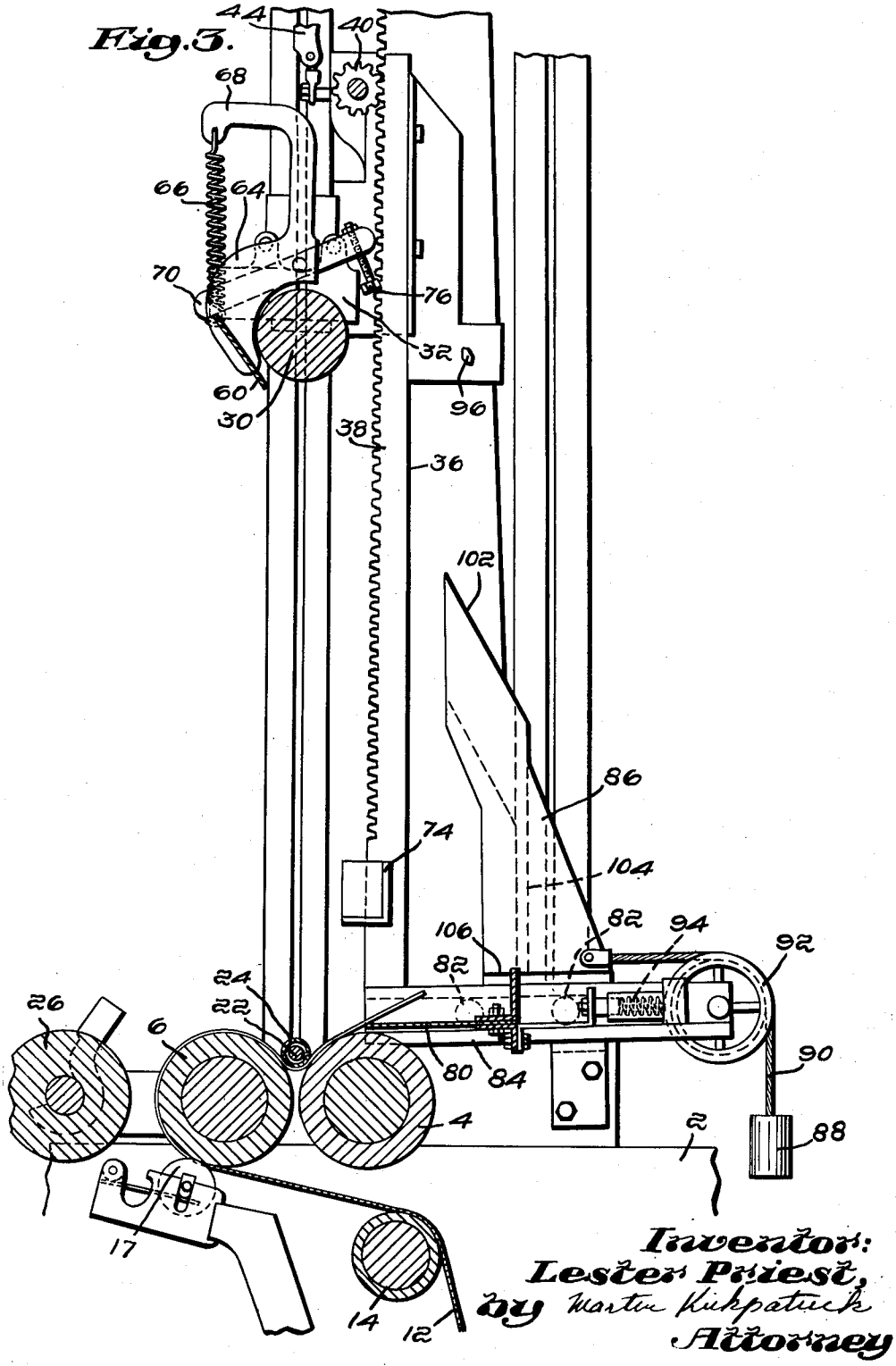
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Fig. 3.



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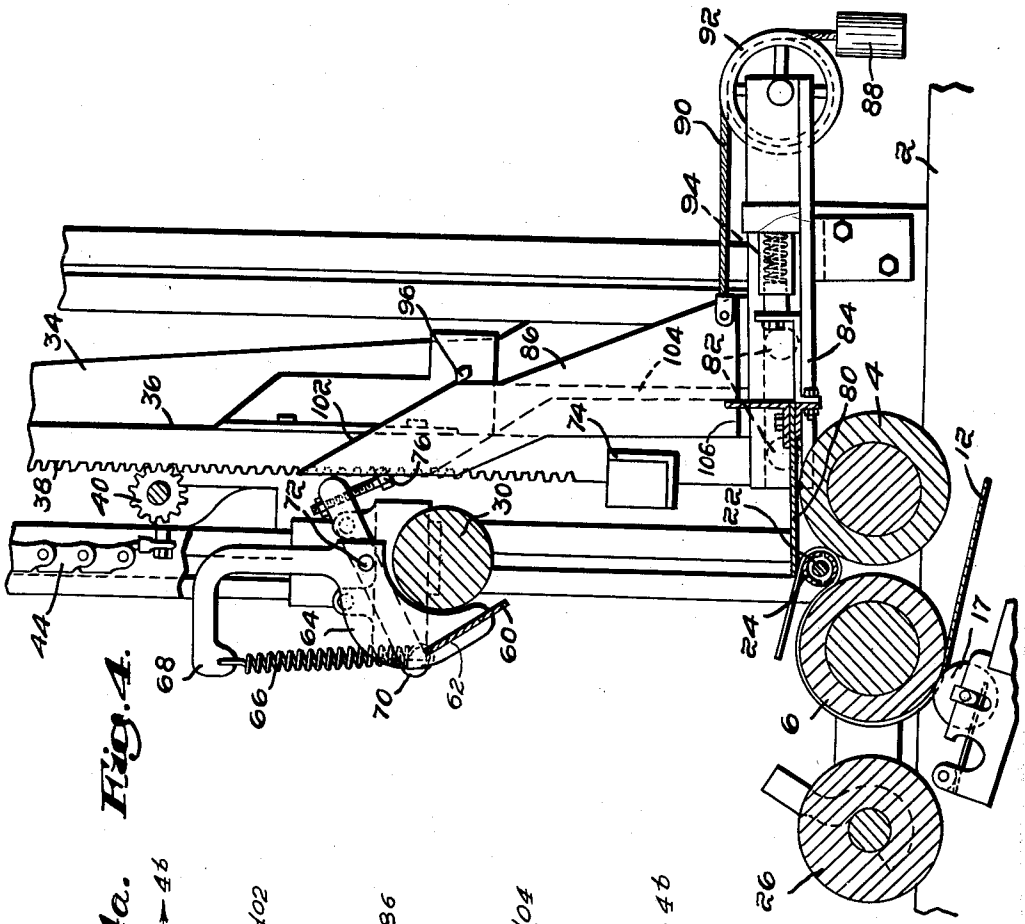


Fig. 4.

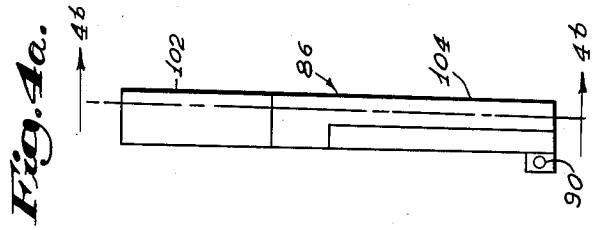


Fig. 4a.

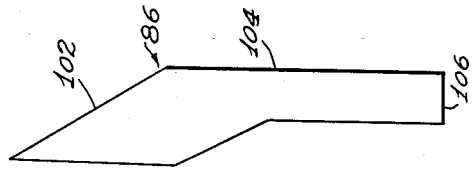


Fig. 4b.

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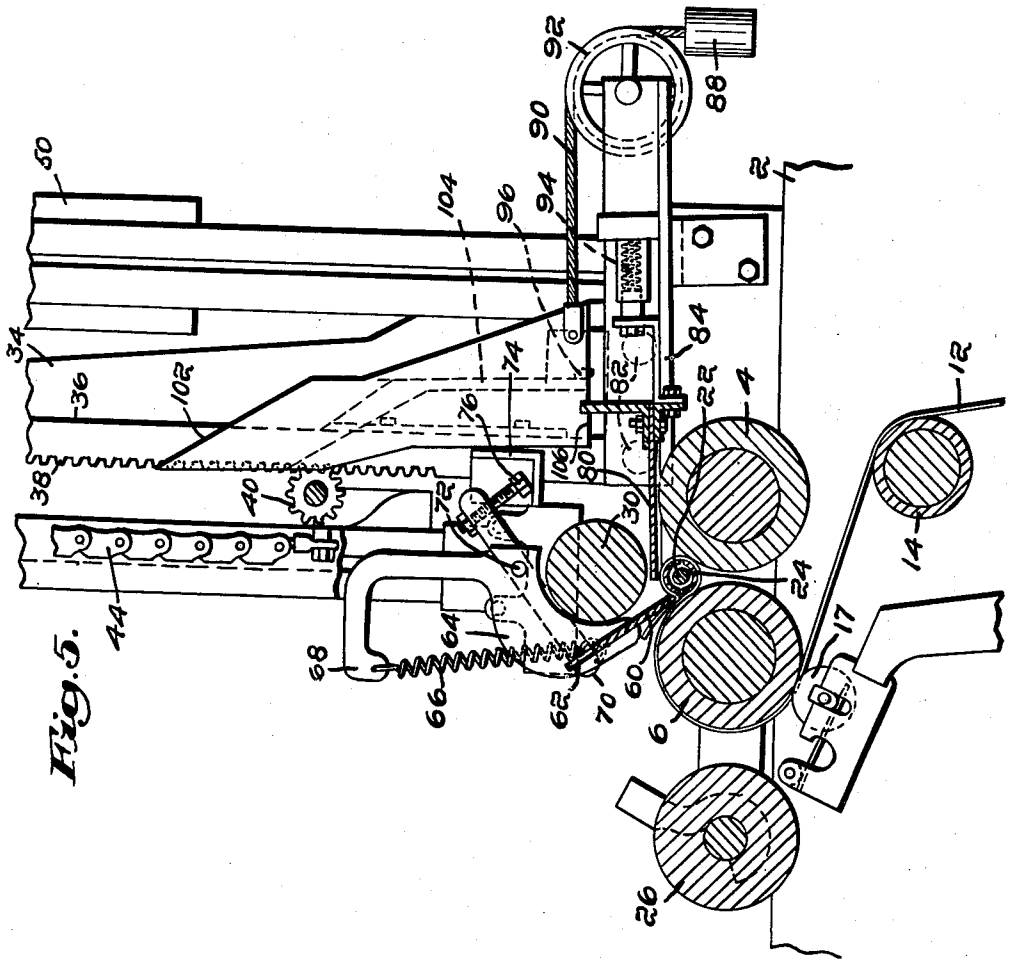


Fig. 5.

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2,670,152

UNITED STATES PATENT OFFICE

2,670,152

REWINDING MACHINE

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Application March 3, 1950, Serial No. 147,387

6 Claims. (Cl. 242—66)

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This invention relates to improvements in paper rewinding machines, and more particularly to a paper slitting and rewinding machine for converting a relatively wide web of paper or other sheet material into a number of relatively small and narrow rolls.

In accordance with a usual practice in slitting and rewinding a relatively wide web of paper into a number of narrow rolls, the web is first slit and then wound in slit form on a number of cores mounted on a mandrel, said mandrel being rotated to wind the web on the cores by a pair of driven bed rollers frictionally engaging the outer surface of paper being wound. When the desired amount of paper has been wound on the cores, it is necessary to stop the machine, sever the web of paper with a knife or the like, remove the mandrel with the wound rolls, and transfer the slit web onto another set of cores on another mandrel before restarting the machine. Since the web to be transferred has already been slit, it consists of a large number of strips of paper which must be tensioned, aligned, and tucked into the nip between a live roller and the core. In prior commercial practice, the operator normally has performed the transfer and tucking operation by the use of a tool with a blade long enough to engage the entire width of the slit web, which may be six feet or more, but the use of such a tool was awkward, non-uniform, and normally required two or three false starts before the strips were all securely tucked into the nip so that the rewinding operation could be resumed. This transfer and hand tucking operation was necessarily time-consuming and, during such time, the machine was idle, thus greatly decreasing the possible production of the machine due to the large number of transfer and tucking operations necessary. Furthermore, the use of such a tool did not give uniform tucking of all the cores to be wound, and hence the wound rolls resulting from the rewinding operation were not uniform.

A general object of my invention is to provide novel apparatus for automatically transferring and tucking the end of a relatively wide slit web into the nip between underlying rollers and the mandrel-mounted cores on which the small rolls are to be wound in effecting a transfer of the web from fully wound rolls on one mandrel to the empty cores on another mandrel.

A further object of my invention is to provide automatic transfer and tucking apparatus which may be added to a type of rewinding machine in commercial use, without the necessity of providing a completely new machine in order to secure the advantages of my invention.

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A still further object of my invention is to provide an automatic tucking apparatus which will produce uniformly wound rolls, and which will decrease the amount of time at present required to transfer the slit web from the fully wound rolls to a new set of cores, thus increasing production.

For the purpose of more fully describing one preferred embodiment of my invention, reference is made to the following drawings, in which:

Fig. 1 is an elevational view of one end of the machine;

Fig. 2 is an elevational cross-sectional view showing the position of the parts while a roll is being wound on the machine;

Fig. 3 is an elevational cross-sectional view showing position of the parts at the beginning of the transfer and tucking operation;

Fig. 4 is an elevational cross-sectional view showing the position of the parts at an intermediate portion of the transfer and tucking operation;

Figs. 4*a* and 4*b* are respectively side and end elevational views of a part of the machine of Fig. 1; and

Fig. 5 is an elevational cross-sectional view showing the position of the parts at the completion of the transfer and tucking operation.

Referring to Fig. 1—the rewinding machine illustrated, in general, is of a conventional type and includes a frame 2 on which are mounted bed rollers 4 and 6 driven by suitable means not shown. A roll 10 of paper or other sheet material is mounted on brackets 8 at the rear of frame 2 of the machine, the web 12 of paper being led from the roll 10 by means of suitable guide rollers 14, 15 and 16 past slitter knives 17, around the forward driven bed roller 6, and being wound up on roll 20, said roll including a mandrel 22, with, preferably, cores 24 as hereinafter more fully explained. An idler roller 26 is provided at the front of the machine adjacent bed roller 6 to facilitate removal of fully wound rolls 20 from the machine. In order to provide the necessary frictional engagement between roll 20 and bed rollers 4 and 6, such rewinding machines are normally provided with a head roller 30 rotatably mounted in end bearings 32, said end bearings being mounted for vertical movement on the vertical end members of a top frame 34. To aid in guiding said head roller bearings 32 for vertical movement, top frame 34 may be provided with vertical tracks 36 and racks 38 as a part of the vertical end members at opposite ends of top

frame 34, head roller bearings 32 riding on said tracks 36, and pinions 40 mounted on said head roller bearings engaging said racks 38.

The vertical movement of bearings 32 is controlled by chains 42 and 44 attached to bearings 32 and to counterweights 48. Upper chains 44 lead around sprockets 46 rotatably mounted at the upper ends of the vertical members of top frame 34 to counterweights 48 mounted for vertical movement along guide bars 50 mounted at opposite ends of the rear of frame 2. Counterweights 48 are normally adjusted to permit head roller 30 to be automatically moved upward as the size of the rewound roll of paper 20 increases during winding, without causing undue pressure on said roll 20. Lower chains 42 lead around sprockets 52 rotatably mounted on frame 2 and upward to counterweights 48. Sprockets 52 may be rotated to move head roller 30 by means of chain 54 operatively attached to one of said sprockets 52 and hand wheel 56, so that the rotation of hand wheel 56 will rotate sprockets 52 and move head roller 30 vertically as desired.

Referring to Figs. 1 and 2—the novel transfer and tucking mechanism of my invention includes two blade-like elements extending for the entire width of the web 12 of paper or other sheet material and movably supported at opposite ends of the machine, one of said elements 60 acting as a tucking element to tuck the deflected web 12 into the nip between cores 24 on mandrel 22 and bed roller 6, said element 60 being urged downwardly by a pair of levers 70 adapted to be pivoted about pins 72 by contact with adjustable bolts 76 on stops 74, and the other of said elements 80 acting as a transfer element to deflect the end of the web 12 of paper partly around cores 24 on mandrel 2. Since this effects a complete surrounding of the cores 24 by the web 12 and an overlapping of the tucked portion, rotation of cores 24 by bed rollers 4 and 6 will wind and build up the web 12 to form a roll or series of rolls 20.

Transfer element 80 is adapted for movement toward and away from mandrel 22 surrounded by cores 24, in a plane substantially tangential to the upper surface of cores 24 to enable the end of web 12 overlying said transfer element to be deflected to a position partly around cores 24 on said mandrel where it may be engaged by tucking element 60. Rollers 82 mounted on transfer element 80 ride on tracks 84 mounted substantially horizontally on the end members of top frame 34, permitting free forward and rearward motion of said transfer element. Vertical cam plates 86 (Figs. 4a and 4b) are rigidly mounted on the ends of transfer element 80 and are movable with said transfer element. The transfer element 80 and associated cam plates 86 are normally urged rearwardly by weights 88 attached to cam plates 86 by cables 90, said cables being led around pulleys 92 rotatably mounted at the end of horizontal tracks 84. Back-up springs 94 are provided at the rear edge of horizontal tracks 84 to resist the rearward movement of transfer element 80 and cam plates 86.

Forward and rearward motion of rear transfer element 80 is provided by the action of cam followers 96 cooperating with cam plates 86, said cam followers being mounted on and vertically movable with bearings 32 to move transfer element 80 to its forward position as hereinafter more fully explained.

Tucking element 60 is adapted to tuck the end of the deflected web into the nip between bed roll 6 and cores 24 to initiate the rewinding, but yet does not interfere with the rewinding operation as it is vertically movable with head roller 30 and moves away from tucking engagement with web 12 as head roller 30 moves vertically, as hereinafter more fully explained.

The ends of tucking element 60 are slidably mounted in slots 62 in plates 64 mounted on bearings 32 and movable vertically with said bearings. The slots 62 and tucking element 60 are arranged at a suitable angle for tucking the web 12 into the nip between driven roller 6 and cores 24 on mandrel 22, said tucking element 60 being substantially tangential to the surfaces of driven roller 6 and empty cores 24 on mandrel 22 at their point of contact. The tucking element 60 is normally retained at the upper end of slots 62 by coil springs 66 attached to said element 60 and to arms 68 extending upwards from and forming a part of plates 64. Levers 70 are pivotally mounted on pins 72 on plates 64 and bear against the upper edge of tucking element 60, while stops 74 adapted to co-operate with said levers are rigidly mounted on top frame 34, said levers 70 being pivoted by contact with stops 74 as a foundation for the lever to urge tucking element 60 downward against the force exerted by the springs 66. Machine bolts 76 are provided on levers 70 to permit adjustment of the contact of levers 70 with stops 74.

Referring to Fig. 3, the position of the machine elements is shown at the beginning of an operating cycle, such as after a fully wound set of rolls of paper on a mandrel has been removed from the machine. In accordance with the usual practice, the head roller 30 has been raised vertically by means of hand wheel 56, and a mandrel 22 with empty cores 24 has been placed on top of the web 12 of paper between bed rollers 4 and 6 in readiness for the transfer and tucking operations preparatory to the winding operation. The bearings 32 carrying tucking elements 60 and cam followers 96 of my novel transfer and tucking mechanism have likewise been raised to bring cam followers 96 to a position above that of cam plates 86, and transfer element 80 is in its normal position with the cut end of web 12 overlying said element.

Referring now to Fig. 4, as head roller 30 is lowered by hand wheel 56, cam followers 96 engage the upper rear sloping edge 102 of cam plates 86, driving transfer element 80 forward under the web 12 of paper and transferring said web to a position partly around and over the top of cores 24 on mandrel 22, so that at the completion of the travel of cam followers 96 along the entire length of the upper rear sloping edges 102 of cam plates 86, transfer element 80 is in its forward position holding the web 12 tightly wrapped around and securely clamped on top of cores 24 on mandrel 2.

Referring now to Fig. 5, as the head roller 30 is lowered further to engage web 12 on cores 24 on mandrel 22, cam followers 96 engage the lower rear vertical edges 104 of cam plates 86, causing a dwell of transfer element 80 as head roller 30 is further lowered. At the same time, tucking element 60 is approaching operative tucking engagement with web 12, and when machine bolts 76 on levers 70 engage stops 74 on top frame 34, levers 70 are pivoted about pins 72 urging tucking element 60 downward in slots 62 against the force exerted by springs 66 and tucking the web 12 securely into the nip between driven roll 6 and cores 24 on mandrel 22. At the same time as the tucking element 60 tucks the web 12 securely around cores 24 and into the nip between cores

24 and driven roller 6, cam followers 96 pass out of engagement with lower rear vertical edges 104 of cam plates 86 releasing transfer element 80 which is then pulled rearwardly out of operative engagement with web 12 by weights 88, cam followers 96 passing beneath the lower horizontal edge 106 of cam plates 86. A slight further lowering of machine part 32 then permits head roller 30 to engage the web 12 on cores 24, such web still being securely held by upper tucking element 60.

The winding operation may then be started by rotating bed rollers 4 and 6. Since the web 12 overlying bed roller 6 overlaps the tucked end of web 12, the rotation of cores 24 by bed rollers 4 and 6 will wind and build up the web 12 on cores 24. As the number of turns of the web 12 on cores 24 increases, forming a roll 20, head roller 30 and associated bearings 32 are automatically raised by the increase in diameter of roll 20, such action being well known in rewinding machines of the type herein described. As bearings 32 are thus raised, levers 70 are pivoted about pins 72 as machine bolts 76 pass out of engagement with stops 74, releasing the pressure on tucking element 60 and permitting it to be pulled upward in slots 62 by springs 66, thus removing tucking element 60 from tucking engagement with web 12. The engagement and removal of tucking element 60 may be adjusted for different mandrels 22, cores 24 or the like by means of machine bolts 76, which adjustment will vary the point on the vertical travel of machine part 32 at which the levers 70 are pivoted by engagement with stops 74 through machine bolts 76, since such engagement initiates the downward movement of tucking element 60 in slots 62.

Thus the novel transfer and tucking elements of my invention do not interfere with the normal rewinding operation, since the transfer element 80 passes out of engagement with web 12 before the rewinding operation begins, and tucking element 60 engages web 12 only long enough to assure that the first few turns of web 12 are tight enough to produce uniform rolls 20, and then the tucking element passes out of engagement with the web 12 as the head roller 30 automatically travels upward under the influence of the increasing size of roll 20.

During the upward travel of head roller 30, cam followers 96 preferably engage the forward edges of cam plates 86 for at least the final portion of their travel over said cam plates, thus urging cam plates 86 and transfer element 80 rearward against back-up springs 94 so that when cam followers 96 pass above cam plates 86, said cam plates will be moved slightly forward by said back-up springs 94 in order to insure that cam followers 96 in their subsequent downward travel will positively engage the upper rear sloping edges 102 of said cam plates.

It is apparent from the above that the transfer and tucking operation will be performed automatically as the head roller elevating mechanism is elevated to remove a fully wound roll from the rewinding machine and then lowered after inserting a mandrel with empty cores. It will also be seen that my novel transfer and tucking apparatus is of a type that may be added to well known rewinding machines with a minimum amount of alteration, and as so added will result in a material reduction of the time necessary for transferring the web from a fully wound roll to empty cores and produce a better product at a much larger production rate.

Various changes and modifications may be made without departing from the spirit of the invention and all of such changes are contemplated as may come within the scope of the appended claims.

I claim:

1. In a winding machine for winding a web into rolls, a rotatable mandrel, roller means including a pair of rollers for frictionally rotating said mandrel, a movably supported transfer element movable for engagement with said web to deflect said web to a position partly around said mandrel, a movably supported tucking element operable to tuck said web into the nip between said mandrel and one of said rollers, tucking means operable after said transfer element has deflected said web around said mandrel to move said tucking element into tucking engagement with said web, said tucking means including a pivotally mounted lever adapted to move said tucking element, stop means cooperating therewith to pivot said lever to move said tucking element, and camming means operable to move said transfer element to deflect said web and operable after said tucking element has engaged said web to move said transfer element out of engagement with said web.

2. In a winding machine for winding a web into rolls, a rotatable mandrel, roller means including a pair of rollers for frictionally rotating said mandrel, a movably supported transfer element movable for engagement with said web to deflect said web to a position partly around said mandrel, a movably supported tucking element movable into engagement with said web to tuck said web, camming means operable to move said transfer element to deflect said web and operable after said tucking element has engaged said web to move said transfer element out of engagement with said web, said camming means including a cam plate movable with said transfer element and a cam follower movable with said tucking element and tucking means operable after said transfer element has deflected said web around the mandrel to tuck said web into said nip between said mandrel and one of its rollers, said means including a pivotally mounted lever adapted to move said tucking element and stop means cooperating therewith to pivot said lever to move said element into tucking engagement with said web.

3. In a machine for winding a web into rolls, a rotatable mandrel, roller means including a pair of rollers for frictionally rotating said mandrel, a movably supported tucking element operable to tuck said web into the nip between said mandrel and one of said rollers, and tucking means including a pivotally mounted lever adapted to move said tucking element and stop means cooperating therewith to pivot said lever to move said tucking element into tucking engagement with said web.

4. In a winding machine for winding a web into rolls, a rotatable mandrel, roller means including a pair of rollers for frictionally rotating said mandrel, a movably supported transfer element movable for engagement with said web to deflect said web to a position partly around said mandrel, a movably supported tucking element movable into engagement with said web to tuck said web and tucking means operable after said transfer element has deflected said web around said mandrel to move said tucking element to tuck said web into the nip between said mandrel and one of said rollers, and camming means operable to move said transfer element

after said tucking element has engaged said web to move said transfer element out of engagement with said web.

5. In a winding machine for winding a web into rolls as claimed in claim 4 in which said tucking means includes a pivotally mounted lever adapted to move said tucking element, and stop means cooperating therewith to pivot said lever to move said tucking element into tucking engagement with said web.

6. In a winding machine for winding a web into rolls as claimed in claim 4 in which said camming means includes a cam plate movable with said transfer element and a cam follower movable with said tucking element.

LESTER PRIEST.

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