Jan. 1, 1963 E. D. NYSTRAND ET AL 3,071,259

WINDER LOADER

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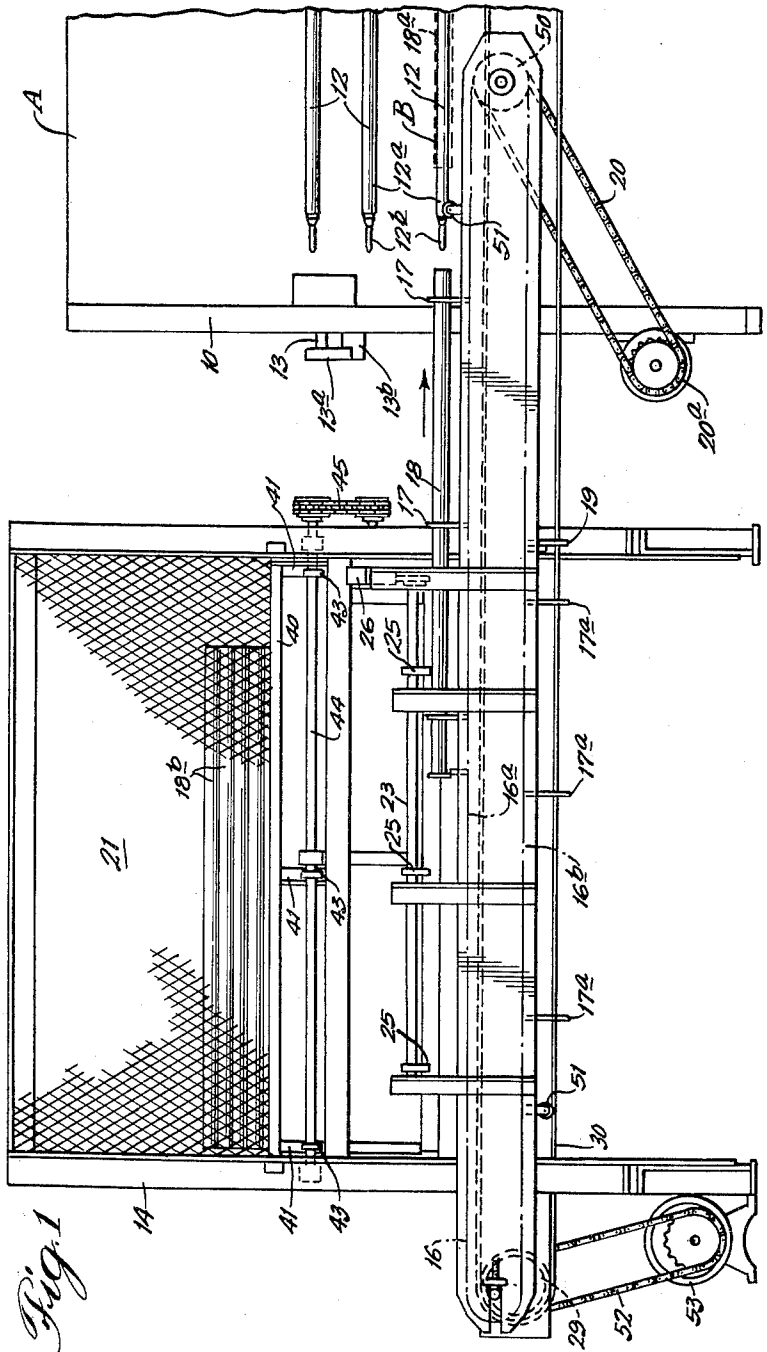


Fig. 1

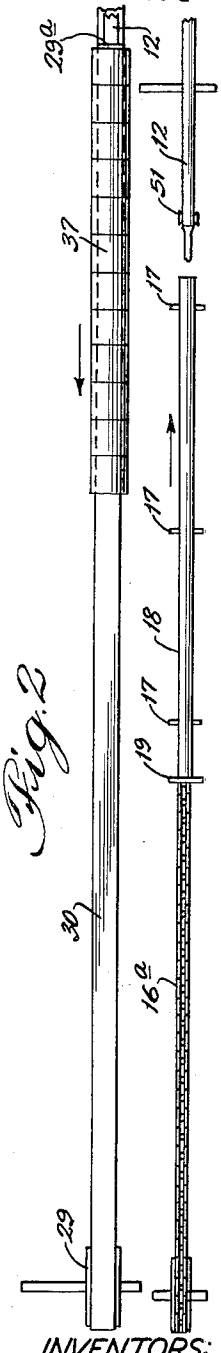


Fig. 2

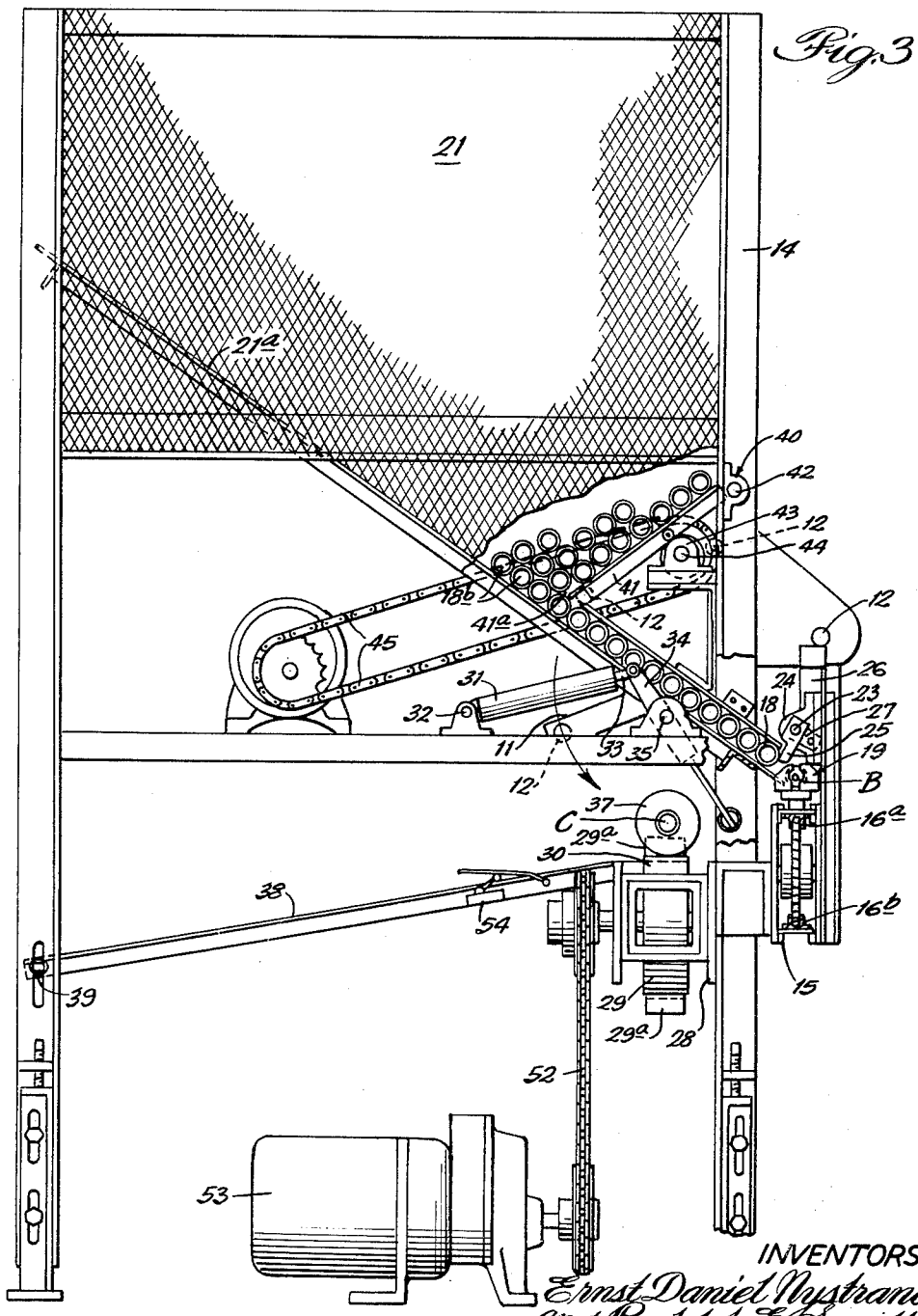
INVENTORS:
Ernst Daniel Nystrand
and Rudolph E. Smatt,
BY Dawson, Tilton, Fallon & Lungmus,
ATTORNEYS.

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Fig. 3



INVENTORS:
Ernst Daniel Nystrand
and Rudolph E. Smatt,

BY Dawson, Tilton, Fallon & Lungmus,
ATTORNEYS.

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WINDER LOADER

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Fig. 4

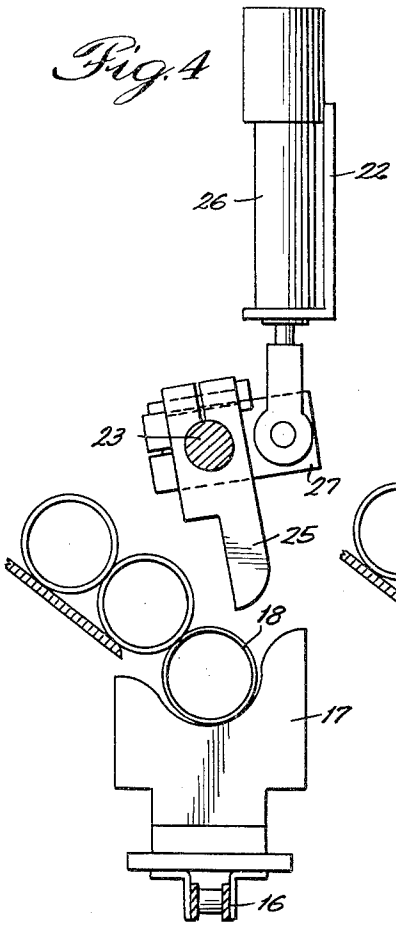


Fig. 5

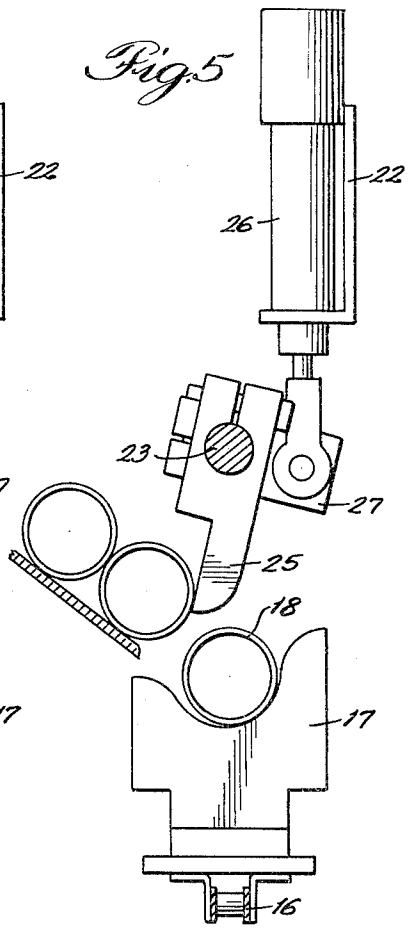


Fig. 6

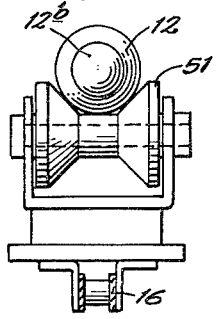


Fig. 7

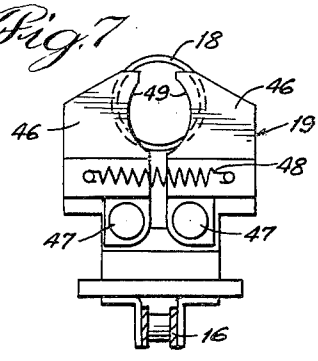
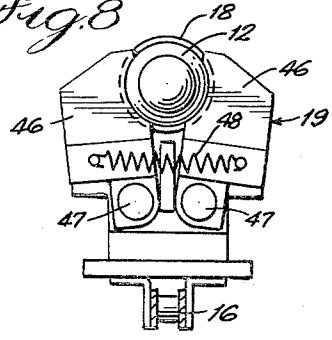


Fig. 8



INVENTORS:
Ernst Daniel Nystrand
and Rudolph E. Smatt,

BY Dawson, Tilton, Fallon & Lungmus,
ATTORNEYS.

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3,071,259

WINDER LOADER

Ernst Daniel Nystrand and Rudolph E. Small, Green Bay, Wis., assignors to Paper Converting Machine Co., Inc., Green Bay, Wis., a corporation of Wisconsin

Filed Sept. 4, 1959, Ser. No. 838,155
14 Claims. (Cl. 214—1)

This invention relates to a winder loader and, more particularly, to apparatus wherein cores for wound webs are automatically ensleeved on a cantilevered mandrel.

Conventionally, many types of paper webs are wound on cores, i.e., toilet tissue, paper toweling, etc. The apparatus provided for this operation is usually designated a "rewinder," since it serves to unwind the large diameter paper rolls provided by the paper machine and rewind the web after it has been slitted onto a number of paperboard cores. For example, the parent roll may be several feet in diameter and eight feet long. This is unwound at a rate in excess of one thousand feet per minute and, in the case of toilet tissue, slit into webs four and one-half inches wide. Conventionally, these webs are transversely perforated in the U.S. on four and one-half inch centers and thereafter rewound on one and one-half inch diameter cores with up to one thousand sheets per roll.

Within the last decade or so, the paper converting industry has witnessed the advent of the automatic rewinder. In this machine, the paper is unwound continuously at high speed from the parent roll while core-equipped mandrels are sequentially moved into position to pick up the fast-traveling web after the cores on a given mandrel have been suitably wound. Such an automatic rewinder can be seen in Kwitek and Nystrand Patent No. 2,769,600.

With a rewinder operating at 1000 f.p.m. on normal toilet tissue, each winding operation requires only 16 seconds, or less. To make the high speed operation economically feasible, it must not be interrupted. Heretofore, this desirable condition was not attained, since it was impossible to be sure that a new core would be installed in place. Here, it is to be appreciated that only a few seconds were available for loading the core, since the mandrel on which the core is to be installed must be in a subsequent station at the end of the winding cycle—this necessitated by the fact that the mandrel being wound must move out of the web pick-up station in order to make room for the next mandrel.

In large part, the cores have been loaded manually and any interruption meant the wasting of a large quantity of paper, since a heavy machine operating at a speed in excess of 1000 f.p.m. requires some time to come to rest. It would, therefore, be very desirable to provide means that would dependably equip rewinder mandrels with cores so that the high speed operation of which the rewinder is capable would be fully utilized. Such forms one of the objects of this invention.

Another object of the invention is to provide a novel core loading apparatus that operates automatically and in concert with an automatic rewinder to sequentially apply cores to cantilevered mandrels. Still another object is to provide novel core loading apparatus for an automatic rewinder characterized by novel core pusher elements that operate to positively seat the core in a desired position on a rewinder mandrel and without interfering with the other rewinder operations. Yet another object is to provide a core loader for an automatic rewinder that provides for advantageous roll unloading operation. Other objects and advantages of this invention can be seen as this specification proceeds.

The invention, in an illustrative embodiment, will be explained in conjunction with the following drawings:

FIG. 1 is a fragmentary front elevational view of a rewinder equipped with apparatus according to the invention;

FIG. 2 is a fragmentary top plan view of core loading and unloading apparatus;

FIG. 3 is an enlarged side view of the apparatus; and

FIGS. 4–8 are enlarged side views of mechanisms for supplying cores to the rewinder.

In the illustration given, the letter A designates generally an automatic, high-speed rewinder which may be of the character seen in the above-mentioned Kwitek and Nystrand Patent No. 2,769,600, issued November 6, 1956. The rewinder A is seen to include a heavy frame 10 capable of supporting without undesirable vibration the various rotating elements that operate at high speed. The frame 10 is seen to include turret 11 (see FIG. 3) equipped with a plurality of mandrels 12. A drive mechanism (not shown) is provided on frame 10 for indexing the turret 11 so as to sequentially bring one of the mandrels 12 into a core-loading station designated B in FIG. 3. The path of movement of each mandrel is circular and in that path each mandrel 12 passes through a sequence of stations. After the core-loading station, the mandrel carries the core to a station in which the core is transversely slitted so as to develop a plurality of roll cores, each of the proper length—this slitting operation corresponding to the horizontal slitting provided on the web entering the rewinder A. Further movement of the turret brings the mandrels 12 sequentially into a glue application station and thereafter to a web take-up and winding station. The final station of the mandrels 12 is a wound roll unloading station designated by C in FIG. 3.

Each mandrel stays in each station only a short time, a matter of seconds, so that any operation performed in the station must of necessity be accomplished quickly. All of this stems from the fact that a core being wound must progress along the circular path provided by indexing the turret 11 in order to vacate the web take-up station for occupancy by a subsequent mandrel—this being necessary in order to insure that the fast traveling web will be suitably taken up after the requisite winding of the web on a given mandrel. The frame 10 is equipped with a turret shaft 13 which is equipped with an arm 13*a*. The arm 13*a*, in the illustration given, rotates six times for each turret rotation, so that the arm 13*a* may be utilized as a means for signalling the completion of a given winding operation.

Disposed to one side of the rewinder frame 10 is an auxiliary frame 14 which provides means for loading and unloading the mandrels in the stations B and C. The frame 14 is seen to include a sub-frame 15 extending generally in alignment with a mandrel 12 in the core-loading station B. The sub-frame 15 supports a chain 16 for travel therein and thus, in effect, provides a conveyor track. The chain 16 is an endless chain and on the upper run 16*a* thereof, moves toward the rewinder A. The chain 16 is seen to be equipped with a plurality of core-supporting saddles 17 (see also FIGS. 4 and 5) which are effective to support a core 18 therein and in axial alignment with a mandrel 12 and the core-loading station B. Two sets of the core saddles 17 are provided, as shown, one set being on the upper run 16*a* of the conveyor while the other set is on the lower run 16*b* of the conveyor chain 16, the lower set being designated 17*a* in FIG. 1. The upper run of the conveyor chain 16 is seen to overlap the adjacent end 12*a* of the mandrel 12 in the core-loading station B. The mandrel 12 in this station is cantilevered, being supported only at its remote end so as to be easily ensleeved by the core 18. The mandrel 12 in the roll unloading station C is similarly supported at only its remote end. In the other stations, the man-

drels 12 are supported at both ends, a releasable journal being provided for this purpose on the frame 10, the particulars of which can be seen by reference to the above-mentioned Kwitek and Nystrand patent.

Associated with each set of saddles 17 and 17*a* is a pusher generally designated 19 and which is seen to be positioned rearwardly of each set of saddles. Thus, a core 18 supported on the saddles 17 is effectively pushed or rammed onto a mandrel 12 in the core-loading station B when the conveyor chain 16 has the upper run 16*a* thereof advancing toward the unsupported end 12*a* of a mandrel 12.

The conveyor 16 is actuated by a chain and sprocket mechanism 20, which is connected to a motor 20*a*. The motor 20*a* may be energized by a signal from the arm 13*a*. This is operative to permit advance of the upper run 16*a* of chain 16 only when the mandrel 12 is stabilized within the core-loading station B.

A series of cores are singly and sequentially delivered to the conveyor chain 16 from a hopper 21 mounted on the auxiliary frame 14 and positioned for gravity delivery of cores to the chain 16. The sequential delivery is achieved through the operation of a stop mechanism 22 (see FIGS. 4 and 5). The mechanism 22 includes a shaft 23 journaled for pivotal movement within pillow blocks 24, designated only in FIG. 3. The pillow blocks in turn are suitably anchored to the auxiliary frame 14. The shaft 23 carries a plurality of downwardly-extending fingers 25 which block the gravity movement of cores 18 in hopper 21 except when the fingers are moved outwardly. The finger 25, as seen in FIG. 4, is in a core release position, while in FIG. 5 it is in a core-holding position. Rotation of shaft 23 from the FIG. 4 to the FIG. 5 position is achieved through the solenoid-actuated air cylinder 26 supported on frame 14 and coupled to shaft 23 by eccentric linkages 27. The air cylinder 26 is actuated each time a set of the saddles 17 or 17*a* is beginning to move under the influence of a signal from the rewinder—the same signal that starts movement of conveyor 16.

The frame 14 is equipped with a second sub-frame 28 positioned adjacent and rearwardly of the sub-frame 15. A second conveyor 29 is supported on this sub-frame and is seen to include an endless belt 30. The conveyor 29 also operates intermittently and is generally aligned with a mandrel 12 in the roll-unloading station C. The conveyor 29 ejects a wound roll from the rewinder and serves to carry it axially outward of the turret 11.

The finished rolls are unloaded from a mandrel in station C by a pusher element 29*a*, as seen in FIG. 3, and which is secured in upstanding relation on conveyor 29. Several such elements 29*a* may be provided so as to position an element in stripping position when another mandrel comes into station C. The conveyor 29 is effective to transport the finished product out of the rewinder to a suitable finishing station.

The frame 14 is equipped with a fluid pressure cylinder 31 which is pivotally mounted as at 32 on frame 14. The piston rod 33 of cylinder 31 is pivotally connected to a lever 34 which is fulcrumed as at 35 on frame 14. The end of lever 34 opposite to that pivotally connected to piston rod 33 is equipped with a pusher rod 36. It will be seen that extension of the piston rod 33 produces a clockwise rotation of the lever 34 and sweeps the pusher rod 36 across the top of the conveyor belt 30. This action serves to move any roll 37 transversely off the conveyor belt 30 and onto a chute 38 which is positionably supported on frame 14 as at 39. Suitable disposition of the various wound rolls can be made after they have positioned on the chute 38.

In the operation of the hopper 21 for supplying cores to the chain 16, advantageous use may be made of a jogging mechanism generally designated 40 (see FIG. 3), in which a reinforced plate 41 is hinged to frame 14 as at 42 and which is moved through a small vertical arc under the influence of the cams 43. The cams 43, in turn, are fixed to a shaft 44 rotated by a motor, chain and sprocket arrangement 45. The jogging mechanism 40 is not only effective to prevent "bridging" of cores in the hopper 21, but also provides means for admitting cores singly into the lower portion of the hopper 21. This can be seen in FIG. 3, where the plate 41 cooperates with the inclined hopper portion 21*a* to provide the constricted entrance 41*a*.

Referring now more particularly to FIGS. 7 and 8, the character of the pusher 19 is seen in detail. Each pusher 19 is seen to include a pair of jaw elements 46 that may be constructed of rubber or similar resilient material. Each jaw element is pivotally attached as at 47 to the chain 16 and may be pivoted laterally outwardly of the chain 16 to the position seen in FIG. 8. Within each jaw element 46, a spring 48 is mounted for extension as the jaw elements 46 are moved outwardly. Thus, the springs 48 are effective to urge the jaw elements to return to a generally vertical position.

Each jaw element is equipped with an arcuate inner face as at 49 to facilitate the passage of the elements 46 past the end of a core seated on a mandrel in the core-loading station B. In the operation of the pusher 19, the jaw elements 46 remain in a generally vertical position while pushing the core 18 onto the adjacent end 12*a* of a mandrel 12 in the core-loading station B. As the jaw elements 46 engage the bullet-nose 12*b* of mandrel 12, they pivot outwardly to the position seen in FIG. 8. At this time, the elements 46 are still effective to push the core 18 and continue to do so until the core is firmly seated on the mandrel 12. The proper seating of the core (the seated core being designated 18*a* in FIG. 1) is insured by having the jaw elements 46 (the pusher 19) continue to advance along the mandrel even after the core is seated and until the pusher 19 passes around the sprocket 50. During this last advance, the jaw elements 46 flex rearwardly and pivot outwardly so as to pass around the core 18*a* now seated on the mandrel 12. As soon as this occurs, another pusher 19 and its associated saddle 17 are in position on the top run, ready to receive another core from the hopper. At this time, the fingers 25 are actuated to release another core 18 onto the conveyor 16.

In the operation of the apparatus just described, a plurality of hollow paperboard cores 18*b* may be positioned within the hopper 21. Under the influence of the jogging mechanism 40, the cores 18*b* are arranged in a single line series on the lower part of the inclined hopper portion 21*a* of hopper 21 (see FIG. 3). As a series of saddles 17 are properly positioned on the top run 16, the air cylinder 26 is actuated to pivot the fingers 25 from the position seen in FIG. 5 to the position seen in FIG. 4. This permits a single core 18 to be deposited upon the saddles 17. The jogging mechanism 40, being driven by the motor, chain and sprocket arrangement 45, is continuously operating so as to maintain the cores 18*b* in a ready condition for deposit upon the chain 16.

As the mandrel 12 enters the core-loading station B, the chain 16 begins moving and the upper run 16*a* thereof moves to the right, as seen in FIG. 1. In the illustration given, the rotating arm 13*a* energizes a solenoid 13*b* which in turn starts motor 20*a* for the movement of chain 16. The chain 16 is equipped with a pair of guide rollers 51 (one for each run thereof) which are the first elements of the chain to engage a given mandrel 12 in the core-loading station B. This stabilizes the mandrel 12 for receipt of the core 18. Further movement of the chain 16 brings the pusher element 19 against the outer end of a core 18 and pushes the core onto the mandrel 12. Still further movement of the chain 16 results in the jaw elements 46 of the pusher 19 splitting apart and yielding to assume the position seen in FIG. 8 so that the jaw elements can pass by the end of the mandrel 12

and subsequently pass by the end of the core **18** when it is in the position designated **18***a*.

Thus, it is to be seen that sequential loading operations can be performed through a rotary motion and without the need for any time-consuming reciprocation. As one set of saddles **17**, along with their associated pusher element **19** and guide roller **51**, move to the lower run **16***b*, another set of these elements is positioned for receipt of a core **18** and delivery thereof to a subsequent mandrel **12**. This subsequent mandrel **12** has been readied for this operation through the movement of the conveyor **29** to deposit the wound rolls on the chute **38**. The wound rolls are pushed from the conveyor **29** by pusher rod **36**, this being actuated by a signal from conveyor **29**—as by a limit switch being engaged by the pusher element **29**.

For the purpose of energizing the conveyor **29** through a chain and sprocket **52** coupled to motor **53**, a rewinder arm **13***a* may be employed through the same circuitry utilized in connection with motor **20***a*. Wound rolls traveling downward by gravity on chute **38** engage the switch **54** and cause the pusher arm **36** to return to the position seen in FIG. 3.

While in the foregoing specification we have set forth a detailed description of an embodiment of the invention for the purpose of illustrating the same, many variations in the details herein given will be seen by those skilled in the art without departing from the spirit and scope of the invention.

We claim:

1. In core handling apparatus for a mandrel-equipped rewinder, a core hopper, conveyor means below said hopper adapted to receive cores therefrom, core-supporting means on said conveyor means, said conveyor means including jaw means mounted for movement with said conveyor means and projecting laterally from said conveyor means, said jaw means being operative to abut one end of a core to urge said core into sleeved relation with said rewinder mandrel, said jaw means being constructed to yield laterally of the direction of travel of said conveyor means.

2. In core handling apparatus for a mandrel-equipped rewinder, a core hopper, conveyor means below said hopper adapted to receive cores therefrom, means supporting said conveyor means in fixed relation to said core hopper, core-supporting means on said conveyor means, said conveyor means including means mounted for movement with said conveyor means and operative to abut one end of a core to urge said core into sleeved relation with said rewinder mandrel.

3. In combination, a rewinder equipped with a plurality of mandrels, means on said rewinder for moving said mandrels sequentially into a core loading station wherein the mandrel is supported horizontally and at only one end, an endless conveyor arranged for horizontal travel and extending parallel to the loading station mandrel, means for driving said conveyor, means supporting said conveyor in fixed horizontal relation to said mandrels, said conveyor being equipped with a plurality of spaced-apart core pusher elements for pushing a core onto said mandrel from the unsupported end thereof, and after the core is seated on said mandrel yieldingly continuing to push said core, said driving means being interconnected with said rewinder for cooperation action therewith to intermittently move said pusher elements.

4. In combination, a rewinder equipped with a plurality of mandrels each adapted to receive a core for the winding of a web thereon, means on said rewinder for indexing said mandrels through a circular path with one of the indexing stations being a core loading station, means on said rewinder for supporting said mandrels only at one end thereof when said mandrels are in said loading station, an endless conveyor arranged parallel to the axis of a mandrel in said loading station, means for supplying single cores sequentially to the conveyor aligned with the mandrel in said loading station, pusher means on the loading conveyor operative to engage the end of a core on said loading conveyor and frame means rigidly supporting, said loading conveyor in a position relative to the mandrel in said core loading station whereby said core loading station mandrel overlaps said conveyor.

5. In combination, a rewinder equipped with a plurality of mandrels each adapted to receive a core for the winding of a web thereon, means on said rewinder for indexing said mandrels through a circular path with one of the indexing stations being a core loading station, means on said rewinder for supporting said mandrels only at one end thereof when said mandrels are in said loading staiton, an endless conveyor arranged parallel to the axis of a mandrel in said loading station, means for supplying single cores sequentially to the conveyor aligned with the mandrel in said loading station, pusher means on the loading conveyor operative to engage the end of a core on said loading conveyor, and means rigidly supporting said conveyor to position the mandrel in said core loading station in overlapping relation with said conveyor, said loading conveyor being equipped with drive means, said drive means being coupled to said rewinder for moving said conveyor only when a mandrel is in said core loading station and being operative to maintain said pusher means between conveyor movements in a position out of overlapping relation with said mandrel.

6. In combination, a rewinder equipped with a plurality of mandrels each adapted to receive a core for the winding of a web thereon, means on said rewinder for indexing said mandrels through a circular path with one of the indexing stations being a core loading station, means on said rewinder for supporting said mandrels only at one end thereof when said mandrels are in said loading station, an endless conveyor arranged parallel to the axis of a mandrel in said loading station, means for supplying single cores sequentially to the conveyor aligned with the mandrel in said loading station, pusher means on the loading conveyor operative to engage the end of a core on said loading conveyor, means rigidly supporting said conveyor in a fixed position relative to a mandrel in said core loading station with said core loading station mandrel overlapping said conveyor, said pusher means including a pair of jaw elements arranged in upstanding fashion on said loading conveyor, said elements being mounted for opposite movement laterally of the direction of travel of said loading conveyor.

7. In core handling apparatus for a mandrel-equipped rewinder, a generally horizontally disposed conveyor adapted to transport a core towards a mandrel supported only at the end remote from said conveyor and in alignment therewith, the improvement comprising pusher means attached to said conveyor and operative to push against one end of said core in one direction of travel of said conveyor and yieldingly pass by said core when said core is in position on a mandrel and during said one direction of conveyor travel.

8. In core handling apparatus for a mandrel-equipped rewinder, a generally horizontally disposed conveyor adapted to transport a core towards a mandrel supported only at the end remote from said conveyor and in alignment therewith, the improvement comprising pusher means attached to said conveyor and operative to push said core in one direction of travel of said conveyor and yieldingly pass by said core when said core is in position on a mandrel and during said one direction of conveyor travel, said pusher means including a pair of resilient elements extending vertically from said conveyor on a line transversely thereto, each of said elements being pivotally attached to said conveyor for movement transversely outwardly thereof.

9. In core handling apparatus for a mandrel-equipped rewinder, a generally horizontally disposed conveyor adapted to transport a core towards a mandrel supported only at the end remote from said conveyor and in alignment therewith, the improvement comprising pusher

means attached to said conveyor and operative to push said core in one direction of travel of said conveyor and yieldingly pass by said core when said core is in position on a mandrel and during said one direction of conveyor travel, said pusher means including a pair of resilient elements extending vertically from said conveyor on a line transversely thereto, each of said elements being pivotally attached to said conveyor for movement transversely outwardly thereof, each of said elements being equipped with spring means urging said elements to a vertical position.

10. In core handling apparatus for a mandrel-equipped rewinder, a generally horizontally disposed conveyor adapted to transport a core towards a mandrel supported only at the end remote from said conveyor and in alignment therewith, the improvement comprising pusher means attached to said conveyor and operative to push said core in one direction of travel of said conveyor and yieldingly pass by said core when said core is in position on a mandrel and during said one direction of conveyor travel, said conveyor being equipped with a plurality of spaced-apart core-supporting saddles operative to support a core above said conveyor for pushing engagement with said pusher means, said conveyor also being equipped with a mandrel-stabilizing roller positioned forward of said saddles in the direction of conveyor travel.

11. In combination, a rewinder equipped with a plurality of mandrels, means for indexing said mandrels through a core loading station with the mandrel to be loaded being horizontally disposed and supported only at one end, an endless conveyor having a horizontally-disposed upper run, means on said conveyor for supporting a core in axial relation with a mandrel to be loaded, means for supporting said conveyor in fixed horizontal relation with said rewinder, a mandrel to be loaded being in overlapping relation with said conveyor, and pusher means upstanding from said conveyor operative to push against one end of a core on said conveyor, said pusher means being constructed of resilient material to flex about said core when the same is seated on a mandrel to be loaded.

12. In combination, a rewinder equipped with a plurality of mandrels, means for indexing said mandrels through a core loading station with the mandrel to be loaded being horizontally disposed and supported only at one end, an endless conveyor having a horizontally-disposed upper run, means on said conveyor for supporting a core in axial relation with a mandrel to be loaded, means for supporting said conveyor in fixed horizontal relation with said rewinder, a mandrel to be loaded being in overlapping relation with said conveyor, and pusher means upstanding from said conveyor operative to push against one end of a core on said conveyor, said pusher means being constructed of resilient material to flex about said core when the same is seated on a mandrel to be loaded, said pusher means including a pair of cooperating upstanding jaw elements pivotally connected to said conveyor for lateral movement during flexing.

13. In combination, a rewinder equipped with a plurality of mandrels, means for indexing said mandrels through a core loading station with the mandrel to be loaded being horizontally disposed and supported only at one end, an endless conveyor having a horizontally-disposed upper run, means on said conveyor for supporting a core in axial relation with a mandrel to be loaded, means for supporting said conveyor in fixed horizontal relation with said rewinder, a mandrel to be loaded being in overlapping relation with said conveyor, and pusher means upstanding from said conveyor operative to push against one end of a core on said conveyor, said pusher means being constructed of resilient material to flex about said core when the same is seated on a mandrel to be loaded, said pusher means including a pair of cooperating upstanding jaw elements pivotally connected to said conveyor for lateral movement during flexing, and means for advancing said conveyor, said advancing means being operative to push said jaw elements outside of the overlapped portion of said mandrel and conveyor when a mandrel is moving under the influence of said indexing means.

14. In apparatus for supplying elongated cores to a rewinder equipped with a plurality of mandrels arranged for movement through an orbital path, a core hopper, a single continuous conveyor positioned below said hopper adapted to receive cores therefrom, means supporting said conveyor in fixed relation to said core hopper, core-supporting means on said conveyor, said conveyor including means fixed thereto for continuous movement with said conveyor and operative to urge said core into sleeved relation with a rewinder mandrel, said single conveyor constituting the only moving mechanism for urging said core into sleeved relation with said rewinder mandrel whereby said single conveyor is adapted to substantially overlap said rewinder mandred to permit the core urging means to seat an elongated core on said mandrel without interfering with the orbital movement of said mandrel.

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