

Nov. 17, 1959

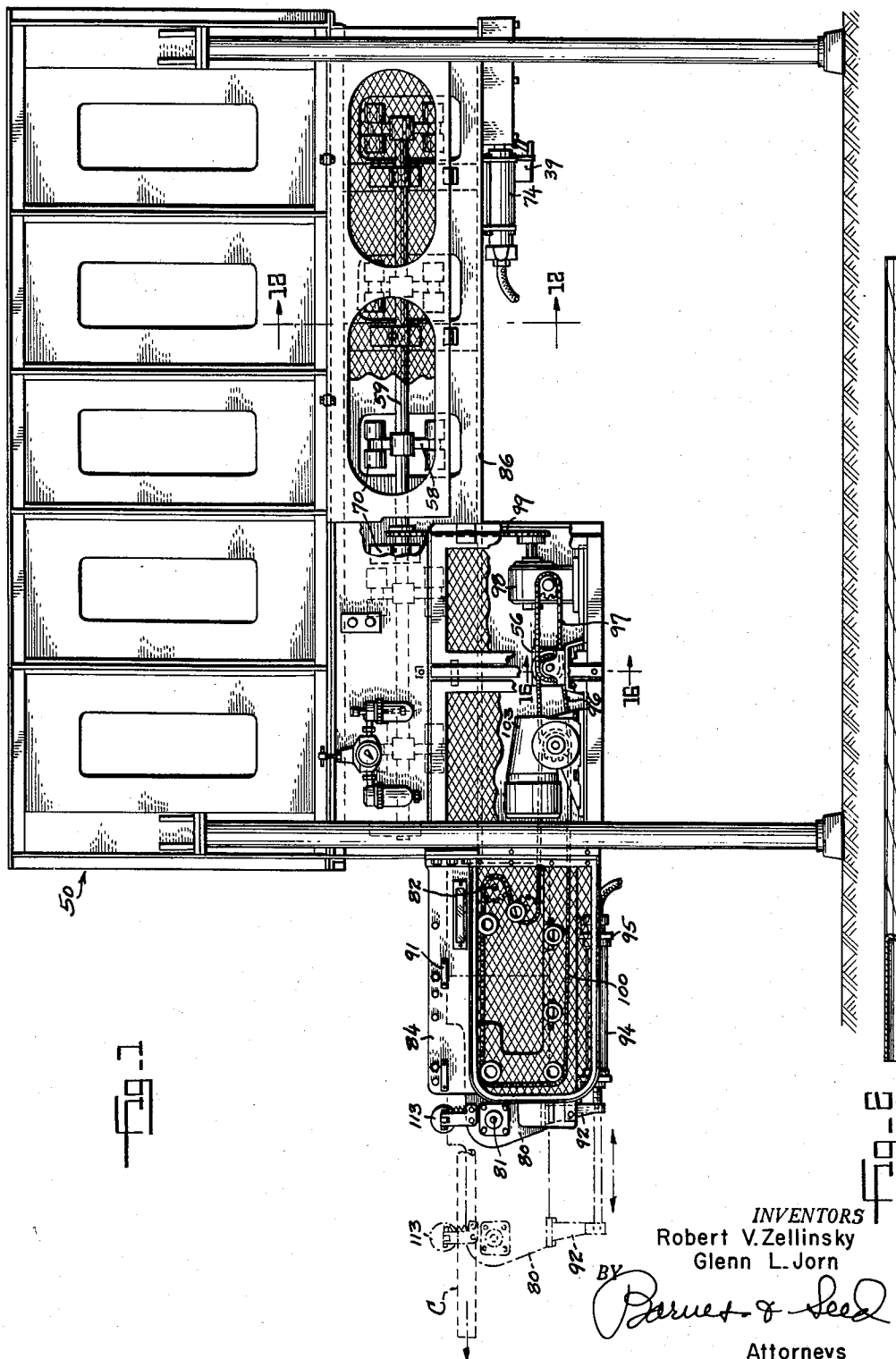
R. V. ZELLINSKY ET AL

2,913,098

CORE-LOADER FOR WINDING MACHINE

Filed Jan. 2, 1957

9 Sheets-Sheet 1



Nov. 17, 1959

R. V. ZELLINSKY ET AL
CORE-LOADER FOR WINDING MACHINE

2,913,098

Filed Jan. 2, 1957

9 Sheets-Sheet 2

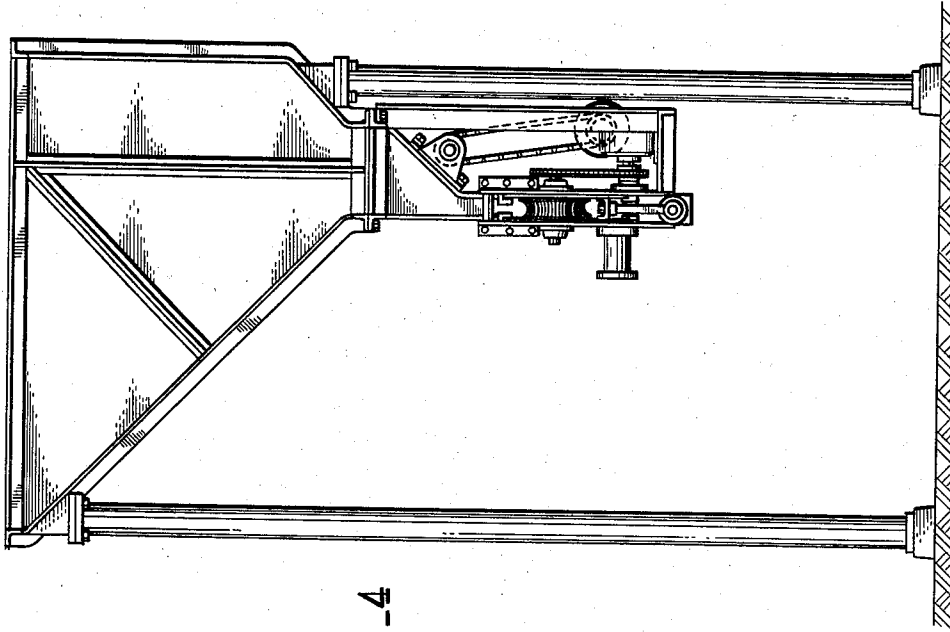


Fig. 4

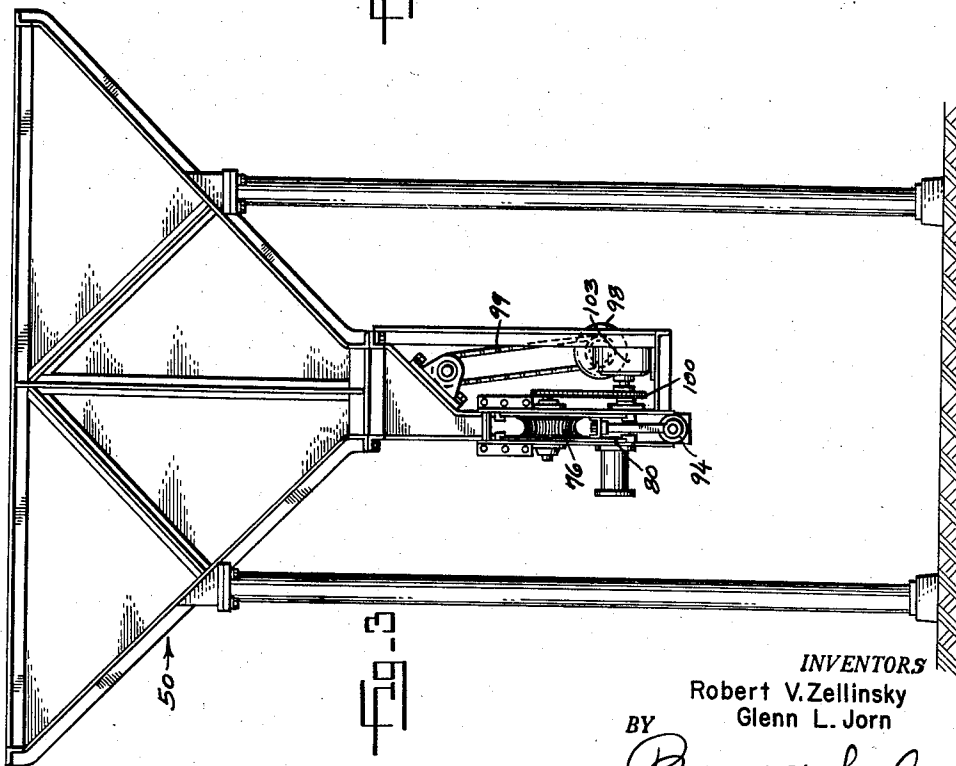


Fig. 5

INVENTORS
Robert V. Zellinsky
Glenn L. Jörn
BY *Parmer & Seed*
Attorneys

Nov. 17, 1959

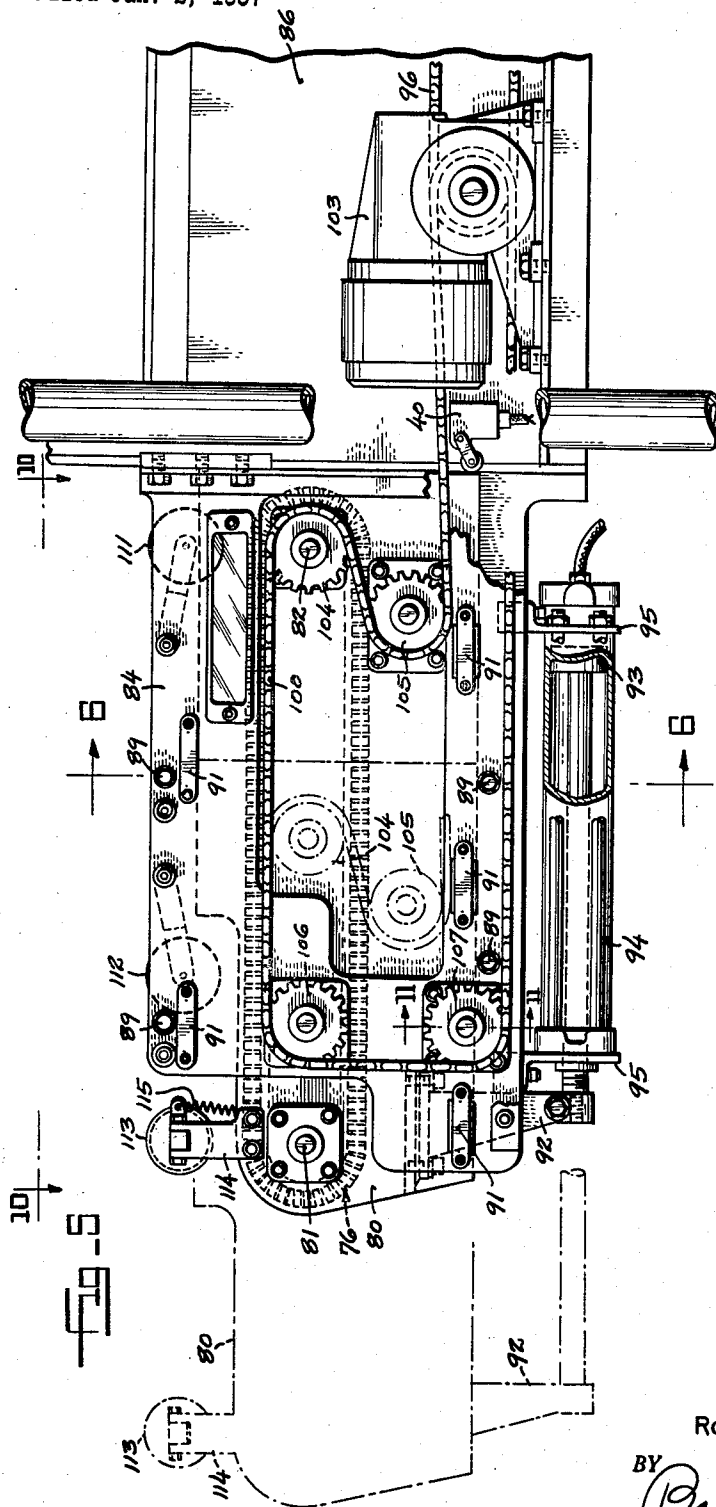
R. V. ZELLINSKY ET AL

2,913,098

CORE-LOADER FOR WINDING MACHINE

Filed Jan. 2, 1957

9 Sheets-Sheet 3



INVENTORS
Robert V. Zellinsky
Glenn L. Jorn
BY *Parnes & Seed*
Attorneys

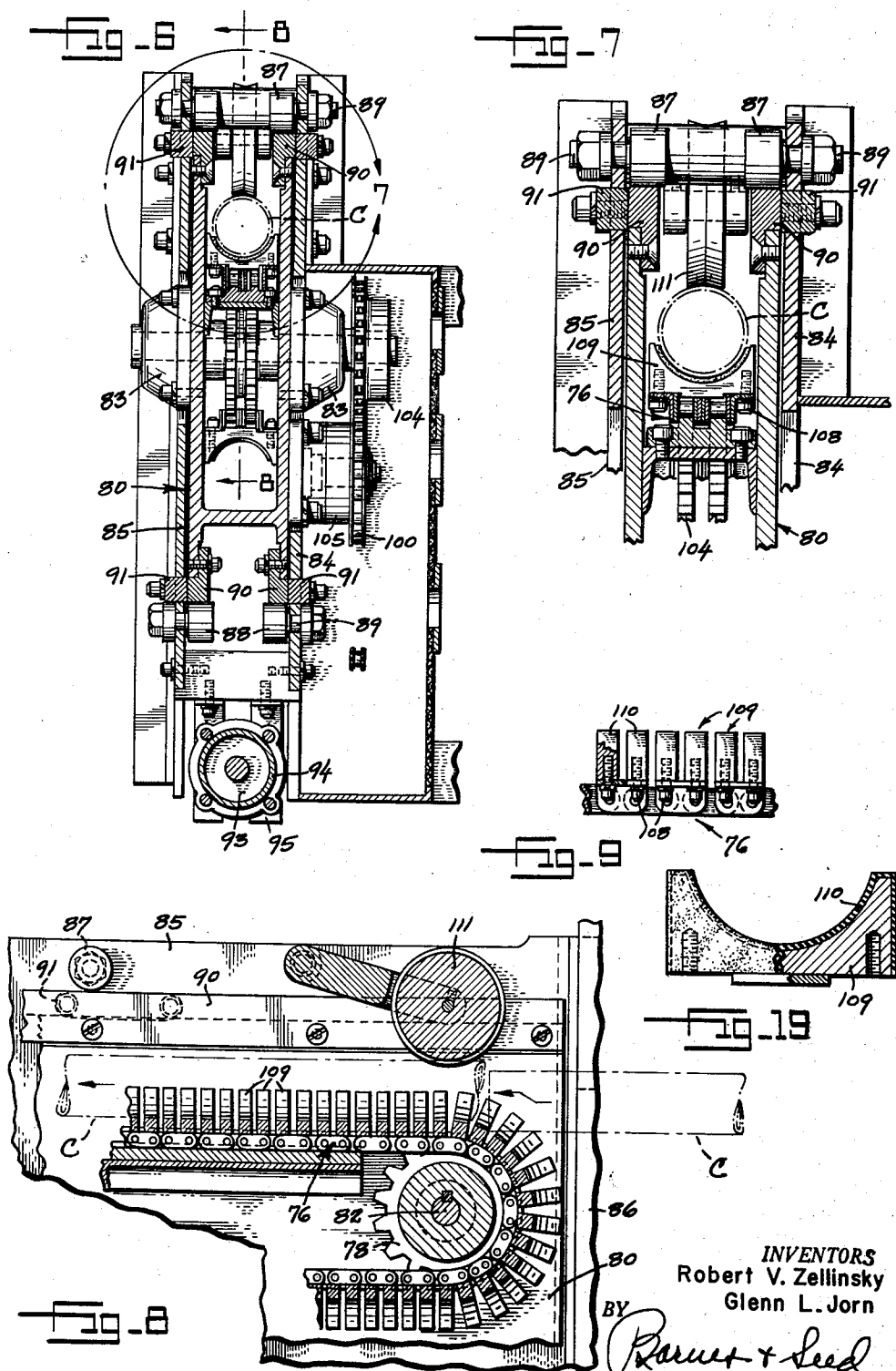
Nov. 17, 1959

R. V. ZELLINSKY ET AL
CORE-LOADER FOR WINDING MACHINE

2,913,098

Filed Jan. 2, 1957

9 Sheets-Sheet 4



INVENTORS
Robert V. Zellinsky
Glenn L. Jorn

BY *Barrett & Seed*
Attorneys

Nov. 17, 1959

R. V. ZELLINSKY ET AL

2,913,098

CORE-LOADER FOR WINDING MACHINE

Filed Jan. 2, 1957

9 Sheets-Sheet 5

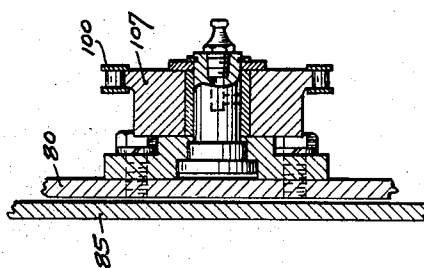
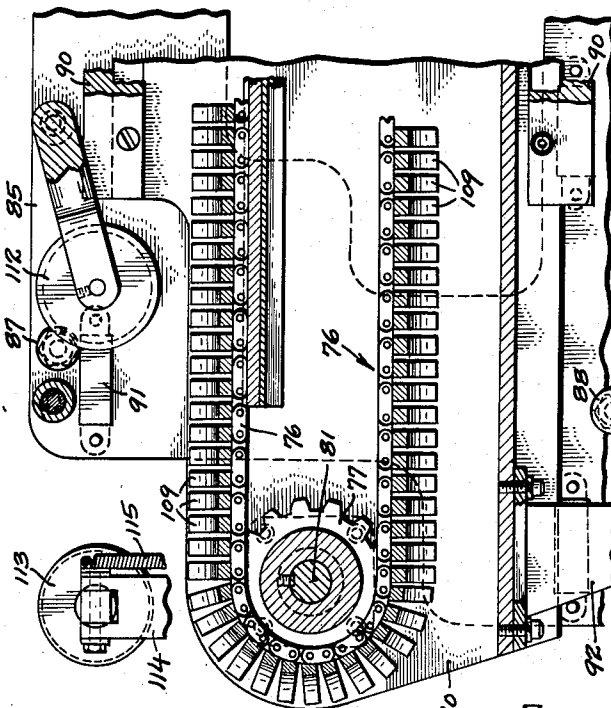
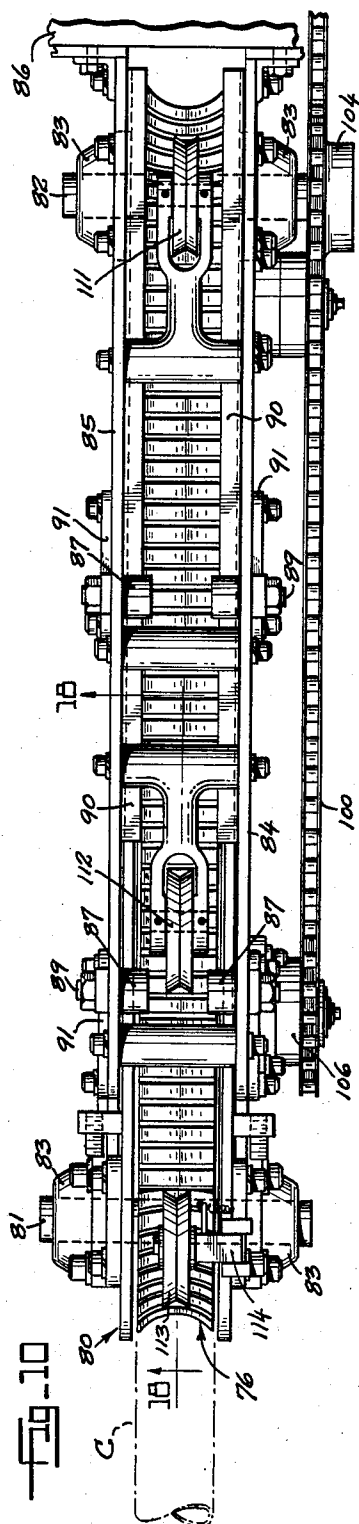


Fig. 11

INVENTORS
Robert V. Zellinsky
Glenn L. Jörn
BY *Barnes & Lead*
Attorneys

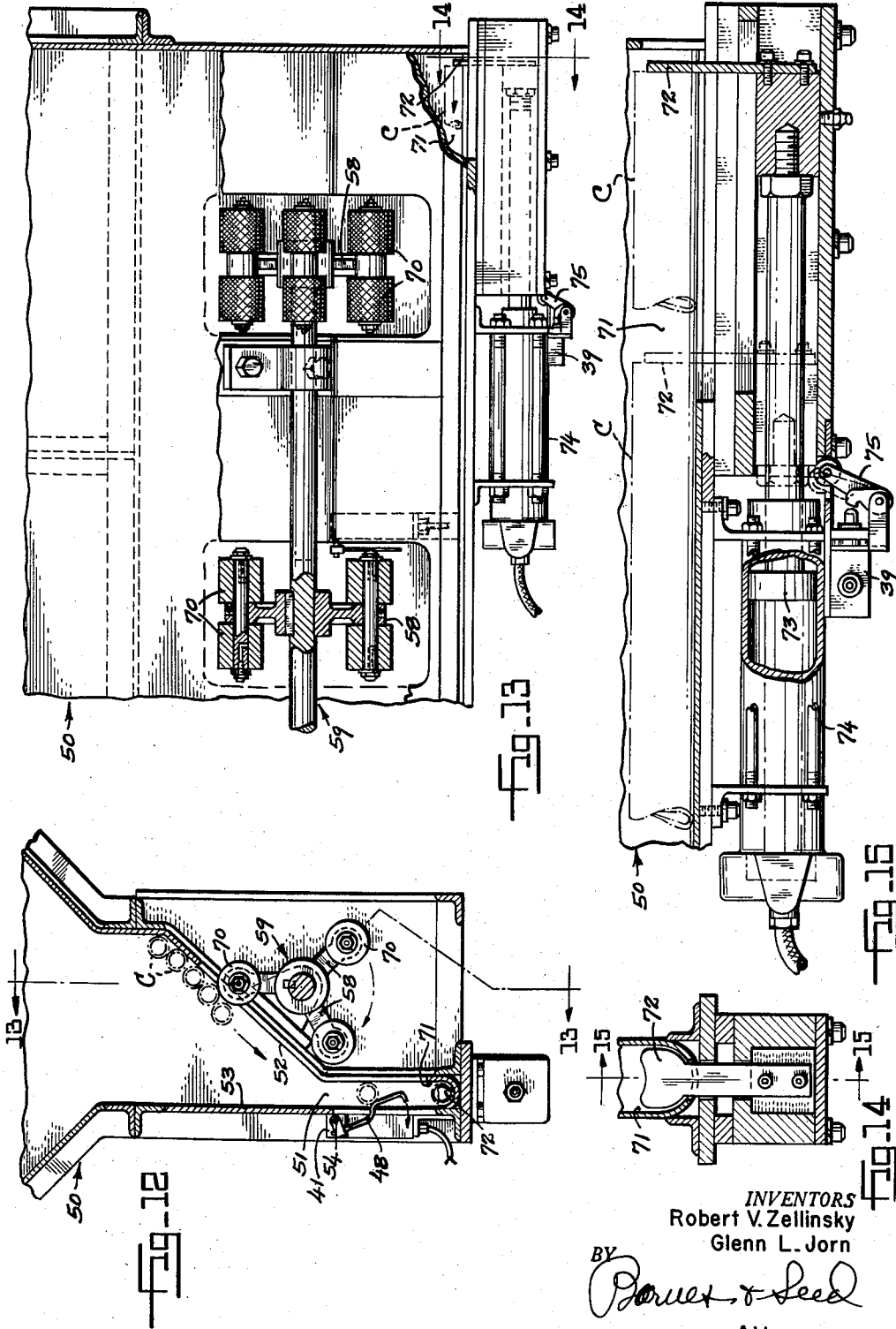
Nov. 17, 1959

R. V. ZELLINSKY ET AL
CORE-LOADER FOR WINDING MACHINE

2,913,098

Filed Jan. 2, 1957

9 Sheets-Sheet 6



INVENTORS
Robert V. Zellinsky
Glenn L. Jorn

BY *Parmer & Seed*
Attorneys

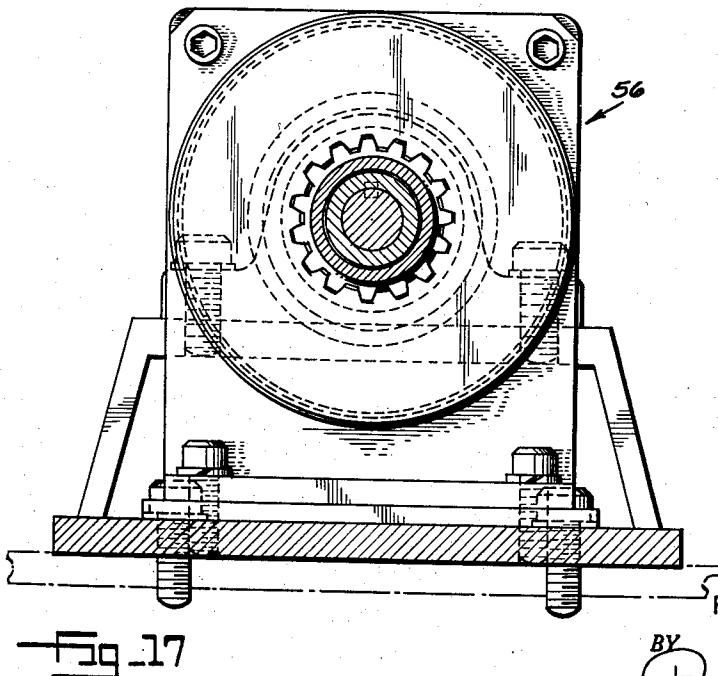
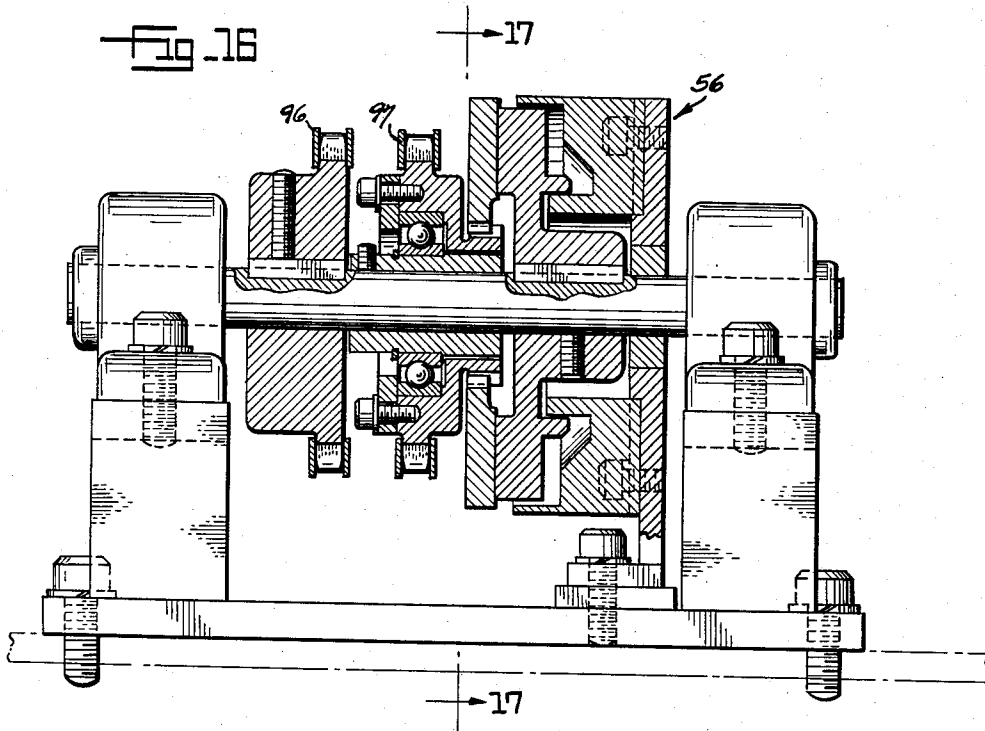
Nov. 17, 1959

R. V. ZELLINSKY ET AL
CORE-LOADER FOR WINDING MACHINE

2,913,098

Filed Jan. 2, 1957

9 Sheets-Sheet 7



INVENTORS
Robert V. Zellinsky
Glenn L. Jorn

BY
Barner & Seod
Attorneys

Nov. 17, 1959

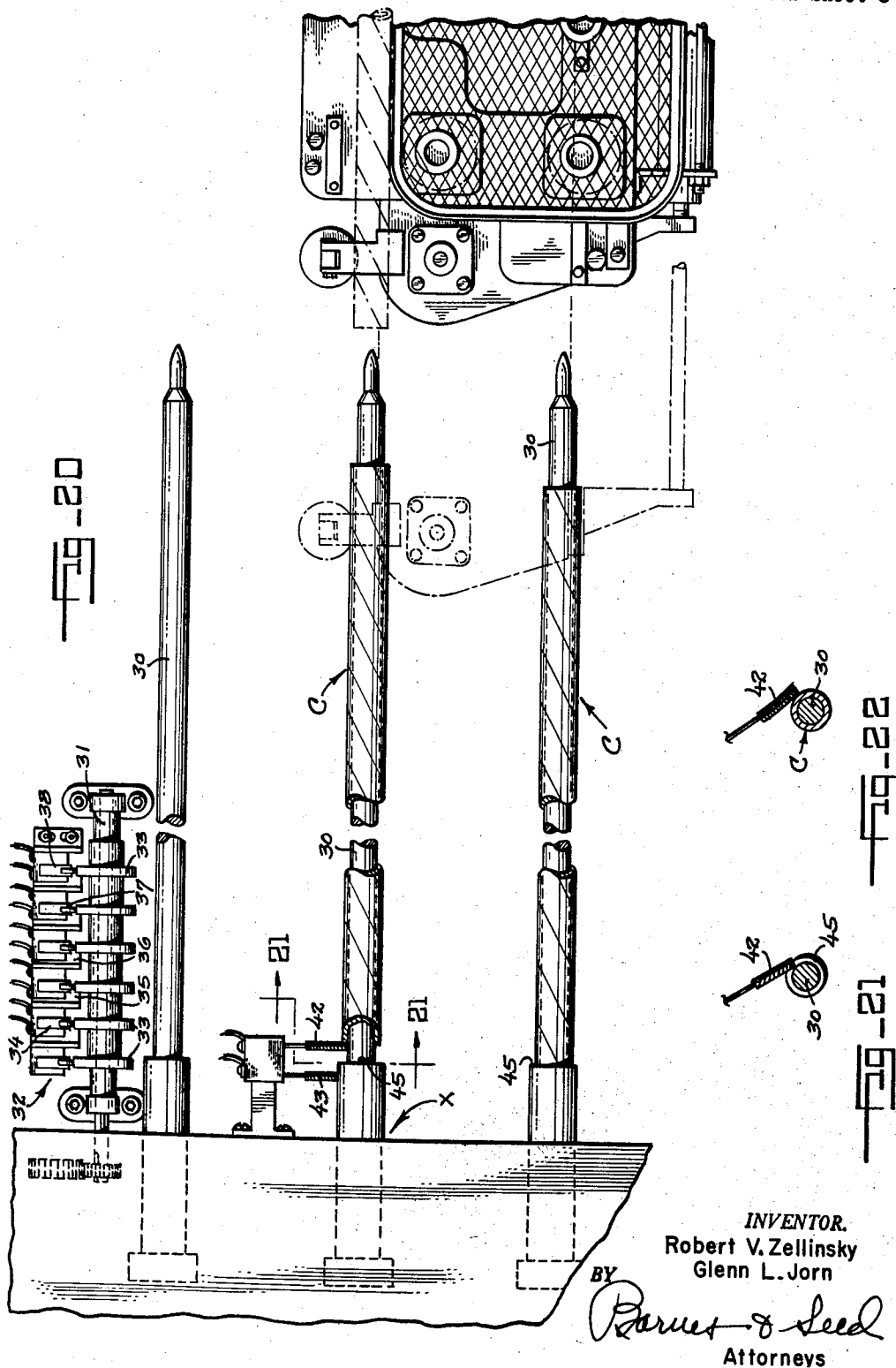
R. V. ZELLINSKY ET AL

2,913,098

CORE-LOADER FOR WINDING MACHINE

Filed Jan. 2, 1957

9 Sheets-Sheet 8



Nov. 17, 1959

R. V. ZELLINSKY ET AL

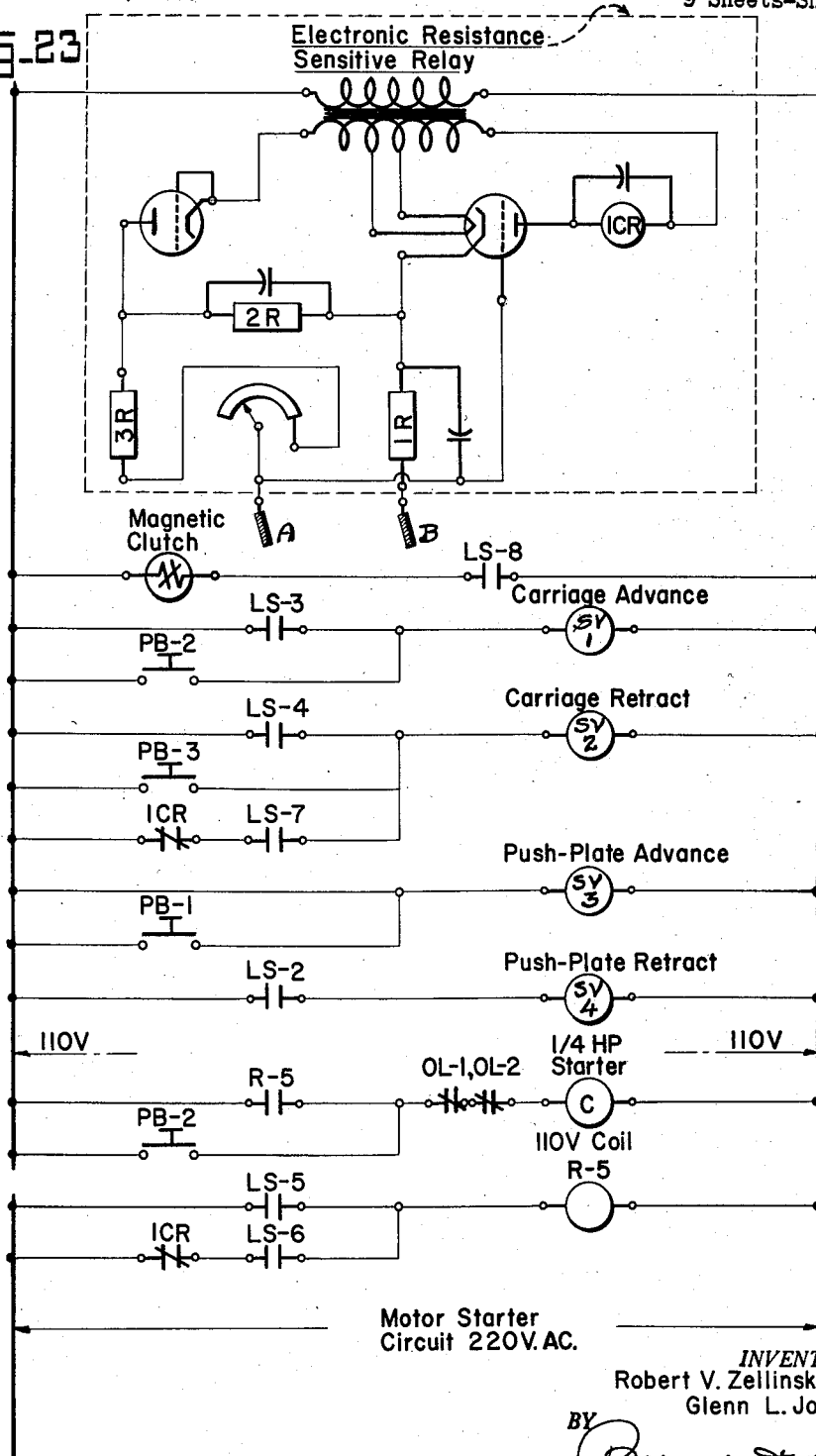
2,913,098

CORE-LOADER FOR WINDING MACHINE

Filed Jan. 2, 1957

9 Sheets-Sheet 9

Fig. 23



INVENTORS
Robert V. Zellinsky and
Glenn L. Jörn
BY *Barner & Seel*
Attorneys

1

2,913,098

CORE-LOADER FOR WINDING MACHINE

Robert V. Zellinsky and Glenn L. Jorn, Seattle, Wash.,
assignors to Western Gear Corp., Seattle, Wash., a corporation of Washington

Application January 2, 1957, Serial No. 632,168

36 Claims. (Cl. 198—21)

The winding machine for use with which the present invention is designed is characterized in that the same presents a plurality of mandrels which are mounted for movement through an established orbit eccentric to a center with which the several mandrels constantly maintain a parallel relationship. The mandrels derive their support from one end only, leaving the other end exposed for the application to and the removal from the mandrel of a core on which paper is wrapped, the removal perforce accomplished only upon the completion of a winding operation. Each mandrel, at a point thereon spaced from the exposed end a distance moderately exceeding the length of the cores, presents a shoulder, and in the application of the cores to the mandrels the core is bottomed against such shoulder so as properly to position the core. The mandrels, in following their prescribed path of travel, move interruptedly, indexing from one another position in response to the progress of the winding operation. The cores are applied to the mandrels at a given single one of the several stations successively occupied by the mandrels, and the wrapped rolls with their foundation cores are removed from the mandrels at a different said station. In winding machines of the character here cursorily described it has been the practice, heretofore, to core-load the mandrels by hand. For its general object the present invention aims to provide a machine for loading the mandrels, and it is a further and particular object to devise such a machine as will perform its loading function automatically in response to the indexing of the mandrels.

Other more particular objects and advantages of the invention will, with the foregoing, appear and be understood in the course of the following description and claims. The invention consists in the novel construction and in the adaptation and combination of parts hereinafter described and claimed.

In the accompanying drawings:

Figure 1 is a fragmentary side elevational view, partially broken away, illustrating a core-loading machine constructed to embody the preferred teachings of the present invention, the core-feeding carriage being shown by full lines in its normal retracted position and being shown by dotted lines in its advanced position, dotted lines being also used to illustrate the core as it is being fed by said carriage.

Fig. 2 is a view of the core, shown partly in elevation and partly in section and using a scale enlarged from that of Fig. 1.

Fig. 3 is a front elevational view of the machine.

Fig. 4 is a front elevational view of a machine having a supply hopper modified from that of the machine illustrated in Fig. 3, a hopper of this design permitting a space-saving back-to-back installation to accommodate two separate winding machines with one such hopper feeding in one direction to one such winding machine located at one end of the installation and with the other hopper feeding in the opposite direction to the second

2

winding machine, the latter being located at the other end of the installation.

Fig. 5 is a fragmentary enlarged-scale side elevational view of a tail-end portion of the machine in which is contained a feed carriage.

Fig. 6 is a transverse vertical sectional view drawn to an enlarged scale on line 6—6 of Fig. 5.

Fig. 7 is a fragmentary transverse vertical sectional view, drawn to a yet larger scale, to detail the portion of the carriage structure contained in the feature circle 7 of Fig. 6.

Fig. 8 is a fragmentary longitudinal vertical sectional view on line 8—8 of Fig. 6.

Fig. 9 is a fragmentary side elevational detail of the endless conveyor chain carried by the carriage, the scale here used corresponding to that of Fig. 7.

Fig. 10 is a fragmentary top plan view of the portion of the machine shown in Fig. 5, the scale corresponding to that of Fig. 6.

Fig. 11 is a fragmentary longitudinal vertical sectional view drawn to an enlarged scale on line 11—11 of Fig. 5.

Fig. 12 is a transverse vertical sectional view drawn to an enlarged scale on line 12—12 of Fig. 1 and incorporating a dotted-line showing of several cores to indicate the manner in which the same are delivered from the hopper.

Fig. 13 is a fragmentary longitudinal vertical sectional view on line 13—13 of Fig. 12.

Fig. 14 is a transverse vertical sectional view drawn to an enlarged scale on line 14—14 of Fig. 13 to detail a push-plate which feeds the cores from the hopper to the carriage.

Fig. 15 is a fragmentary longitudinal vertical sectional view on line 15—15 of Fig. 14.

Fig. 16 is a transverse vertical sectional view drawn to an enlarged scale on line 16—16 of Fig. 1 to detail the magnetic clutch which operates the normally inactive agitator of the hopper, such clutch being energized automatically in the event of the cores "hanging up" within the hopper.

Fig. 17 is a longitudinal vertical sectional view on line 17—17 of Fig. 16.

Fig. 18 is a fragmentary longitudinal vertical sectional view drawn to an enlarged scale on line 18—18 of Fig. 10.

Fig. 19 is a view partly in front elevation and partly in section illustrating one of the link-carried friction fingers, detached, of the endless conveyor chain and using a scale enlarged from that of Fig. 9.

Fig. 20 is a side elevational view embodying a fragmentary showing of said tail end of the core-loading carriage together with a fragmentary showing of the paper-winding machine, the view correlating the one to the other. In reading this view it is to be assumed that a core is in process of being fed to a mandrel, having advanced to a point whereat the same approaches, but has not as yet bottomed against, a stop-shoulder formed upon the mandrel. The core-feeding carriage, at this stage of its cyclic operation, would hence properly occupy the advanced dotted-line rather than the retracted full-line position in which it is erroneously shown, the purpose in so illustrating the parts being to point up the clearance provided by the carriage to permit the mandrels to freely index from one to another position when the carriage occupies its normal retracted position. The scale of this view corresponds to that of Fig. 18.

Fig. 21 is a fragmentary transverse vertical section on line 21—21 of Fig. 20.

Fig. 22 is a similar section showing the parts as they would appear when the core-feeding operation has been

3

completed, and namely when the core has bottomed against the shoulder of the mandrel; and

Fig. 23 is a wiring diagram for the system including the electric motor and associated electrical devices responsible for the operation of the winding machine.

Generally, in carrying out the present invention, a multiplicity of cores are contained in a supply hopper and from this hopper are delivered one at a time to the breach of a run-way. The cores are wholly contained within this run-way. An intermittently acting push-plate mounted for reciprocal slide movement in this run-way feeds the core at regulated intervals to the head end of a constantly driven endless conveyor. The front end of the advanced core, as it is brought under the influence of the conveyor and thereupon responsively moves forwardly in concert with the conveyor, is carried by the conveyor beyond the tail end of the latter and onto the exposed end of a turret-carried mandrel occupying the core-loading station of the winder machine. It is a characteristic of the present loader that the conveyor is mounted upon a carriage for bodily reciprocal motion in a fore-and-aft direction from a normal retracted position into and from a momentarily advanced position. This normal retracted position is one which locates the tail end of the conveyor in a position rearwardly spaced beyond said exposed end of the mandrel, thus to give clearance for the mandrels as the latter index by the rotation of the turret into said core-loading station. The forward travel of the carriage momentarily shifts the conveyor into a position whereat its tail end projects forwardly beyond said exposed end of the mandrel so as to complete a loading of the core and assure a bottoming of the latter against the stop shoulder of the mandrel.

Here cursorily considering the winding machine with its said mandrels, there are six such mandrels designated by the numeral 30 and these mandrels, lying parallel to the rotary center of a motor-driven turret, progress interruptedly through an established eccentric orbit into a succession of six stations. Responsible for guiding the mandrels as they trace this orbital travel is a geneva cam-wheel (not shown). The present invention is concerned with only one of the six stations, and namely a core-loading station designated by the letter X. As the mandrels index from one to another station, turning motion is transmitted to the cam shaft 31 of a special control timer designated generally by 32, and provided upon this cam shaft are a plurality (six being shown) of cams 33 each of which operates a limit switch. Only five of these cam-operated limit switches are of moment to the present invention and are designated in Fig. 20 by 34, 35, 36, 37, and 38. In our later trace of the operation these said switches will be termed, respectively, LS-1, LS-3, LS-4, LS-5, and LS-7, and it is by these symbols that the same are identified in the wiring diagram. There are three additional functioning limit switches 39, 40, and 41 which are provided upon our core-loading machine and identified in the wiring diagram as LS-2, LS-6, and LS-8.

As a complement to the limit switches, we provide a low-voltage sensing system employing two electrically conductive sensing fingers 42 and 43 (A and B in the wiring diagram) performing the function of a normally open switch operative when closed to complete an electric circuit through the coil of a relay designated in the wiring diagram as ICR. The energizing of this coil opens normally closed contacts of the relay. The mandrels themselves are electrically conductive, and the fingers occupy positions such that the same are contacted by the mandrel as the mandrel reaches the loading station, thus closing the electric circuit through the said coil of the relay. The relation between mandrel and fingers is such that at least one of such fingers, indicated as the finger 42, makes its contact upon the core-receiving portion of the mandrel immediately adjacent the shoulder, hence being lifted out of contact with the mandrel, so as re-

4

sponsively to break the electric circuit, as the core is brought into bottoming engagement against the shoulder 45. The sensing fingers are by preference composed of spring coils to give the same extreme flexibility in compensation of the bending to which the same are subjected as the same are traversed by the mandrels as the mandrels index into and out of the loading station.

Designated generally by 50, the referred-to hopper has a length moderately exceeding the length of the cores C and leads by a chute to the head end of a vertical delivery throat 51, the chute having a funnel shape with one side wall 52 being sloped while the other side wall 53 is desirably a vertical prolongation of one side wall of the throat. The width of the throat moderately exceeds the diameter of the cores. In said side wall of the throat there is provided an opening, and extending through said opening and normally occupying a position in the path travelled by the descending cores is a hinged arm 48. This arm is movable by the weight of the cores into an out-of-the-way position. Associated with the hinge pin 54 of the arm is the limit switch 41, and the circuit completed by this limit switch includes a magnetic clutch 56 acting, when energized, to transfer driving power through a chain 99 to a normally inactive agitator 59. This agitator is in the nature of a spider having its arms 58 working through openings provided in the sloping wall 52 of the hopper and providing rollers 70 upon the ends of these arms. The arrangement is one in which the agitator operates automatically in the event of the cores hanging up within the hopper, the responsible limit switch 41 (LS-8) being closed only when the hinged arm 48 lies within the throat.

The breach of the afore-mentioned run-way is denoted by 71, and the push-plate which is mounted for horizontal reciprocal movement therein is designated by 72. As previously stated, successive cores dropped from the hopper into the breach of the run-way are wholly contained within said run-way, and this is to say that the front end of the core is out of contact with the endless conveyor and is brought into engagement therewith (as indicated by broken lines in Fig. 8) only when the normally retracted push-plate is caused to be advanced in the forward stroke of its reciprocatory movement. A double-acting piston 73 working in an air cylinder 74 drives the push-plate, with the solenoid valves which control the feeding and dumping of pressure air to and from the two ends of this cylinder being controlled by two of the described limit switches, and namely the limit switch 34 (LS-1) contained in the special timing control box, and the limit switch 39 (LS-2), such latter switch being carried by the cylinder 74 in a position whereat the same is activated, in this instance by a roller-carrying arm 75, as the piston-actuated push-plate 72 reaches the forward limit of its reciprocatory travel.

Denoted by 76, the endless constantly driven conveyor to which the cores are intermittently fed by the push-plate is comprised of a chain trained about front and rear sprocket wheels 77 and 78 of which the former is an idler and the latter a live wheel. The sprocket wheels are received between opposite side walls of a carriage 80, and have their shafts, designated by 81 and 82, respectively, journaled in pillow blocks 83 bolted or otherwise secured to said side walls upon the outer faces thereof.

The carriage is arranged for horizontal reciprocatory movement between laterally spaced cheek-plates 84 and 85 of a fabricated frame section extending forwardly as a nose prolongation of the main frame 86 of the loader. Top and bottom rollers 87 and 88, respectively, journaled on pins 89 carried by the cheek-plates support the carriage in its said reciprocal motion, tracking against rails 90 boltably secured to the carriage and running substantially the full length thereof. As a complement to the rollers, guides 91 bear upon the outer face of each rail. At its forward end a foot 92 depends from the carriage, and attached to this foot is a double-acting piston 93

working in an air cylinder 94 which is secured to mounting brackets 95 fixed to the cheek-plates, solenoid valves which control the feeding and dumping of pressure air to and from the two ends of such cylinder 94 being controlled by limit switch 35 (LS-3) and by the sensing fingers 42—43, respectively. One of the box-carried limit switches, and namely the switch 36 (LS-4), makes a momentary contact as the mandrel, with the core thereon, is about to index out of the loading station. It performs a safety function, closing the solenoid valve to effect retraction of the carriage in the event the sensing fingers shall have failed to return the carriage.

Reverting to the conveyor chain, the drive therefor comprises a constant-drive endless chain 100 powered from a constant-drive electric motor 103. The referred-to magnetic clutch 56 also has its input side chain-driven from such motor, the chain therefor being designated by 96. A chain take-off 97 from the clutch drives the input shaft of a gear box 98, the drive thence passing by chain 99 to the agitator.

It will be seen that the live shaft 82 for the conveyor chain 76 has a sprocket wheel 104 mounted upon one of its exposed ends, and this sprocket wheel is augmented by a second carriage-carried idler sprocket wheel 105 located below and somewhat to the front of said sprocket 104. The chain 100, passing by an upper run from a sprocket wheel driven by the motor 103 first takes a half-turn from below about said idler sprocket 105 and thence an oppositely directed half-turn about the live sprocket 104, from whence it carries forwardly by an upper run to an idler sprocket wheel 106 receiving its journal mounting from the cheek-plate 84. The chain then drops to a second idler sprocket wheel 107 also journaled from the cheek-plate 84, and thence returns by a lower run to the driving sprocket wheel. A cut-out in the cheek-plates 84 accommodates the fore-and-aft motion of the bearings for the sprocket wheels 104 and 105 as the latter move with the carriage. It will be apparent that the described "walking" arrangement of the two sprockets 104 and 105 maintains a constant tension upon the chain in that the chain run between the drive sprocket and the sprocket 105 lengthens and shortens correspondingly with a shortening and lengthening, respectively, of the chain run between sprockets 104 and 106.

The conveyor chain is constituted of a multiplicity of saddle-shaped fingers 109 secured, as by screws 108, to flange links of the chain proper. Each said finger is coated with a skin 110 of neoprene or other like or suitable friction surfacing, and as a complement to the friction purchase provided by such fingers there are provided a plurality of overhead pressure rollers. Two such rollers, denoted by 111 and 112, are swingably carried by arms hinged to the cheek-plates of the frame, thus being gravity-loaded. A third roller 113 is journaled upon a pin pivoted to the head end of a bracket 114 surmounting the front end of the carriage and is yieldingly depressed upon the advancing rolls by a spring 115.

Augmenting the above description it may be here stated that the timing of limit switch 35 (LS-3) is such that the same closes to advance the carriage when the core has progressed to a point whereat approximately 70% of its length is on the mandrel. It is desirable that the advancing core engage and lift the sensing finger 42 at a distance of, say, $\frac{1}{4}$ " to $\frac{1}{2}$ " from the shoulder.

The invention, in order to minimize danger of damage to the core loader and the winding machine, incorporates a safety device in addition to the limit switch 36 (LS-4). Said limit switch 36 is in parallel (electrically) with the relay responsible for retraction of the carriage. ICR is used on the wiring diagram to denote such relay. Such added safety feature is provided by the normally closed limit switch 37 (LS-5). Opened for approximately 10° in the cam's rotation, this limit switch parallels a circuit including relay ICR and limit switch 40 (LS-6), such latter switch being located on the core-loader in a position

to be closed by the carriage as the latter becomes fully retracted. The two said paralleling circuits are each in series with a relay, denoted R-5 in the wiring diagram, for the winder drive and core-loader motor control circuits so that if the coil of this relay becomes de-energized the drive motors stop. Thus, if the contacts of relay ICR or limit switch 40 (LS-6) are open during the 10° period when limit switch 37 is open, namely a 10° interval immediately before the mandrels index out of the loading station, the relay R-5 is de-energized.

As will be further seen from an inspection of the wiring diagram, there are three push buttons designated PB-1, PB-2, and PB-3. These push buttons respectively parallel LS-1, LS-2, and LS-4, and PB-2 additionally parallels the relay R-5 so as to permit independent energizing of the motor starter.

The invention and the manner of its operation will, it is believed, be clearly understood from the foregoing detailed description of our now-preferred illustrated embodiment. Changes within the spirit of our teachings may be resorted to without departing from the invention and it is accordingly our intention that the hereto annexed claims be given a scope in their construction fully commensurate with the broadest interpretation to which the employed language admits.

What we claim is:

1. In combination with a winding machine having a core-receiving mandrel bodily movable by indexing motion and in a direction normal to its axis into and out of a loading station, a core-loader therefor comprising an endless conveyor providing an upper run arranged to support and feed cores to successive mandrels occupying said loading station, a source of power imparting a constant drive to said conveyor, a reciprocally mounted carriage supporting the conveyor for bodily movement in a fore-and-aft direction from a retracted position whereat the front end of the conveyor is spaced rearwardly from the proximal end of the mandrel into and out of an advanced position whereat said front end of the conveyor projects beyond said proximal end of the mandrel, means made to operate only when a mandrel occupies said loading station for charging a core to the endless conveyor, and means acting as a follow-up to said charging operation while the mandrel still occupies said loading station for first advancing and then retracting the carriage.

2. In combination with a winding machine having a core-receiving mandrel bodily movable by indexing motion and in a direction normal to its axis into and out of a loading station, a core-loader therefor comprising an endless conveyor adapted to feed cores to successive mandrels occupying said loading station, a source of power imparting a constant drive to said conveyor, a reciprocally mounted carriage supporting the conveyor for bodily movement in a fore-and-aft direction from a retracted position whereat the front end of the conveyor is spaced rearwardly from the proximal end of the mandrel into and out of an advanced position whereat said front end of the conveyor projects beyond said proximal end of the mandrel, means made to operate only when a mandrel occupies said loading station for charging a core to the endless conveyor, and means acting as a follow-up to said charging operation while the mandrel still occupies said loading station for first advancing and then retracting the carriage.

3. In combination with a winding machine having a core-receiving mandrel bodily movable by indexing motion and in a direction normal to its axis into and out of a loading station, a core-loader therefor comprising an endless conveyor adapted to feed cores to successive mandrels occupying said loading station, a source of power imparting a constant drive to said conveyor, a reciprocally mounted carriage supporting the conveyor for bodily movement in a fore-and-aft direction from a retracted position whereat the front end of the conveyor

7

is spaced rearwardly from the proximal end of the mandrel into and out of an advanced position whereat said front end of the conveyor projects beyond said proximal end of the mandrel, means for charging cores successively to the endless conveyor, and means acting only when a mandrel occupies said loading station for first advancing and then retracting the carriage.

4. In combination with a winding machine having a core-receiving mandrel bodily movable by indexing motion and in a direction normal to its axis into and out of a loading station, a core-loader therefor comprising an endless conveyor acting to feed cores to successive mandrels occupying said loading station, a source of power imparting a constant drive to said conveyor, a reciprocally mounted carriage supporting the conveyor for bodily movement in a fore-and-aft direction from a retracted position whereat the front end of the conveyor is spaced rearwardly from the proximal end of the mandrel into and out of an advanced position whereat said front end of the conveyor projects beyond said proximal end of the mandrel, means made to operate only when a mandrel occupies said loading station for charging a core to the endless conveyor, and means acting as a follow-up to said charging operation for first advancing and then retracting the carriage, means being provided for maintaining the mandrel in said loading station until the carriage and its supported conveyor have cleared the travel path of the mandrel in the retraction movement of the carriage.

5. In combination with a winding machine having a core-receiving mandrel bodily movable by indexing motion and in a direction normal to its axis into and out of a loading station, a core-loader therefor comprising an endless conveyor acting to feed cores to successive mandrels occupying said loading station, a reciprocally mounted carriage supporting the conveyor for bodily movement in a fore-and-aft direction from a retracted position whereat the front end of the conveyor is spaced rearwardly from the proximal end of the mandrel into and out of an advanced position whereat said front end of the conveyor projects beyond said proximal end of the mandrel, means for charging a core to the endless conveyor, means acting as a follow-up to said charging operation for first advancing and then retracting the carriage, and means acting upon the conveyor throughout the period of the conveyor's head advancing and retracting movement for constantly driving the conveyor in a direction such that the surface supporting the core has a forward travel, means being provided for maintaining the mandrel in said loading station until the carriage and its supported conveyor have cleared the travel path of the mandrel in the retraction movement of the carriage.

6. In combination with a winding machine having a core-receiving mandrel bodily movable by indexing motion and in a direction normal to its axis into and out of a loading station, a core-loader therefor comprising an endless conveyor acting to feed cores to successive mandrels occupying said loading station, means for driving the conveyor, a reciprocally mounted carriage supporting the conveyor for bodily movement in a fore-and-aft direction from a retracted position whereat the front end of the conveyor is spaced rearwardly from the proximal end of the mandrel into and out of an advanced position whereat said front end of the conveyor projects beyond said proximal end of the mandrel, means for charging cores successively to the endless conveyor, and means acting only when a mandrel occupies said loading station for first advancing and then retracting the carriage.

7. In combination with a winding machine having a core-receiving mandrel bodily movable by indexing motion and in a direction normal to its axis into and out of a loading station: a core-loader therefor comprising an endless conveyor providing an upper run so positioned that a core carried thereon lies approximately co-axial

8

with a mandrel occupying the loading station, a reciprocally mounted carriage supporting the conveyor for bodily movement in a fore-and-aft direction from a retracted position whereat the carriage and its supported conveyor are spaced rearwardly from the proximal end of the mandrel into and out of an advanced position whereat the front end of the conveyor's said upper run projects beyond said proximal end of the mandrel, means for constantly driving the conveyor in a direction such that its upper run has a forward travel, a supply hopper for the cores, normally inactive means for charging the cores one at a time from the hopper to the conveyor, means for activating said charging means automatically when a mandrel indexes into said loading station, a normally inactive means for imparting said fore-and-aft reciprocal motion to the carriage, a means made to operate automatically as a follow-up to the charging operation for activating said last-named means, and means preventing the mandrel from indexing out of the loading station during said follow-up operation of the carriage.

8. In combination with a winding machine having a core-receiving mandrel bodily movable by indexing motion and in a direction normal to its axis into and out of a loading station: a core-loader therefor comprising an endless conveyor providing an upper run so positioned that a core carried thereon lies approximately co-axial with a mandrel occupying the loading station, a reciprocally mounted carriage supporting the conveyor for bodily movement in a fore-and-aft direction from a retracted position whereat the front end of said conveyor is spaced rearwardly from the proximal end of the mandrel into and out of an advanced position whereat the front end of the conveyor's said upper run projects beyond said proximal end of the mandrel, a supply hopper for the cores, means for charging the cores one at a time from the hopper to the conveyor, normally inactive means for imparting said fore-and-aft reciprocal motion to the carriage, means made to operate when a mandrel occupies said loading station for activating said last-named means, means preventing the mandrel from indexing out of the loading station during said fore-and-aft motion of the carriage, and means acting upon the conveyor at least throughout the period of the conveyor's fore-and-aft movement uninterruptedly driving the conveyor in a direction causing the upper run to have a forward travel.

9. In combination with a winding machine having a plurality of core-receiving mandrels successively bodily movable by indexing motion and in a direction normal to their axis into and out of a loading station: a core-loader therefor comprising an endless conveyor providing an upper run so positioned that a core carried thereon lies approximately coaxial with a mandrel occupying the loading station, a reciprocally mounted carriage supporting the conveyor for bodily movement in a fore-and-aft direction from a retracted position whereat the carriage and its supported conveyor are adjacent to but spaced rearwardly from the proximal end of the mandrel into and out of an advanced position whereat the front end of the conveyor projects beyond said proximal end of the mandrel, means for constantly driving the conveyor in a direction such that its upper run progresses toward the mandrel, a supply hopper for the cores, normally inactive means for charging the cores one at a time from the hopper to the conveyor, a constantly driven cam shaft movable in timed concert with the indexing movement of the mandrels, a plurality of cams on said cam shaft, means controlled by one of said cams for activating said charging means when a mandrel indexes into said loading station, a normally inactive means for imparting said fore-and-aft reciprocal motion to the carriage, means controlled by another of said cams causing said last-named means to be activated as a direct follow-up to the charging operation, and means controlled by still another of said cams preventing the mandrel from

indexing out of the loading station during said follow-up operation of the carriage.

10. In combination with a winding machine having a plurality of core-receiving mandrels each bodily movable by indexing motion and in a direction normal to their axis into and out of a loading station: a core-loader therefor comprising an endless conveyor providing an upper run so positioned that a core carried thereon lies approximately coaxial with a mandrel occupying the loading station, a reciprocally mounted carriage supporting the conveyor for bodily movement in a fore-and-aft direction from a retracted position whereat the carriage and its supported conveyor are adjacent to but spaced rearwardly from the proximal end of the mandrel into and out of an advanced position whereat the front end of the conveyor projects beyond said proximal end of the mandrel, means for constantly driving the conveyor in a direction such that its upper run progresses toward the mandrel, a supply hopper for the cores, normally inactive means for charging the cores one at a time from the hopper to the conveyor, a constantly driven cam shaft movable in timed concert with the indexing movement of the mandrels, a plurality of cams on said cam shaft, means controlled by one of said cams for activating said charging means when a mandrel indexes into said loading station, normally inactive means for imparting said fore-and-aft reciprocal motion to the carriage, means controlled by another of said cams and made to operate as a direct follow-up to the charging operation for so activating the carriage-moving means as to move the carriage through its forward stroke of reciprocation, means made to operate by contact of the advancing core as the latter feeds onto the mandrel and reaches a given end limit of travel for so activating the carriage-moving means as to move the carriage through its return stroke of reciprocation, and means preventing the mandrel from indexing out of the loading station until the carriage, in its return travel, has cleared the travel path of the mandrel.

11. Structure according to claim 10 in which the means last recited is comprised of a limit switch operated by the returning carriage.

12. Structure according to claim 10 in which the means last recited comprises still another of said cams activating a normally closed limit switch during a momentary interval approaching the end of the mandrel's dwell period, said limit switch being contained in a series electric circuit including a relay responsible for energizing an electric motor powering the mandrels in the indexing motion thereof and paralleling another series electric circuit also including said relay together with circuit-closing switch means which are closed only when the carriage is retracted.

13. In combination with a winding machine providing a core-receiving mandrel bodily movable by indexing motion and in a direction normal to its axis into and out of a loading station: a core-loader therefor comprising an endless conveyor arranged to convey a core along a path in which its axis approximately coincides with that of a mandrel occupying the loading station, a reciprocally mounted carriage supporting the conveyor for bodily movement in a fore-and-aft direction from a retracted position whereat the carriage and its supported conveyor are adjacent to but spaced rearwardly from the proximal end of the mandrel into and out of an advanced position whereat the front end of the conveyor projects beyond said proximal end of the mandrel, a supply hopper for the cores, means for charging the cores one at a time from the hopper to the conveyor, normally inactive means for moving the carriage in the latter's forward and return strokes of reciprocation, means acting upon the conveyor at least throughout the period of the conveyor's fore-and-aft movement uninterruptedly driving the conveyor in a direction causing the same to impart forward travel to a core on the conveyor, means made to operate automatically as the mandrel in-

dexes into said loading station for activating the carriage-moving means so as to move the carriage in its forward stroke of reciprocation, means made to operate automatically as a core fed by the forward motion of the carriage reaches a given end limit of travel upon the mandrel for activating the carriage-moving means so as to return the carriage, and means preventing the mandrel from indexing out of the loading station until the carriage, in its return travel, has cleared the travel path of the mandrel.

14. Structure according to claim 13, the mandrel being electrically conductive, said means which activates the carriage-moving means so as to cause the latter to return the carriage comprising an electrically operated device contained in a normally complete electric circuit, two electrically conductive sensing fingers being provided which are normally isolated electrically one from the other and so positioned as to be first brushed by the mandrel when the mandrel indexes into the loading station and thereafter again electrically isolated from one another as the core is loaded upon the mandrel, said sensing fingers performing a circuit-closing function for a normally open low-voltage electric circuit including a relay the energizing of which opens normally closed contacts responsible for completing the first-named electric circuit.

15. Structure according to claim 14 in which the sensing fingers are comprised of spring coils giving extreme flexibility in compensation of the movement necessary as the mandrel brushes the sensing fingers in its indexing movement into and out of the loading station.

16. Structure according to claim 14, one of said sensing fingers engaging the mandrel in an out-of-the-way position with respect to the loaded core, the other of the sensing fingers engaging the mandrel in a position traversed by the cores as the core is loaded upon the mandrel.

17. In combination with a winding machine having a core-receiving mandrel bodily movable by indexing motion and in a direction normal to its axis into and out of a loading station: a core-loader therefor comprising an endless conveyor providing an upper run so positioned that a core carried thereon lies approximately co-axial with a mandrel occupying the loading station, a reciprocally mounted carriage supporting the conveyor for bodily movement in a fore-and-aft direction from a retracted position whereat the carriage and its supported conveyor are adjacent to but spaced rearwardly from the proximal end of the mandrel into and out of an advanced position whereat the front end of said upper run of the conveyor projects beyond said proximal end of the mandrel, means for constantly driving the conveyor in a direction such that its upper run progresses toward the mandrel, a supply hopper for the cores, a core-receiving breech underlying the hopper to the rear of the carriage in approximate axial alignment with said upper run of the conveyor, normally inactive means movable reciprocally in a fore-and-aft direction for charging the cores one at a time from the breech of the conveyor, means for activating said charging means in its forward stroke of reciprocation when a mandrel indexes into said loading station, means for activating said charging means in its return stroke of reciprocation as an automatic follow-up to the forward stroke of reciprocation, normally inactive means for imparting said fore-and-aft reciprocal motion to the carriage, means made to operate automatically as a follow-up to the charging operation for activating said last-named means, and means preventing the mandrel from indexing out of the loading station during said follow-up operation of the carriage.

18. In combination with a winding machine having a core-receiving mandrel bodily movable by indexing motion and in a direction normal to its axis into and out of a loading station, and having an electric motor supplying power for said indexing motion: a core-loader

11

therefor comprising an endless conveyor arranged to convey a core along a path in which its axis approximately coincides with that of a mandrel occupying the loading station, a reciprocally mounted carriage supporting the conveyor for bodily movement in a fore-and-aft direction from a retracted position whereat the carriage and its supported conveyor are adjacent to but spaced rearwardly from the proximal end of the mandrel into and out of an advanced position whereat the front end of the conveyor projects beyond said proximal end of the mandrel, normally inactive means for imparting said fore-and-aft movement to the carriage, means for constantly driving the conveyor in a direction such as to feed cores onto the mandrel, a supply hopper for the cores, a breech having capacity for a single core and underlying the hopper to the rear of the carriage, means for delivering the cores one at a time from the hopper to the breech, a means mounted for fore-and-aft reciprocal motion in said breech and acting to charge the cores from the breech to the conveyor, normally inactive means for imparting said fore-and-aft movement to the charging means, a constantly driven cam shaft movable in timed concert with the indexing movement of the mandrel, a plurality of cams on said cam shaft, three normally incomplete electric circuits and one normally complete electric circuit each containing a respective electric device so operatively connected with the charging means or the carriage-moving means, as the case may be, that energizing thereof operates in the instance of one of the said normally incomplete electric circuits to activate the charging means for advance movement, operates in the instance of a second said normally incomplete electric circuit to activate the charging means for retraction movement, operates in the instance of the remaining said normally incomplete electric circuit to activate the carriage-moving means for advance travel, and operates in the instance of said normally complete circuit to activate the carriage-moving means for retraction travel, a normally open limit switch for completing the first-named of said three normally incomplete electric circuits so operatively associated with one of said cams as to be closed thereby upon an indexing of a mandrel into said loading station, a second normally open limit switch for completing the second-named of said three normally incomplete electric circuits and so operatively associated with the charging means as to be closed thereby as the latter reaches the forward limit of its core-charging travel, a third normally open limit switch for completing the last-named of said three normally incomplete electric circuits and so operatively associated with another of said cams as to be closed thereby when the conveyor-advanced core reaches a given point upon the mandrel short of complete bottoming, means so operatively associated with said normally complete circuit as to maintain the same in a closed condition excepting for a period commencing with the arrival of the mandrel at the loading station and extending through approximately the time interval necessary for the carriage to load the mandrel, and a normally incomplete electric circuit including a circuit-closing limit switch engaged and closed by the carriage as the latter retracts and acting to prevent the mandrel from indexing out of the loading station while its travel path is occupied by the carriage.

19. Structure according to claim 18 having, as an added safety feature, a normally closed limit switch so operatively associated with still another of said cams as to be opened thereby toward the end of the dwell period during which the mandrel occupies the loading station and acting when opened to complete an electric circuit through said electric device which is contained in said normally complete circuit.

20. Structure according to claim 18, the conveyor being driven by an electric motor, and having still another and normally closed limit switch so associated with yet

12

another of said cams as to be activated thereby during a momentary interval approaching the end of the mandrel's dwell period, said limit switch being contained in a series electric circuit including a relay responsible for energizing both of said electric motors and paralleling another series electric circuit also including said relay together with circuit-closing switch means closed only when the carriage is retracted.

21. Structure according to claim 20 having normally open manually-operated switches one for energizing the motor which drives the conveyor, a second for completing the electric circuit which activates the carriage-moving means for advance travel, and a third for completing the electric circuit which activates the carriage-moving means for return travel.

22. Structure according to claim 18 having a normally closed limit switch held open by the presence of cores in a delivery throat leading from the hopper to the breech, and providing a normally inactive rotary agitator operating when activated to agitate the cores within the hopper, a constantly driven electric motor being provided having driving connection with the conveyor and also also driving the input end of a magnetic clutch which has driving connection from its output end to the agitator, the clutch being contained in an electric circuit closed by the last-named limit switch.

23. Feed devices comprising a constantly driven unidirectional endless conveyor, a carriage mounted for fore-and-aft reciprocal movement and supporting said conveyor so that the latter will move bodily with the carriage, receiving means movable by indexing motion into and out of a receiving station located at the approximate forward limit of the conveyor's travel as the latter moves with the carriage, means for charging to said conveyor an object which is to be conveyed to the receiving station and means for imparting said fore-and-aft motion to the carriage, the movement of the object as it is conveyed by the conveyor corresponding directionally with the forward travel of the carriage, means being provided for co-ordinating the charging means and the carriage with the indexing movement of the receiving means so that (1) the object to be conveyed is charged to the conveyor and (2) the carriage is given forward motion only when the receiving means indexes into said receiving station.

24. In combination with a tube-receiving mandrel bodily movable by indexing motion and in a direction normal to its axis into and out of a loading station, a tube-loader therefor comprising an endless conveyor arranged to convey a tube along a path in which its axis approximately coincides with that of a mandrel occupying the loading station, a reciprocally mounted carriage supporting the conveyor for bodily movement in a fore-and-aft direction from a retracted position whereat the carriage and its supported conveyor are spaced rearwardly from the proximal end of the mandrel into and out of an advanced position whereat the front end of the conveyor projects beyond said proximal end of the mandrel, normally inactive means co-ordinated with the indexing movement of the mandrel causing the carriage to be moved into and out of said advanced position only when the mandrel occupies said loading station, and means active upon the conveyor at least during its travel with the carriage giving movement to the conveyor in a direction corresponding with the forward travel of the carriage, means being provided for supplying to the conveyor the tube which is to be received upon the mandrel.

25. Structure according to claim 24, said conveyor comprising a multiple-link chain in which the multiple links carry fingers shaped to provide a close-fitting seat for the tube, the seating surface of said fingers being coated with a skin of plastic material having a high friction characteristic.

26. Structure as recited in claim 24, and means yield-

ingly pressing the tube against said seating surfaces of the fingers.

27. In combination with a tube-receiving mandrel, tube-carrying conveyor means operatively associated with said mandrel and mounted for fore-and-aft movement from a retracted position whereat the same is isolated from the mandrel into an advanced position whereat a tube carried by the conveyor means is fed onto the mandrel, means for imparting said advance movement to the conveyor means, a normally open electric circuit including an electrically operated device operatively interconnected with the conveyor means and characterized in that the same acts when energized to return the conveyor means to said retracted position, and means operated automatically as the tube reaches a given point in course of being fed by the conveyor means onto the mandrel serving as a control switch for closing said electric circuit so as to energize said electrically operated device.

28. Structure according to claim 27, the mandrel being electrically conductive, and the tube being electrically non-conductive, and in which the normally open electric circuit includes a circuit-completing switch closed by the inactivation of an electric coil contained in an electric circuit including, as the control switch therefor, the mandrel and two separated electrically conductive movably mounted fingers occupying a position in the path travelled by the delivered tube so as to be moved by the latter into a position isolated from the mandrel and thus opening the circuit through the coil.

29. The structure recited in claim 28 characterized in that the fingers are comprised of highly flexible spring coils.

30. In combination with a tube-receiving mandrel bodily movable by indexing motion and in a direction normal to its axis into and out of a loading station, a tube-loader therefor comprising a tube-carrying conveyor arranged to convey a tube along a path in which its axis approximately coincides with that of a mandrel occupying the loading station and mounted for fore-and-aft movement from a retracted position whereat the conveyor is spaced rearwardly from the proximal end of the mandrel into and out of an advanced position whereat a tube carried by the conveyor is fed onto the mandrel, normally inactive means co-ordinated with the indexing movement of the mandrel causing the conveyor to be moved into and out of said advanced position only when the mandrel occupies said loading station, an electrically operated device for moving the mandrel interruptedly in its said indexing motion, and two paralleling electric circuits each in series with said electrically operated device and characterized in that one said paralleling circuit includes a normally closed circuit-completing switch opened automatically for a momentary time interval immediately before the mandrel indexes out of said loading position and the other said paralleling circuit includes a normally open circuit-completing switch closed automatically by movement of the conveyor into its retracted position.

31. In combination with a tube-receiving mandrel bodily movable by indexing motion and in a direction normal to its axis into and out of a loading station, and with the means for moving the mandrel interruptedly in the said indexing motion, a tube-loader for said mandrel comprising a tube-carrying conveyor arranged to convey a tube along a path in which its axis approximately coincides with that of the mandrel when the latter occupies the loading station and mounted for fore-and-aft reciprocal movement from a retracted position whereat the conveyor is spaced rearwardly from the proximal end of the mandrel into and out of an advanced position whereat a tube carried by the conveyor is fed onto the mandrel, normally inactive means for imparting said fore-and-aft reciprocal motion to the conveyor, a cam shaft movable in timed concert with the indexing move-

ment of the mandrel, means controlled by one of the cams on said cam shaft causing said conveyor-moving means to be activated upon an indexing of the mandrel into said loading station, and means controlled by another of the cams on said cam shaft preventing the mandrel from indexing out of the loading station during activation of the conveyor-moving means.

32. In combination with a carriage supported for fore-and-aft reciprocal motion along a rectilinear path, and an endless conveyor chain trained about drive and idler sprocket wheels one fast to a live shaft and the other to an idler shaft carried by the carriage for rotation about longitudinally spaced apart transverse axes, an endless driving chain trained about a set of five sprocket wheels occupying a plane alongside and parallel with the plane occupied by said conveyor chain, two of said set of five sprocket wheels being carried by the carriage one above the other with the upper wheel fast to an end of the live shaft and the other freely journaled, another two of said set of five being journaled to the front of said carriage-carried sprocket wheels for rotation about localized axes one disposed above the other with one axis occupying the plane travelled by the live shaft and the other spaced therebelow, the remaining one of said set of five being journaled about a localized axis lying to the rear of said carriage-carried sprocket wheels in a plane which extends parallel to said plane travelled by the live shaft and transversing the axis of the lower of the last-named two sprocket wheels, at least one of said localized sprocket wheels being a power-driven wheel, the drive chain passing forwardly by an upper run from said rearmost sprocket wheel and taking oppositely-directed half-turns from below first about the lower and then about the upper of the two carriage-carried sprocket wheels, thence extending forwardly to pass first over the upper and then under the lower of the two forwardly placed localized sprocket wheels, and finally returning by a lower run to the rearmost sprocket wheel.

33. In combination with a carriage supported for fore-and-aft reciprocal motion along a rectilinear path, and an endless conveyor chain trained about drive and idler sprocket wheels one fast to a live shaft and the other to an idler shaft carried by the carriage for rotation about longitudinally spaced apart transverse axes, an endless driving chain trained about a set of sprocket wheels occupying a plane alongside and parallel with the plane occupied by said conveyor chain, said set including several stationary sprocket wheels journaled for rotation about localized axes and at least two walking sprocket wheels carried by the carriage one above the other with one fast to an end of the live shaft and the other freely journaled, one of said stationary sprocket wheels being a power-driven wheel, said sprocket wheels in the set being so located and the drive chain so trained about the same that two oppositely moving runs of the chain each parallel the travel path of the carriage and extend one run between one of the walking wheels and one of the stationary wheels and the other run between two stationary wheels which occupy positions one beyond one and the other beyond the other extreme of the path travelled by said walking wheels, the run of the chain including oppositely directed half-turns taken about the two walking wheels.

34. Feed devices comprising an endless conveyor, a carriage mounted for fore-and-aft reciprocal movement and supporting said conveyor so that the latter will move bodily with the carriage, means for driving the carriage in its reciprocal movement, means operative when the carriage occupies a retracted position for charging to the conveyor an object which is to be conveyed, means acting as a complement to said conveyor yieldingly pressing the charged object against said conveyor, and means independent of said carriage-driving means and operative at least throughout periods when the carriage is in mo-

15

tion for driving the conveyor with the direction thereof corresponding to the forward travel of the carriage.

35. In combination with a winding machine having a core-receiving mandrel bodily movable by indexing motion and in a direction normal to its axis into and out of a loading station, and having an electric motor supplying power for said indexing motion: a core-loader therefor comprising an endless conveyor arranged to convey a core along a path in which its axis approximately coincides with that of a mandrel occupying the loading station, a reciprocally mounted carriage supporting the conveyor for bodily movement in a fore-and-aft direction from a retracted position whereat the carriage and its supported conveyor are adjacent to but spaced rearwardly from the proximal end of the mandrel into and out of an advanced position whereat the front end of the conveyor projects beyond said proximal end of the mandrel, normally inactive means for imparting said fore-and-aft movement to the carriage, means for driving the conveyor in a direction such as to feed cores onto the mandrel, means for charging cores individually to the conveyor when the carriage occupies a retracted position, and means preventing the mandrel from indexing out of

16

the loading station while its travel path is occupied by the carriage.

36. Structure according to claim 35 having a normally closed switch contained in a series electric circuit including a relay responsible for energizing the electric motor and paralleling another series electric circuit also including said relay together with circuit-closing switch means closed only when the carriage is retracted, means being provided for opening said normally closed switch during a momentary interval approaching the end of the mandrel's dwell period.

References Cited in the file of this patent

UNITED STATES PATENTS

681,916	Hoxie et al. _____	Sept. 3, 1901
1,991,699	Reiners et al. _____	Feb. 19, 1935
2,219,954	Geiger et al. _____	Oct. 29, 1940
2,349,456	Olson _____	May 23, 1944
2,536,412	Bamford _____	Jan. 2, 1951
2,634,022	Wyatt _____	Apr. 7, 1953
2,679,924	Powell _____	June 1, 1954
2,723,049	Ward _____	Nov. 8, 1955