

July 29, 1952

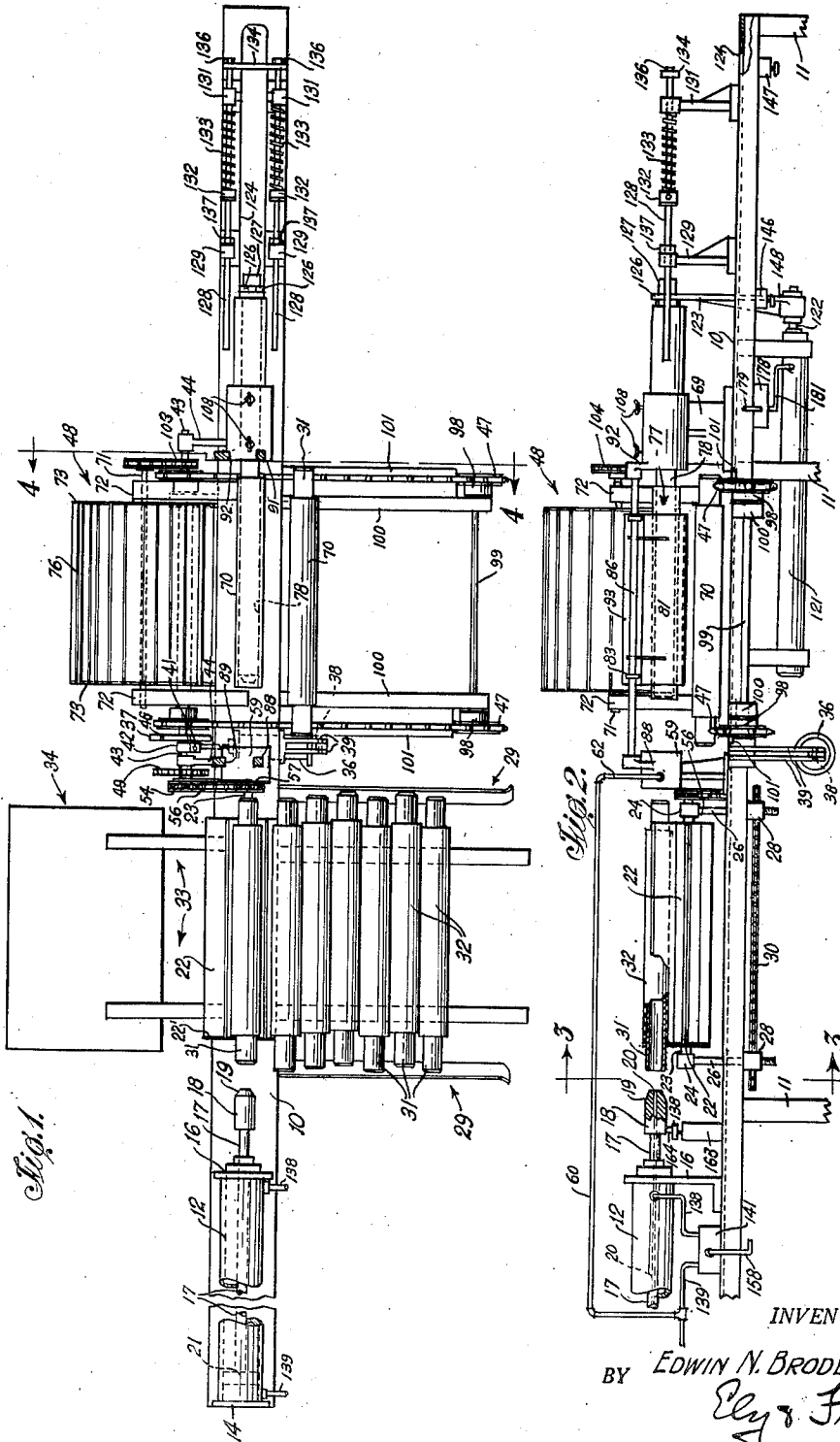
E. N. BRODEN

2,604,658

MACHINE FOR MOUNTING AND DEMOUNTING MANDREL-HELD FLEXIBLE TUBES

Filed Dec. 1, 1950

4 Sheets-Sheet 1



INVENTOR.
BY EDWIN N. BRODEN
Ely & Frye
ATTORNEYS

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4 Sheets-Sheet 2

Fig. 3.

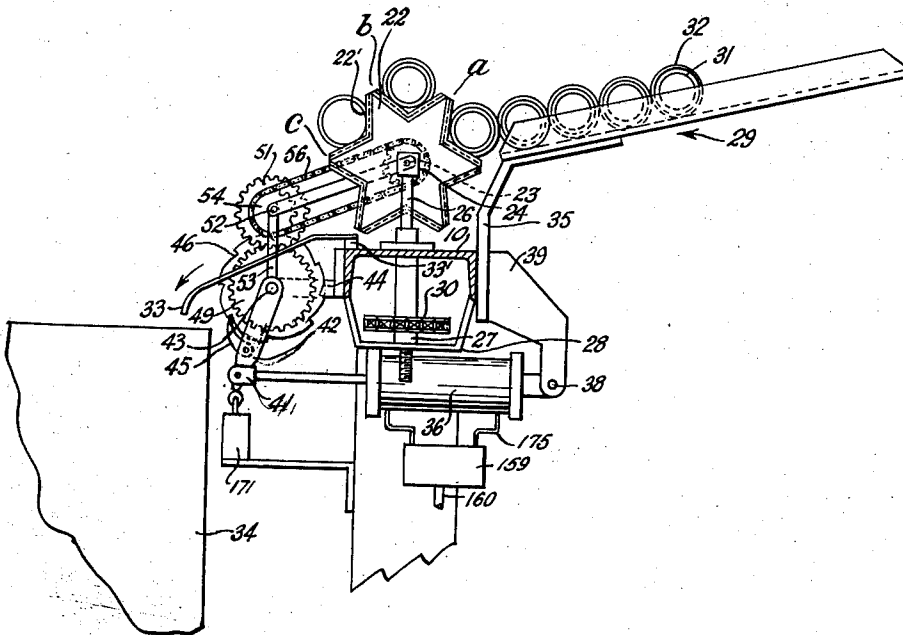
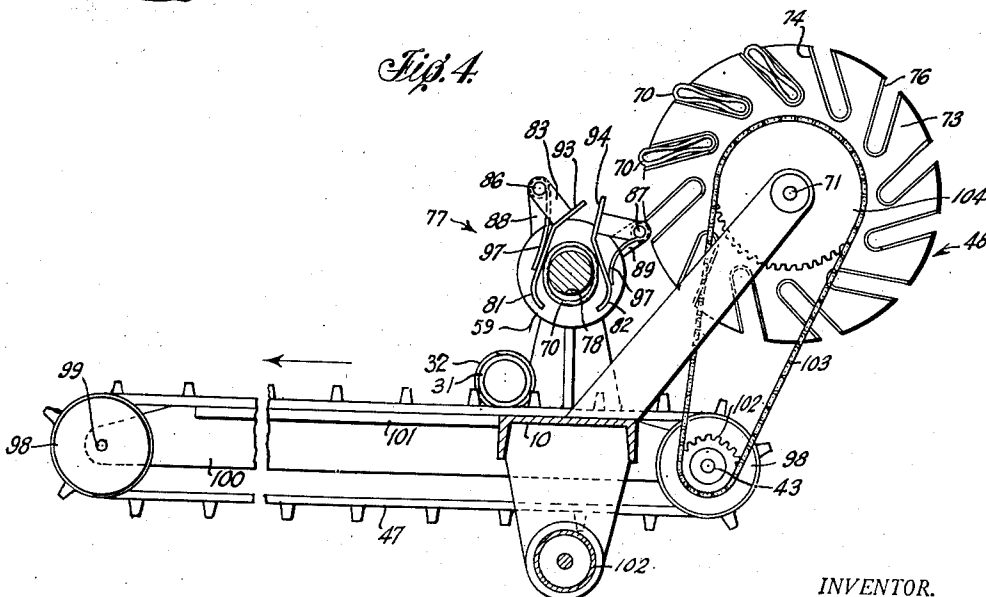


Fig. 4.



INVENTOR.

EDWIN N. BRODEN

BY

Ely & Frye
ATTORNEYS

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E. N. BRODEN

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4 Sheets-Sheet 3

Fig. 5.

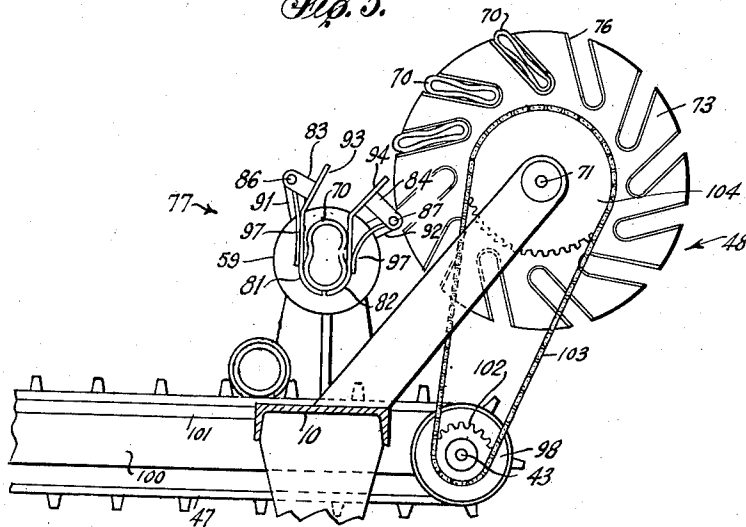


Fig. 6.

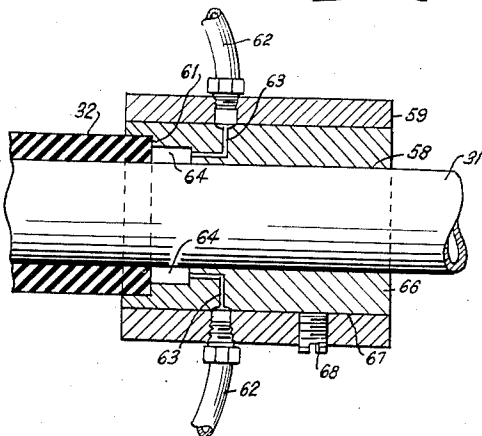
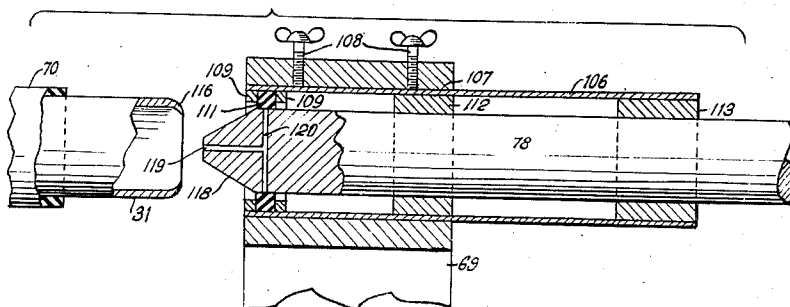


Fig. 7.

INVENTOR.
EDWIN N. BRODEN
BY *Cly & Faye*
ATTORNEYS

UNITED STATES PATENT OFFICE

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MACHINE FOR MOUNTING AND DEMOUNTING MANDREL-HELD FLEXIBLE TUBES

Edwin N. Broden, Assonet, Mass., assignor to The Firestone Tire & Rubber Company, Akron, Ohio, a corporation of Ohio

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21 Claims. (Cl. 18—2)

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This invention relates to a device for mounting and demounting sections of tubing of flexible material, such as rubber, onto and from mandrels. Such tubes have been manually placed on cylindrical mandrels for vulcanization, and the usual procedure has been to strip the tubes by hand from the mandrels after vulcanization.

According to the present invention, in its best known and preferred form, the mandrels, as they are removed from cured tubes, are, in the same movement, caused to pass into uncured tubes which have been opened to receive the mandrels.

It is, therefore, an object of the invention to facilitate the mounting and stripping of mandrel-held tubes. Further objects are to render such a process fully automatic, with a consequent speeding up of production and reduced unit cost of handling. Another object of the invention is to provide a novel indexing mechanism for simultaneously handling the transfer of articles in the various stages of the said automatic process.

The foregoing and other objects which will be apparent to those skilled in the art are accomplished by this invention, one preferred form of which is described in the following specification and illustrated in the drawings, in which:

Fig. 1 is a top plan view of the machine,

Fig. 2 is a front elevation of the machine of Fig. 1,

Fig. 3 is an enlarged sectional view taken on the line 3—3 of Fig. 2,

Fig. 4 is an enlarged sectional view taken on the line 4—4 of Fig. 1,

Fig. 5 is an enlarged view of a portion of Fig. 4, with the parts in a differently adjusted position,

Fig. 6 is an enlarged view in partial section of the pilot in its mounting and a cooperating mandrel,

Fig. 7 is an enlarged view, in axial section of a mandrel in its guide tube, and

Fig. 8 is a schematic view illustrating the automatic controls of the machine.

Referring to the drawings by characters of reference, there is shown a horizontal table 10 of channel section supported on a plurality of legs 11. An air cylinder 12 is supported at one end of the table on a pair of brackets 14, 16. Piston rod 17 of the air cylinder has a headed end 18, with a frusto-conical end 19, and the piston rod has a longitudinal, axial bore 20 extending throughout for a purpose to be explained hereinafter. The piston in cylinder 12 is indicated by the numeral 21.

To the right of cylinder 12 there is located an

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indexing wheel 22, star-shaped in end view (Fig. 3), and having a shaft 23 journaled in bearing blocks 24 on the tops of upright rods 26. The latter are threaded on their lower ends in internally threaded sleeves 27 supported on straps 28 beneath table 10, welded to the edges of the table channel. Suitable openings are provided in the table and in straps 28 for passage of rods 26, and rotation of sleeves 27 effects raising or lowering of shaft 23. Thus, adjustment may be made so that the axis of a cylindrical object, such as a mandrel 31, carried in the pockets between the star points of wheel 22, can be aligned with the axis of piston rod 17 when a mandrel is located in the pocket in the star wheel when the pocket is at the top of the wheel. This enables the machine to operate upon mandrels of different diameters. Sleeves 27 carry sprockets engaged by an endless chain 30, by means of which the sleeves are rotated in unison by any desired means to effect the vertical adjustment of the star wheel.

An inclined ramp, indicated generally by the numeral 29, is attached to the table through a bracket 35 and serves as a gravity feed for mandrels 31 in their advance to indexing wheel 22. When the mandrels are received on the ramp, they carry tubes 32 which encase the mandrel except at the ends which are exposed, as shown in Fig. 2. An inclined ramp 33, attached by a bracket 33' to the opposite side of the table from ramp 29, delivers tubes 32 to a suitable receiver 34, after the mandrels have been removed from the tubes.

The star wheel is driven intermittently by an air cylinder 36 acting through an indexing ratchet wheel 37. Air cylinder 36 is pivoted at 38 between a pair of arms 39 secured to one side of the table and the piston rod has a clevis 41, pivoted to a link 42, the other end of which is mounted for swinging motion on the shaft 43 of ratchet wheel 37, said shaft being supported between brackets 44, which are secured to one side of the table. Pivotaly mounted on link 42, adjacent clevis 41, is a spring-pressed pawl 42 adapted to engage recesses 46 in wheel 37 to rotate the latter stepwise for indexing. As will be explained, the indexing drive from cylinder 36 is also communicated to a double belt 47 and to a feed drum 48, which delivers uncured tubes into position for receiving the mandrels.

The drive from ratchet wheel 37 to star wheel 22 is communicated through a gear 49, keyed to the shaft 43, meshing with a gear 51 rotatable on a shaft 52 carried by a pair of arms 53, which are pivoted on shaft 43, so that the center of

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gear 51 can be shifted circumferentially about shaft 43. Shaft 52 also carries a sprocket 54, driving a chain 56 which, in turn, drives a sprocket 57, keyed to shaft 23 of the star wheel. This general arrangement of the drive gives a "knee action" which permits compensation for changes in the vertical adjustment of the star wheel.

The operations performed at the star wheel station comprise the removal of the mandrel 10 from the cured tube and removal of the cured tube after emergence of the mandrel therefrom. As will be seen in Fig. 3, three upper spaces in the star wheel are occupied simultaneously. In space *a*, a tube-bearing mandrel has been received from the ramp 29 and is in readiness for lifting to the stripping position; in space *b* the mandrel is positioned for removal from the tube by head 18 of the piston rod, and in space *c* an empty, cured tube is ready for delivery to the ramp 33.

As the mandrel is moved by the action of the piston 17 to the right, it passes through a bore 58 (Fig. 7) in a supporting upright 59, secured on table 10. In order to accommodate mandrels of different diameter, bore 58 is located in a removable sleeve 66, received in a bore 67 in upright 59, and secured with a set screw 68. In this manner the sleeve 66 may be replaced by a similar sleeve having the central bore to fit snugly about the particular size of mandrels which are being stripped. Rubber tube 32 moves with its mandrel until the right edge of the tube contacts the abutment formed by the bottom 61 of a counterbore of bore 58, which arrests motion of the rubber tube and thus provides a stripping action.

In order to effect the stripping of a tube from its mandrel, it is necessary to expand the tube and this is done by injecting air under pressure between the leading edge of the tube and its mandrel. The stripping is therefore assisted by air under pressure, communicated from the pressure side of cylinder 12, through a line 60 leading from the rear side of piston 21, and through a pair of conduits 62 branching from line 60 and leading to passages 63 in sleeve 66, leading to a second counterbore 64 of bore 58. The line 60 is connected to the interior of cylinder 12 through a line 139, which also communicates with a two-way valve 41.

A second upright 69, attached to table 10, having a bore co-axial with that of upright 59, is spaced from the latter and the space between the two uprights constitutes a station wherein uncured tubes 70 receive the mandrels as they are ejected from the cured tubes. At this station, feeding wheel 48 is located, with a shaft 71 journaled in brackets 72 secured to the table. Wheel 48 (Fig. 4) comprises a pair of end discs 73 having peripheral slots 74, inclined to radial directions on the disc, in such manner that the slots will drop their contents at about the "nine o'clock" position. The slots are lined throughout the length of the drum, by U-shaped pockets of sheet metal 76 extending from one disc to the other and secured in slots 74. Other supporting discs, intermediate discs 73, may be employed, if desired. The pockets are adapted to receive uncured tubes, as collapsed into a flat condition.

As a flat tube falls from the feed wheel 48, it passes into a receiver, shown generally at 77, which holds the tube temporarily in position to receive a pilot 78, of somewhat smaller outer diameter than the mandrel 31, which pilot, in a sliding movement to the left, opens a tube 70

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held in the receiver, so that a mandrel 31 may pass into the uncured tube.

Receiver 77, shown in Figs. 2, 4, and 5, but omitted in Fig. 1, comprises a split pocket composed of sheet members 81, 82, having brackets 83, 84 by means of which they are pivoted on respective shafts 86, 87. The latter are supported, at their left ends on respective brackets 88, 89, on upright 59, and at their right ends on brackets 91, 92 on upright 69. Sheet members 81, 82, defining the receiving pocket are in the form of a U, split at the bight, and have upper, bent portions 93, 94 directed to receive a flat tube from that pocket of wheel 48 which is in delivering position. Leaf springs 97, carried on the supporting brackets of the pocket system 77 and engaging the separable pocket sections 81, 82, serve to keep the split pocket closed when empty or when only the weight of the uncured tube is being borne in the pocket, but which yield under the combined weight of a mandrel and a tube, so that the pocket opens and the covered mandrel falls onto the conveyers 47. The latter are suitably spaced apart so that no uncured rubber, but only the ends of the mandrel bear upon them. The conveyers may be of rubber and formed on their outer surfaces with spaced lugs to receive the mandrels. The conveyers pass over pulleys 98 journaled on shaft 43 and on a shaft 99, the latter journaled in brackets 100 carried transversely of the table 10. Shelves 101 on brackets 100 give support to the upper span of the chain or belt. Also keyed to the shaft 43 is a sprocket 102 which communicates rotation to the feed drum 48 by means of a chain 103 and sprocket 104 fixed to shaft 71. By these connections, the feed wheels 22 and 48 and the conveyor chains 47 are indexed simultaneously with each impulse from air cylinder 36. Other movements of the system are co-ordinated through limit switches, as will be explained.

The pilot 78 is located on the opposite side of the machine from the piston 18 and the piston and the pilot are in alignment with each other and with the mandrel which is in the pocket *b* of the star wheel 22.

The slide bearing for pilot 78 (Fig. 6) is contained in a long sleeve 106 received in a bore 107 in upright 69, which is axially aligned with piston rod 17 and bore 67, sleeve 106 being fixed in place by thumb screws 108 or the like. During the operation, mandrels 31 pass partly within sleeve 106 and, as in the case of sleeve 66, sleeve 106 is replaceable to take care of mandrels of different diameters.

Secured in the left end of tube 106 are a pair of collars 109, defining internal annular ribs and spaced apart to accommodate a rubber ring 111, having a smaller internal diameter than that of the said ribs. In particular, the internal diameter of the rubber ring is about the same as the outer diameter of the pilot 78, and the inner diameter of ribs 109 is such as to receive the mandrel 31 in a sliding fit. A pair of axially spaced, bearing sleeves 112, 113, in tube 106, are sized to receive pilot 78 in a sliding fit.

Mandrels 31 are of tubular form in order to communicate air from piston rod 17 and the mandrels have tapered edges 116 to facilitate entry into the guide bores. Pilot 78 has a tapered nose 118 and a short, axial bore 119 at its left end, communicating with a diametral bore 120.

Pilot 78 is moved to the left, to open the uncured tube in pocket 77, by means of an air cylinder 121 secured to the underside of table 10. The

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piston rod 122 of the air cylinder carries an upright arm 123 which passes through a long slot 124 in the table top and has, at its upper end, a fork 126 which engages behind the head 127 of a projection on the outer end of the pilot. The air cylinder is single acting, with the pressure arranged to move the fork to the left, and the pilot and the piston rod 122 are pushed to the right by a mandrel as it penetrates one of the uncured tubes. In this latter movement, it is necessary for the mandrel end to move into sleeve 106 so that the right end of the uncured tube will be spaced inwardly from the end of the mandrel. Therefore, means are provided for ejecting the mandrel from its position of partial entry into tube 106 so that it may fall onto the conveyor belts 47. This return means comprises a pair of rods 128 on opposite sides of the table, at the right end thereof, each mounted for sliding motion in bores in a pair of uprights 129, 131 on the table. Each rod carries a stop collar 132 forming an abutment for a coil spring 133 surrounding the rod and located between collar 132 and upright 131. The outer ends of the rods are threaded into a cross bar 134 and are provided with lock nuts 136 outwardly of the cross bar. The latter is positioned to be contacted by the outer end of the pilot 78 when a mandrel end enters sleeve 106 and, during this phase, rods 128 slide through bearings 129, 131, with stops 132 compressing springs 133. Upon return stroke of piston rod 17 to the left, springs 133, acting on pilot 78, through rods 128 and cross bar 134 move the mandrel to the left so that it follows the returning piston rod head 19 until the mandrel is clear of tube 106.

A pair of collar stops 137 on rods 128 limit leftward motion of the rods, and motion of the pilot ceases after the mandrel has been moved a sufficient amount to clear the tube 106. Thereafter, as piston rod head 19 continues its leftward, return motion, the loaded mandrel, which is now released from any supporting means, opens up the receiver 77 and drops to conveyor belts 47.

The tube 32, which has been stripped from the mandrel, remains in surrounding relation to piston rod 17 until the latter has retracted. In this movement, the tube will dwell on the piston rod and will move to the left until it abuts flanges 22' on the left hand end of each pocket in the star wheel, which will arrest the return movement of the tube until the piston passes beyond the tube, whereupon the tube is freed from the mandrel and drops onto the delivery chute when the star wheel is advanced to its next station.

The continuous, automatic operation is carried out by means of switches and valves, by an arrangement shown schematically in Fig. 8, in which the schematized elements from the main figures are given like reference numerals, qualified by prime marks.

At the phase of operation shown in Fig. 8, the piston rod of indexing cylinder 36' is in position to deliver an indexing stroke, the piston of pilot-actuating cylinder 121' is in its outward position, in readiness to move the pilot (not shown) leftward, and piston rod 17' of the mandrel-moving cylinder 12' is moving leftward, as indicated by the arrow, and is approaching the end of this return stroke.

Cylinder 12' is double-acting through a pair of conduits 138', 139', leading to a four-way valve 141' with a slider 142 which is controlled by a pair of solenoids 143, 144. Energization of these solenoids is controlled by a pair of switches 146', 147',

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actuatable by a dog 148' on the piston rod of cylinder 121'. All solenoids are energized from a voltage source 149 having main lines 151, 152. Switch 146' is in a lead 153 from line 151 to solenoid 144, and the latter is connected to line 152 through a lead 154. In like manner, switch 147' is connected to lead 153 and to solenoid 143, through a lead 156, and solenoid 143 is connected to line 152 through a lead 157.

It will be seen that when the piston rod of cylinder 121' is at the outward limit of its stroke, solenoid 143 is energized to move slider 142 to the right, and thus air pressure from an air line 158' is applied on the right side of the piston 21' of cylinder 12', to move it leftward. (No main line for the air pressure is shown, but pressure input, in the case of each valve, is indicated by an arrow.) Conversely, when the piston of cylinder 121' is in its retracted position, switch 146' is actuated by dog 148' to energize solenoid 144, which moves slider 142 to the left, placing pressure on the left side of the piston of cylinder 12', to move a mandrel to the right.

The indexing cylinder 36' is controlled by a four-way valve 159', having a slider 161, a pressure-input conduit 160', and a pair of conduits 165', 175' leading to opposite sides of the piston. The valve slider 161 is actuated in one direction (downward in Fig. 8) to move the piston in an indexing operation, through a solenoid 162, controlled by a switch 163' which is actuated by a dog 164' on piston rod 17', when the latter is in retracted position. Solenoid 162 is connected to line 151 through a lead 166, and switch 163 is in a lead 167 from solenoid 162 to line 152.

The piston of indexing cylinder 36' is returned by a solenoid 168, which is connected to lead 153 by a lead 169, and to line 152 by a lead 170, so that solenoid 168 is energized simultaneously with solenoid 144, by switch 146', to put the pressure through conduit 165' and return the indexing piston as the piston rod 17' starts moving to the right to strip a mandrel from its tube.

Movement of pilot-actuating cylinder 121' is controlled by a switch 171', which is closed by a dog 172' on the piston rod of cylinder 36' in its outward or indexing movement. Switch 171' is in a line 173 from line 151 to a solenoid 174, having a lead 176 to line 152. Solenoid 174 actuates a slider 177 in a valve 178' to place air under pressure from a conduit 179' into cylinder 121' through a conduit 181', so that pressure is applied on the right side of the piston to move it to the left, thus moving the pilot (not shown in Fig. 8) to open an uncured tube.

Sequence of operation of switches and valves

As piston rod 17' completes its return stroke, to the left, switch 163' is closed by dog 164', energizing solenoid 162 and moving the piston of cylinder 36' outward to index the various mechanisms.

At the completion of the indexing stroke, dog 172' closes switch 171' to energize solenoid 174 and introduce pressure into cylinder 121' to move its piston and the pilot 78 to the left. At the start of this movement, switch 147' opens, de-energizing solenoid 143 in preparation for action by solenoid 144.

At the completion of the leftward movement of the pilot, dog 148' closes switch 146', which energizes solenoid 144, placing pressure to the left of the piston in cylinder 12' to move it to the right, to strip a mandrel from a cured tube and to insert the mandrel in an uncured tube, while

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it urges the pilot to the right, out of the uncured tube. At the start of rightward movement of piston rod 17', solenoid 158, which has also been energized by switch 146', moves slider 161 of valve 159' to return the indexing piston of cylinder 36'.

As dog 148' moves to the right, switch 146' opens to de-energize solenoid 144 in preparation for subsequent action by solenoid 143, and to de-energize solenoid 168 in preparation for action by solenoid 162.

As the pilot reaches its extreme rightward position, dog 148' closes switch 147', energizing solenoid 143 and returning piston 17' to the left. This completes the cycle.

Summary of operation

With the parts in the positions shown in Figs. 1 to 3, piston rod clevis 41 has just reached the outward limit of its stroke to index the various stations. A stripped, cured tube 32 has been moved to position c of the star wheel 22 and is about to fall onto delivery ramp 33. A mandrel bearing a cured tube has been brought to position b in readiness for stripping by piston rod head 18, the conveyer belts 47 have moved the distance of a link length advancing a tube covered mandrel and moving an empty link into position under the receiving pocket 77 adjacent the feed wheel 48.

With clevis 41 in the position shown, switch 171 has been actuated, cylinder 121 is energized, and pilot 78 has moved to the left into the uncured tube 70 which is resting in the receiver 77. In moving to the left, the pilot has swung pocket wall sections 81, 82 on their pivots to open position, as shown in Fig. 4.

When the pilot has passed through tube 70 until its pointed end protrudes beyond the leftward end of the tube, dog 148 on the pilot-actuating cylinder trips switch 146', which reverses valve 159, returning pawl 46 for the next indexing operation, and switch 146' also actuates valve 141', causing piston rod head 18 to move to the right. Head 18 contacts mandrel 31 in the star wheel and moves it to the right, with tapered end 19 of head 18 snugly engaged in the open end of the mandrel, to communicate air from behind piston 21 through the opening of the mandrel and to bores 119, 120 of the pilot, which serves to expand the uncured tube in front of the advanced mandrel to facilitate passage of the mandrel through the uncured tube.

The right end of the mandrel passes into bore 58 of upright 59 until the end of cured tube 32 contacts the bottom 61 of the counterbore of bore 58, which holds the tube but permits the mandrel to pass on through the bore. This stripping operation is assisted by air from the pressurized left end of cylinder 12, passing through line 60 into lines 62 and leading to counterbore 64 through passages 63. The mandrel passes on until its rounded mount 116 engages the tapered end 118 of the pilot and pushes the latter to the right, the mandrel passing into and through the uncured tube 70 while ejecting the pilot therefrom. The mandrel, which is now supported by the piston head 18 and the pilot, continues pushing the pilot to the right until the end of the mandrel has entered sleeve 106, passing in a tight fit through rubber ring 109. The tube 70 abuts against the outer ring 109, so that as the mandrel continues its movement into tube 106, it moves relatively to tube 70, and when the pilot is stopped by spring 133, the tube is spaced from the end of the

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mandrel in a substantially central position with respect to the mandrel. At this stage, switch 147 is actuated to return piston rod 17, and spring 133 urges the tube-covered mandrel out of sleeve 106 so that it may drop onto the conveyer 47.

As will be seen from the detailed description, the machine automatically strips vulcanized tubes from the mandrels, but as each mandrel is immediately inserted in an unvulcanized tube, the mandrels are not at any time idle; as soon as the tubes are stripped from their mandrels, new tubes are placed thereon and the mandrels may be immediately transferred to the vulcanizers. All that it is necessary to do to get maximum production from the mandrels is to feed a continuous supply of covered mandrels to the ramp 29 and to feed a supply of vulcanized tubes to the pockets of the feed wheel 48. The injection of air or any other expanding medium into the interior of the vulcanized and unvulcanized tubes facilitates the stripping of the vulcanized tubes and the placement of the unvulcanized tubes on the mandrels. With a minimum amount of supervision on the part of the operator, the operations are entirely automatic.

The description of the machine shown in the drawings has been given in great detail so that the construction and mode of operation of the preferred embodiment of the invention may be understood, but the details need not be followed in every adaptation of the invention. While the invention is particularly designed for the handling of mandrels in the production of rubber tubing, it may be employed for analogous purposes and is not necessarily confined to the particular processes set forth.

While the stripping and subsequent mandrel inserting operations are preferably carried on conjointly, it is possible to utilize the invention for either operation without the other. However, the combination of the two operations in one machine makes it possible to conserve time and to utilize the equipment at its highest efficiency.

While a certain preferred embodiment of the invention has been shown and described, the invention is not limited thereby since changes in the size, shape and arrangement, for instance, of the various parts may be resorted to without departing from the spirit or scope of the appended claims.

What is claimed is:

1. A machine for stripping vulcanized tubes from mandrels and for inserting the mandrels into unvulcanized tubes, said machine comprising a support for a mandrel having a vulcanized tube thereon, a second support for holding an unvulcanized tube in alignment with the mandrel, means for moving the mandrel axially, an abutment in the path of the vulcanized tube as it is moved with the mandrel to strip the said vulcanized tube from the mandrel during movement of the mandrel, a pilot in axial alignment with the mandrel, and means to move the pilot axially through said second support to a position with the leading end of the pilot exposed, said mandrel moving means causing the mandrel to contact the pilot to force the pilot out of the unvulcanized tube, until the unvulcanized tube is supported on the mandrel.

2. A machine for stripping vulcanized tubes from mandrels and for inserting the mandrels into unvulcanized tubes, said machine comprising a support for a mandrel having a vulcanized

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tube thereon, a second support for holding an unvulcanized tube in alignment with the mandrel, means for moving the mandrel axially, an abutment in the path of the vulcanized tube as it is moved with the mandrel to strip the said vulcanized tube from the mandrel during movement of the mandrel, a pilot in axial alignment with the mandrel, means to move the pilot axially through said second support to a position with the leading end of the pilot exposed, said mandrel moving means causing the mandrel to contact the pilot to force the pilot out of the unvulcanized tube, until the unvulcanized tube is supported on the mandrel, and means to release the mandrel after the unvulcanized tube is centered on the mandrel.

3. A machine for stripping vulcanized tubes from mandrels and for inserting the mandrels into unvulcanized tubes, said machine including a support for a mandrel having a vulcanized tube thereon, a second support for holding an unvulcanized tube in alignment with the mandrel, means for moving the mandrel axially, an abutment in the path of the vulcanized tube as it is moved with the mandrel, means to inject air between the tube and the mandrel while the mandrel is moving to strip the tube from the mandrel, and means movable through said second support to expand an unvulcanized tube so that the mandrel may enter the said unvulcanized tube during its axial movement.

4. A machine for stripping vulcanized tubes from mandrels and for inserting the mandrels into unvulcanized tubes, said machine including a support for a mandrel having a vulcanized tube thereon, a second support for holding an unvulcanized tube in alignment with the mandrel, means for moving the mandrel axially, an abutment in the path of the vulcanized tube as it is moved with the mandrel, means to inject air between the tube and the mandrel while the mandrel is moving to strip the tube from the mandrel, a pilot, and means to move the pilot through said second support and into contact with an end of the mandrel, said mandrel moving means causing the pilot to withdraw from the unvulcanized tube as the mandrel advances.

5. A machine for stripping vulcanized tubes from mandrels and for inserting the mandrels into unvulcanized tubes, said machine including a support for a mandrel having a vulcanized tube thereon, a second support for holding an unvulcanized tube in alignment with the mandrel, means for moving the mandrel axially, an abutment in the path of the vulcanized tube as it is moved with the mandrel, means to inject air between the tube and the mandrel while the mandrel is moving to strip the tube from the mandrel, a pilot, means to move the pilot through said second support and into contact with an end of the mandrel, said mandrel moving means causing the pilot to withdraw from the unvulcanized tube as the mandrel advances, and means to inject air into the unvulcanized tube during the movement of the mandrel.

6. A machine for transferring mandrels from one tube to another, comprising a reciprocating element for urging a mandrel axially, a pilot axially aligned with said element, means to move the pilot axially toward said element, means to support the mandrel in axial alignment with said element and said pilot, said pilot being movable by said element, acting through said mandrel, an abutment to contact the end of a tube on the mandrel past which said mandrel is caused to

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move by said element, and means to inject air between the tube and the mandrel during movement of the mandrel.

7. A machine for transferring mandrels from one tube to another, comprising a reciprocating element for urging a mandrel axially, a pilot axially aligned with said element, means to move the pilot axially toward said element, means to support the mandrel in axial alignment with said element and said pilot, said pilot being movable by said element, acting through said mandrel, and an abutment to contact the end of a tube on the mandrel past which said mandrel is caused to move by said element.

8. A machine for transferring mandrels from one tube to another, comprising a reciprocating element for urging a mandrel axially, a pilot axially aligned with said element, means to move the pilot axially toward said element, and means to support the mandrel in axial alignment with said element and said pilot, said pilot being movable by said element, acting through said mandrel.

9. A machine for transferring mandrels from one tube to another comprising a reciprocating element for urging a mandrel axially, a first block having a bore axially aligned with said element and spaced from said element to permit the passage of a mandrel, a second block having a bore axially aligned with said element and spaced from said first block, a pilot reciprocable in said second block, and means to move the pilot toward said first block.

10. A machine for inserting mandrels in unvulcanized tubes comprising a receiver to hold the tube, a piston to move a mandrel axially of the tube and to insert the mandrel in the tube, a pilot, and means to move the pilot through the unvulcanized tube prior to the entry of the mandrel and to permit the pilot to retreat as the mandrel enters the tube.

11. A machine for inserting mandrels in unvulcanized tubes comprising a receiver to hold the tube, a piston to move a mandrel axially of the tube and to insert the mandrel in the tube, a pilot, means to move the pilot through the unvulcanized tube prior to the entry of the mandrel and to permit the pilot to retreat as the mandrel enters the tube, and means to inject air into the tube during the movement of the mandrel through the tube.

12. A machine to strip a vulcanized tube from a mandrel and to thereafter insert the mandrel in an unvulcanized tube, said machine comprising a reciprocable piston to engage one end of the mandrel and a pilot to engage the other end of the mandrel, a stripping device to engage an end of a vulcanized tube and arrest the movement of the tube while the mandrel is moving, a support for holding an unvulcanized tube in axial alignment with the mandrel, means to move the pilot into the unvulcanized tube while on the support and to permit the pilot to withdraw from the unvulcanized tube as the mandrel is moved past the stripping device and into the unvulcanized tube.

13. A machine to strip a vulcanized tube from a mandrel and to thereafter insert the mandrel in an unvulcanized tube, said machine comprising a reciprocable piston to engage one end of the mandrel and a pilot to engage the other end of the mandrel, a stripping device to engage an end of a vulcanized tube and arrest the movement of the tube while the mandrel is moving, a support for holding an unvulcanized tube in axial alignment with the mandrel, means to move the

pilot into the unvulcanized tube while on the support and to permit the pilot to withdraw from the unvulcanized tube as the mandrel is moved past the stripping device and into the unvulcanized tube, and means to inject air into the vulcanized and unvulcanized tubes during the movement of the mandrel.

14. In a machine for the purpose set forth, a support for holding a mandrel with a vulcanized tube thereon, a second support for holding an unvulcanized tube in axial alignment with the mandrel, means to move the mandrel endwise from the first named support and to insert it into the unvulcanized tube on the second support, and a stripping device operable during movement of the mandrel to remove the vulcanized tube from the mandrel, said device being located between the said supports.

15. In a machine for the purpose set forth, a support for holding a mandrel with a vulcanized tube thereon, a second support for holding an unvulcanized tube in axial alignment with the mandrel, means to move the mandrel endwise from the first named support and to insert it into the unvulcanized tube on the second support, a stripping device operable during movement of the mandrel to remove the vulcanized tube from the mandrel, said device being located between the said supports, and a reciprocable pilot to enter and open said unvulcanized tube before the entry of the mandrel therein and to hold the unvulcanized tube open as the mandrel moves into the unvulcanized tube.

16. A machine for transferring mandrels from one tube to another comprising a ram, means to reciprocate the ram, a pilot axially aligned with and movable by said ram, means to move the pilot toward the ram, means responsive to movement of the pilot by the ram to return the ram when the pilot is at a predetermined position, and means responsive to return of the ram to move the pilot toward the ram.

17. A machine for transferring mandrels from one tube to another, comprising a reciprocating ram, power means to move the ram, a pilot axially aligned with and movable by the ram, power means to move the pilot toward the ram, switch means responsive to movement of the pilot toward the ram to actuate the power means for the ram to move the ram toward the pilot, and switch means responsive to movement of the pilot by the ram to actuate the power means for the ram to move the ram away from the pilot.

18. A machine for transferring mandrels from one tube to another, comprising a reciprocating ram, power means to move the ram, a pilot axially aligned with and movable by the ram, power means to move the pilot toward the ram, switch means responsive to movement of the pilot toward the ram to actuate the power means for the ram to move the ram toward the pilot, switch means responsive to movement of the pilot by the ram to actuate the power means for the ram to move the ram away from the pilot, an indexing device for feeding articles into the path of the ram and pilot, switch means responsive to movement of the ram away from the pilot to

actuate said indexing device, and switch means responsive to movement of said indexing device to move said pilot toward said ram.

19. A machine for transferring mandrels from one tube to another, comprising a reciprocating element for urging a mandrel axially, a pilot axially aligned with said element, means to move the pilot axially toward said element, and means to support the mandrel in axial alignment with said element and said pilot, said pilot being movable by said element, acting through said mandrel, said reciprocating element having an air passage leading to the end thereof which contacts the mandrels, whereby air under pressure may be communicated through hollow mandrels to said pilots.

20. A machine for transferring mandrels from one tube to another, comprising a reciprocating element for urging a mandrel axially, a pilot axially aligned with said element, means to move the pilot axially toward said element, and means to support the mandrel in axial alignment with said element and said pilot, said pilot being movable by said element, acting through said mandrel, said reciprocating element having an air passage leading to the end thereof which contacts the mandrels, and said pilot having an air passage leading from its end adjacent the said element through a side face of the pilot, whereby air under pressure may be communicated from said element through a hollow mandrel and through a portion of said pilot.

21. A machine for transferring mandrels from one tube to another, comprising a reciprocating element for urging a mandrel axially, a pilot axially aligned with said element, means to move the pilot axially toward said element, means to support the mandrel in axial alignment with said element and said pilot, said pilot being movable by said element, acting through said mandrel, said reciprocating element having an air passage leading to the end thereof which contacts the mandrels, said mandrels being hollow, and said pilot having an air passage leading from its end adjacent the said element through a side face of the pilot, whereby air under pressure may be communicated from said element through a hollow mandrel and through a portion of said pilot, and an air cylinder comprising a piston and piston rod, said piston constituting the reciprocating element, the air passage in said element communicating with the pressure side of said piston.

EDWIN N. BRODEN.

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