April 21, 1959 A. G. FOSTER ET AL 2,883,120

STRAND REELING APPARATUS

Filed Feb. 7, 1956 4 Sheets-Sheet 1

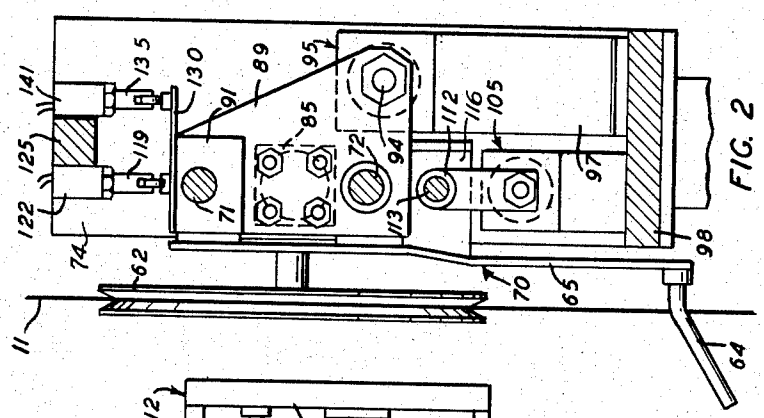


FIG. 2

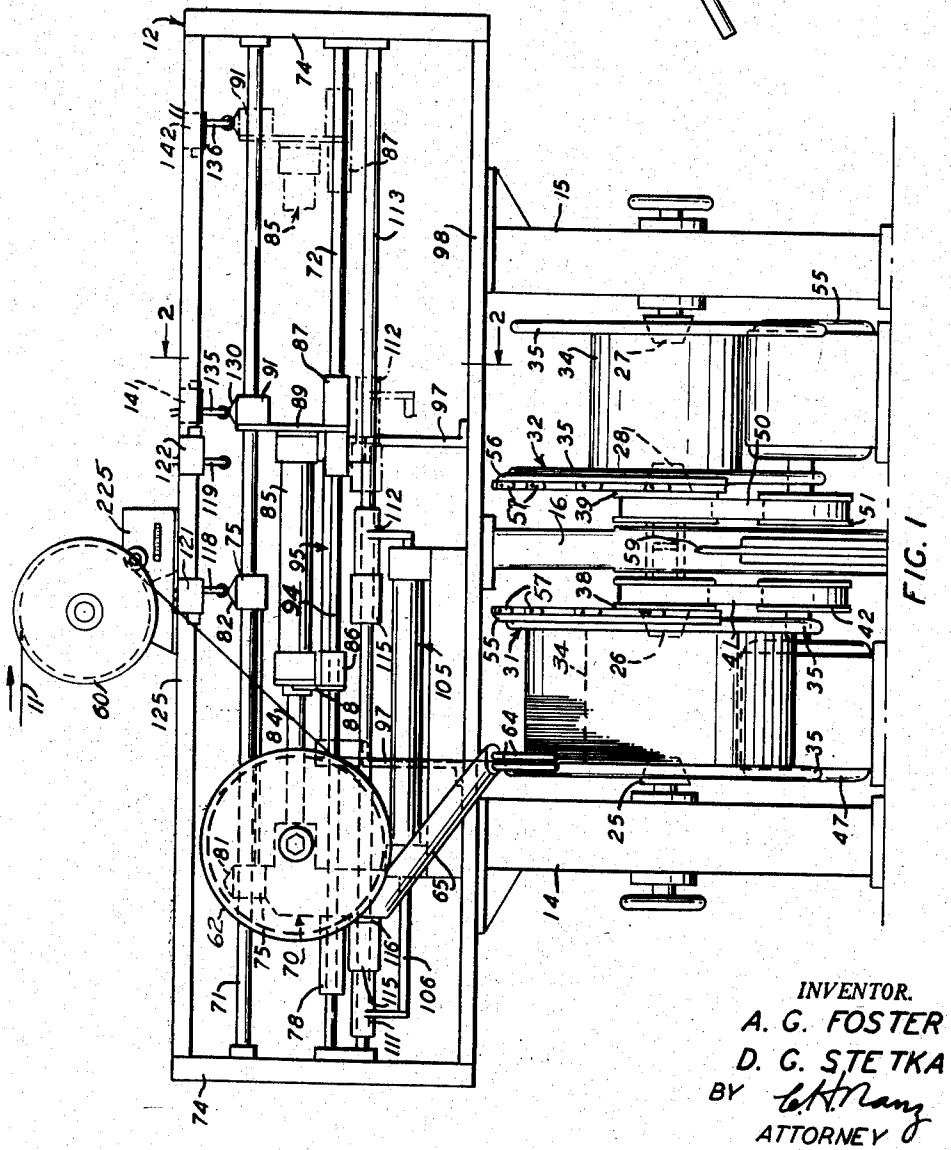


FIG. 1

INVENTOR.
A. G. FOSTER
D. G. STETKA
BY
ATTORNEY

April 21, 1959 A. G. FOSTER ET AL 2,883,120

STRAND REELING APPARATUS

Filed Feb. 7, 1956 4 Sheets-Sheet 2

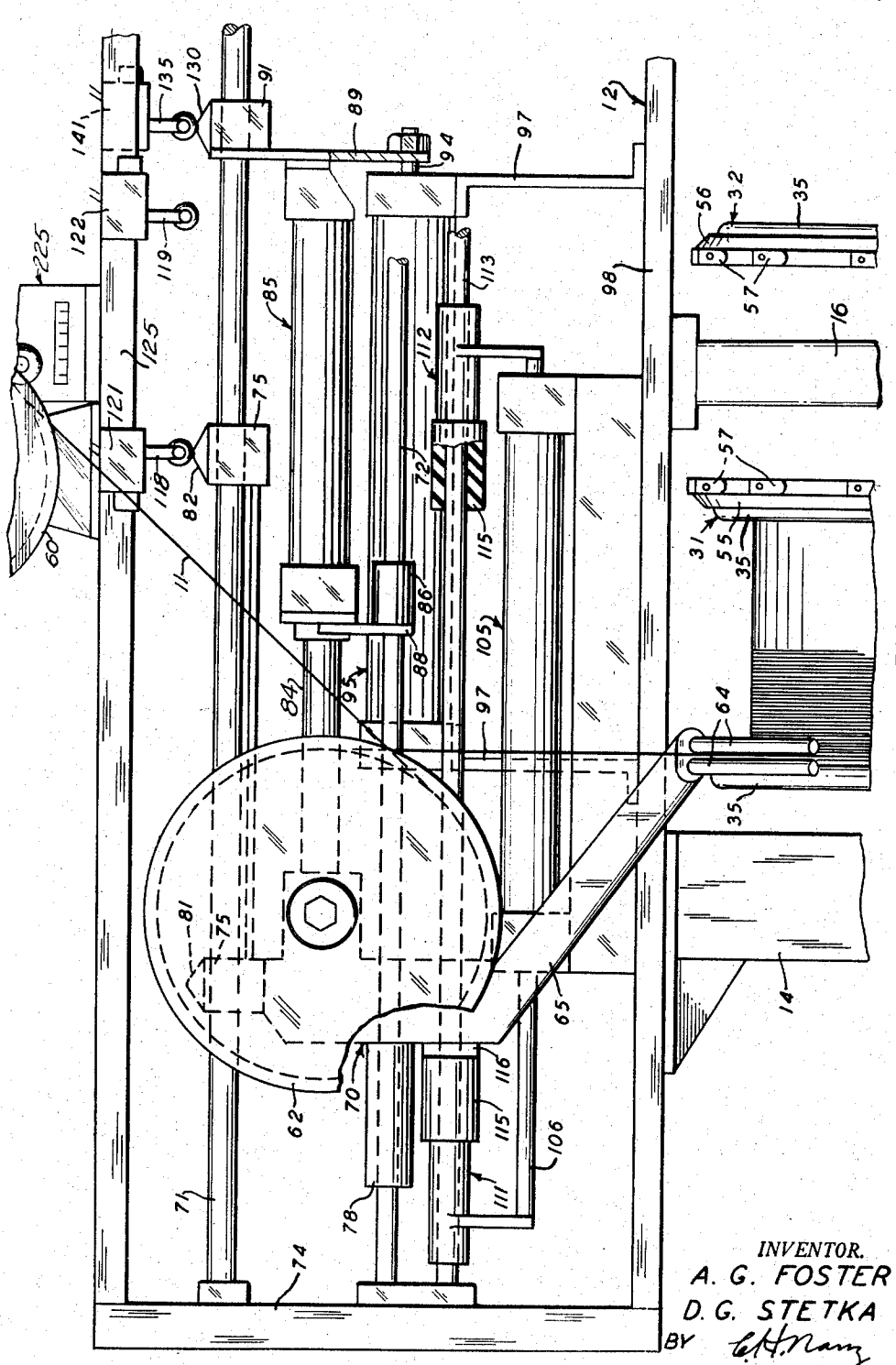


FIG. 3

INVENTOR.
A. G. FOSTER
D. G. STETKA
BY
ATTORNEY

April 21, 1959 A. G. FOSTER ET AL 2,883,120

STRAND REELING APPARATUS

Filed Feb. 7, 1956 4 Sheets-Sheet 3

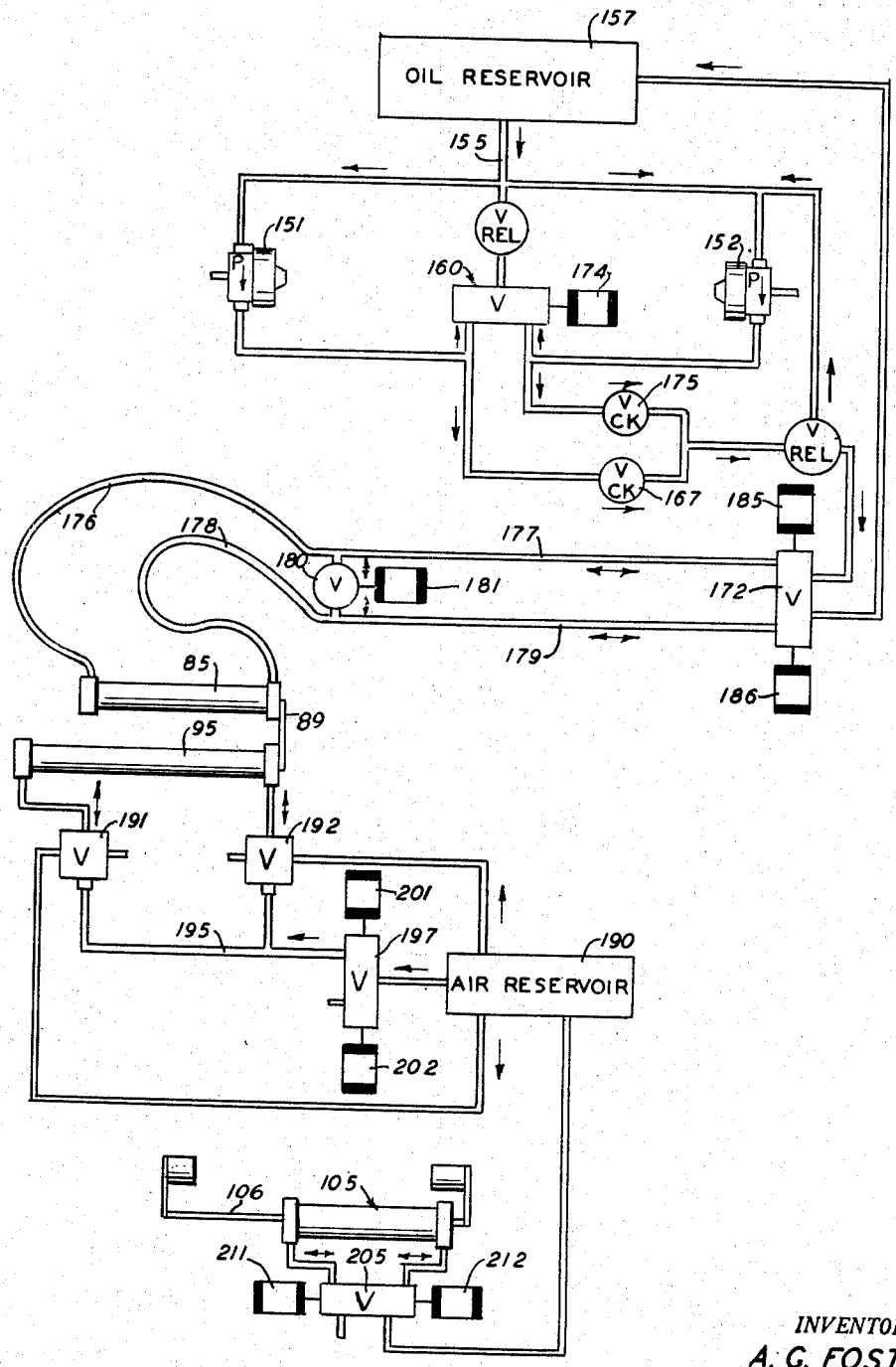


FIG. 4

INVENTOR.
A. G. FOSTER
D. G. STETKA
BY
ATTORNEY

April 21, 1959 A. G. FOSTER ET AL 2,883,120

STRAND REELING APPARATUS

Filed Feb. 7, 1956 4 Sheets-Sheet 4

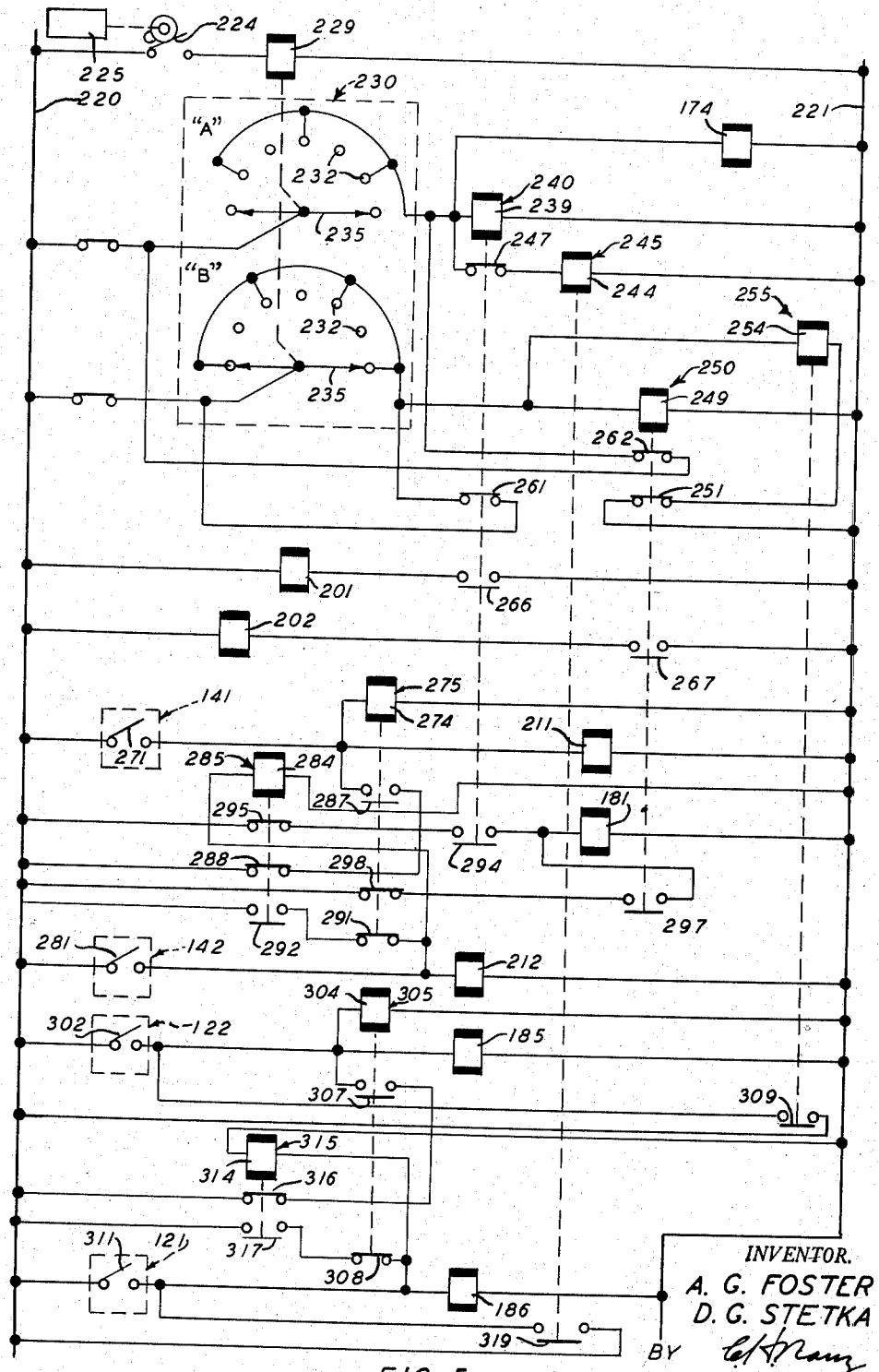


FIG. 5

INVENTOR.
A. G. FOSTER
D. G. STETKA
BY
ATTORNEY

United States Patent Office 2,883,120
Patented Apr. 21, 1959

2,883,120

STRAND REELING APPARATUS

Arthur G. Foster, Towson, and Daniel G. Stetka, Govans, Md., assignors to Western Electric Company, Incorporated, New York, N.Y., a corporation of New York

Application February 7, 1956, Serial No. 563,965

8 Claims. (Cl. 242—25)

This invention relates to strand reeling apparatus, and more particularly to strand reeling apparatus having means for transferring the reeling of a strand alternately from one takeup reel to another so that the winding of the strand begins at predetermined points on the reels.

In the manufacture of plastic insulated wire, the finished insulated wire is delivered continuously from a plastics extruder at a substantially constant linear speed. In order that the extrusion operation may continue without interruption, it is a common practice to employ strand reeling apparatus having two reeling positions where predetermined lengths of the finished insulated wire are wound alternately on reels. As soon as a predetermined length of the wire has been wound upon a takeup reel at one of these reeling positions, the wire is severed and the new leading end of the wire is attached automatically to an empty takeup reel at the other reeling position without interrupting the advance of the wire.

In the operation of certain conventional strand reeling apparatus of the type mentioned above, it is desirable that the path of the leading end of the wire be controlled so that the winding of the wire on an empty takeup reel commences at a predetermined point on the winding surface of that reel. Preferably this point is immediately adjacent to the inside of the takeup reel flange nearest to a snagging device provided for catching the leading end of the strand and attaching it to the empty takeup reel.

An object of this invention is to provide new and improved strand reeling apparatus.

Another object of this invention is to provide new and improved strand reeling apparatus having means for transferring the reeling of a strand alternately from one takeup reel to another so that the winding of the strand begins at predetermined points on the reels.

Strand reeling apparatus for taking up a continuously advancing strand alternately upon rotatably driven takeup reels, which illustrates certain features of this invention, may include a movable strand guide, distributing means for reciprocating the strand guide relative to the winding surfaces of the takeup reels and indexing means for shifting the strand distributing means alternately from a first operating position wherein the strand guide distributes the strand upon the winding surface of one takeup reel to a second operating position wherein the strand is distributed similarly upon another takeup reel. Means are provided for operating the indexing means to transfer the distributing means alternately from one operating position to the other. In addition, means are provided for positively stopping the strand guide momentarily at predetermined positions with respect to the takeup reels while the distributing means is being shifted to transfer the strand from one takeup reel to another so as to cause the strand guide to direct the strand initially to a predetermined point on each takeup reel.

A complete understanding of the invention may be obtained from the following detailed description of strand reeling apparatus forming a specific embodiment thereof,

when read in conjunction with the appended drawings, in which:

Fig. 1 is a front elevation of strand reeling apparatus forming an illustrative embodiment of the invention;

Fig. 2 is an enlarged, fragmentary vertical section taken along line 2—2 of Fig. 1;

Fig. 3 is an enlarged, fragmentary, front elevation of a portion of the apparatus shown in Fig. 1, with parts thereof broken away;

Fig. 4 is a schematic representation of a hydraulic and pneumatic system forming part of the apparatus shown in Fig. 1, and

Fig. 5 is a schematic representation of an electrical control circuit forming part of the apparatus shown in Fig. 1.

Referring now to the drawings, there is shown in Fig. 1 strand reeling apparatus for taking up without interruption a strand **11**, which may be, for example, an insulated wire, delivered at a substantially constant rate from an insulating machine (not shown) by a conventional strand-advancing capstan (not shown). The strand reeling apparatus includes a frame **12** having a pair of vertical, end support members **14** and **15** and a vertical, central support member **16**. Journaled rotatably on the end support member **14** and the central support member **16** are a pair of cooperating, reel-supporting cones **25** and **26**, respectively. Similarly, a pair of reel-supporting cones **27** and **28** are journaled rotatably on the end support member **15** and the central support member **16**, respectively. Removably mounted on the reel-supporting cones **25** and **26** is a conventional takeup reel **31** and mounted similarly between the reel-supporting cones **27** and **28** is another takeup reel **32**.

The takeup reels **31** and **32** are identical in construction and are positioned side by side as shown in Fig. 1 for axial rotation about a common normally rotational axis. The takeup reels **31** and **32** are of a conventional design and each includes a cylindrical winding drum **34** and a pair of flange-like reel heads **35—35** secured fixedly at opposite ends of the winding drum. The reel-supporting cones **26** and **28** are connected operatively to pulleys **38** and **39**, respectively, for rotation therewith. The pulley **38** is connected by means of an endless belt **41** to a drive pulley **42** which is driven rotatably from an electric motor **47**. Similarly, the pulley **39** is connected by means of an endless belt **50** to a drive pulley **51** driven from an electric motor **55**. The electric motors **47** and **55** have a predetermined, controlled maximum speed and drive the takeup reels **31** and **32** in a manner such that a substantially constant predetermined tension is maintained on the strand **11** as it is wound upon the respective takeup reels. Suitable electrical control means are provided for stopping and starting the motors **47** and **55** independently.

Mounted between the central support member **16** and the adjacent reel heads **35—35** of the takeup reels **31** and **32**, respectively, are snagger wheels **55** and **56**. The snagger wheel **55** rotates with the reel-supporting cone **26** and, similarly, the snagger wheel **56** rotates with the reel-supporting cone **28**. Each of the snagger wheels **55** and **56** is provided with a series of peripheral, tangentially projecting fingers **57—57**, which function to catch the strand **11** when the latter is transferred from one takeup reel **31** or **32** to the other takeup reel during a cutover operation. A vertically positioned cutter **59** is mounted on the front surface of the central support member **16** and is designed to sever the strand **11** when a length thereof is engaged between fingers **57—57** on the snagger wheels **55** and **56**, respectively, during the cutover operation. Strand engaging and severing devices employing snagger wheels, similar to those described hereinabove, are disclosed in Hosford Patent 1,393,286.

The strand **11**, as it advances toward the takeup reels

31 and 32 advances around a freely rotatable guide sheave 60 positioned on the top of the frame 12 near the center thereof, as viewed in Fig. 1. From the guide sheave 60 the strand 11 is directed to and travels around a distributor sheave 62, which, in turn, directs the strand between a pair of forwardly projecting, spaced, cooperating guide fingers 64—64 mounted at the lower end of a depending distributor arm 65. The guide fingers 64—64 direct the strand 11 to one or the other of the takeup reels 31 and 32.

The distributor arm 65 forms a part of a movable distributor carriage, indicated generally by the numeral 70, which is mounted slidably for transverse movement along a pair of horizontally extending, spaced traverse rods 71 and 72. The distributor sheave 62 is journalled rotatably on and supported by the distributor carriage 70 for transverse movement therewith. The traverse rods 71 and 72 are supported fixedly at their opposite ends by upright support members 74—74 of the frame 12. The distributor carriage 70 is supported slidably on the traverse rods 71 and 72 by means of sleeve bearings 75—75 and 78, respectively, secured fixedly to the distributor carriage. The sleeve bearings 75—75 carry cams 81 and 82, respectively, on their upper surfaces.

Referring again to Fig. 1, the distributor carriage 70 is shown connected to the outer, free end of a movable piston rod 84 of a hydraulically actuated distributor cylinder 85 which is actuatable to reciprocate the distributor carriage transversely with respect to the takeup reels 31 and 32 so as to distribute the strand 11 across the winding drums 34—34 of the takeup reels. The distributor cylinder 85 is mounted slidably on the traverse rod 72 by means of sleeve bearings 86 and 87 to which it is attached by means of connecting plates 88 and 89, respectively.

The connecting plate 89 is attached to a sleeve bearing 91 slidably mounted on the traverse rod 71 and is also secured fixedly to the outer, free end of a movable piston rod 94 of a pneumatically-actuated stepping cylinder 95 designed to index the distributor cylinder 85 alternately from a lefthand operating position to a righthand operating position. The distributor cylinder 85 is shown in Fig. 1 in its lefthand operating position, in which operating position it operates to distribute the continuously advancing strand 11 upon the takeup reel 31. The righthand operating position of the distributor cylinder 85 is illustrated by means of phantom outlines in Fig. 1, in which position the distributor cylinder operates to distribute the strand 11 upon the takeup reel 32. For the righthand operating position, the piston rod 94 of the stepping cylinder 95 is fully extended to the right. The stepping cylinder 95 is mounted stationary upon supports 97—97 projecting vertically from a cross member 98 of the frame 12.

Mounted fixedly to the cross member 98 is a pneumatically-actuated bumper cylinder 105 having a piston rod 106 which extends through both ends of the cylinder and is provided at the outer ends thereof with bumper members 111 and 112, respectively. The bumper members 111 and 112 are sleeve-like in construction and are slidably engaged upon a traverse rod 113 for movement therealong. The opposed inner ends of the bumper members 111 and 112 are provided with resilient collars 115—115 made of neoprene compound, rubber compound or the like, which are secured thereto, by a suitable adhesive, for movement therewith.

The bumper members 111 and 112 are shown in their lefthand positions, as viewed in Fig. 1 in which positions the bumper members 111 and 112 do not interfere with the distribution of the strand 11 upon the takeup reel 31. The bumper cylinder 105 may be actuated to throw the bumper members 111 and 112 simultaneously to the right into their righthand positions, wherein the bumper members do not interfere with the distribution of the strand 11 on the takeup reel 32.

When the bumper members 111 and 112 are in their lefthand positions, as illustrated in Fig. 1, the bumper member 112 is located to stop any rightward movement of the distributor carriage 70 beyond a position wherein the guide fingers 64—64 direct the strand 11 to a point at the extreme lefthand end of the winding drum 34 of the takeup reel 32 immediately adjacent to the inner reel head 35. In this position a projecting stop 116 on the distributor carriage 70 is engaged by the resilient collar 115 on the bumper member 112. When the bumper cylinder 105 is actuated to throw its piston rod 106 and the attached bumper members 111 and 112 to the right to their righthand positions, as illustrated by phantom outlines in Fig. 1, the bumper member 111 is located so as to stop the subsequent leftward movement of the distributor carriage 70 beyond a position wherein the guide fingers 64—64 direct the strand 11 to a point at the extreme righthand end of the winding drum 34 of the takeup reel 31.

As mentioned hereinabove, the distributor carriage 70 is provided with cams 81 and 82 which are carried by the sleeve bearings 75—75. The cams 81 and 82 move reciprocably with the distributor carriage 70 and are designed to actuate alternately spring-pressed plungers 118 and 119 of sensitive limit switches 121 and 122 depending from a cross member 125 of the frame 12.

The sleeve bearing 91 attached to the connecting plate 89 carries a cam 130 designed to actuate alternately spring-pressed plungers 135 and 136 of sensitive limit switches 141 and 142. The limit switches 141 and 142 are mounted on the rear of the cross member 125. When the piston rod 94 of the stepping cylinder 95 is fully retracted to the left, as viewed in Fig. 1, the cam 130 is in engagement with the plunger 135 to operate the limit switch 141. Conversely, when the piston rod 94 of the stepping cylinder 95 is fully extended to the right, as viewed in Fig. 1, the cam 130 is in engagement with the plunger 136 to operate the limit switch 142.

Referring now to Fig. 4, there is shown a schematic representation of a combined hydraulic and pneumatic system forming a part of the strand reeling apparatus. This system includes a pair of constant displacement, rotary, hydraulic pumps 151 and 152 which are driven by the electric motors 47 and 55, respectively at speeds proportional to the rotation speeds of their respective takeup reels 31 and 32. The intake ports of both hydraulic pumps 151 and 152 are connected directly to a common supply line 155 which, in turn, communicates directly with a reservoir 157 containing a hydraulic fluid at atmospheric pressure.

A three-way, solenoid operated, spring-return valve 160 is connected to the discharge ports of the hydraulic pumps 151 and 152 so that, normally, the hydraulic fluid discharged from the hydraulic pump 152 is bypassed and returned to the reservoir 157 through the valve 160, to the supply line 155. Normally, the valve 160 prevents the return of the hydraulic fluid discharged by the hydraulic pump 151 to the reservoir 157 and the hydraulic fluid from the latter pump flows through a check valve 167 to a four-way, double solenoid operated distributor reversing valve 172. However, when a solenoid 174 of the valve 160 is energized the flow of hydraulic fluid is switched and the hydraulic fluid discharged from the pump 152 is directed through a check valve 175 to the distributor reversing valve 172, whereas the hydraulic fluid discharged by the hydraulic pump 151 is returned to the reservoir 157 through the valve 160.

The distributor reversing valve 172 is designed to control the direction of flow of the hydraulic fluid supplied by either of the hydraulic pumps 151 and 152 to the distributor cylinder 85. One end of the distributor cylinder 85 is connected to a corresponding port of the distributor reversing valve 172 by means of a flexible line 176 and a line 177 and, similarly, the opposite end thereof is connected to another port on the distributor reversing valve by a flexible line 178 and a line 179. The lines 177 and 179 can be placed in communication with one another by the opening of a normally-closed, two-way, sole-

noid-operated, bypass valve **180**. When a solenoid **181** of the bypass valve **180** is energized, the valve is opened to connect one end of the distributor cylinder **85** to the other end thereof, thereby permitting the hydraulic fluid from one end to flow freely to the other end thereof.

The distributor reversing valve **172** is controlled by two solenoids **185** and **186** which are energized alternately. When the solenoid **186** is energized, the valve **172** is operated to supply hydraulic fluid under pressure from either the hydraulic pump **151** or the hydraulic pump **152** to the lefthand end of the distributor cylinder to move the piston rod and attached distributor carriage **70** to the right. Conversely when the solenoid **185** is energized, the distributor carriage **70** is caused to move to the left.

The opposite ends of the stepping cylinder **95** are supplied from an air reservoir **190** through pilot operated, three-way valves **191** and **192**. Normally the valve **191** connects the lefthand end of the stepping cylinder **95** directly to the air reservoir **190** so that the piston rod **94** is in its extended, righthand position as shown by the phantom outlines thereof in Fig. 1. The valve **192** normally connects the opposite end of the stepping cylinder to exhaust at atmospheric pressure. However, when a pilot line **195** is connected to the air reservoir **190** through a three-way, double solenoid-operated valve **197** the valves **191** and **192** are actuated so that the lefthand end of the stepping cylinder **95** is connected to exhaust through the valve **191** and the opposite end of the stepping cylinder **95** is connected to the air reservoir **190** by the valve **192** so that the piston rod is held in the lefthand, retracted position as shown in Fig. 1. The valve **197** is provided with two solenoids **201** and **202** designed to be energized alternately. When the solenoid **201** is energized the pilot line **195** is connected to exhaust through the valve **197** and when the solenoid **202** is energized, the pilot line is connected to the air reservoir **190** through the valve **197** to actuate the valves **191** and **192**.

The operation of the bumper cylinder **105** is controlled by a four-way, double solenoid-operated valve **205** provided with two solenoids **211** and **212** designed to be energized alternately. When the solenoid **212** is energized the lefthand end of the bumper cylinder is connected to the air reservoir **190** to force the piston rod **106** to its extreme righthand position. The opposite end of the bumper cylinder **105** is connected to exhaust at this time through the valve **205**. Conversely, energization of the solenoid **211** connects the righthand end of the bumper cylinder **105** to the air reservoir **190** and the lefthand end thereof to exhaust through the valve **205**, to throw the piston rod **106** in the opposite direction.

Referring now to Fig. 5 there is shown an electrical circuit for controlling the operation of the hydraulic and pneumatic system described hereinabove. The electrical circuit includes a pair of bus lines **220** and **221** supplied from a suitable source of E.M.F. (not shown). Connected across the bus lines **220** and **221**, through a switch **224** forming part of a length-measuring counter **225**, is an operating coil **229** of a stepping relay **230**. The stepping relay **230** includes two separate banks A and B of contacts **232—232**. Each time the operating coil **229** of the stepping relay **230** is energized movable contact brushes **235—235** of the individual banks A and B are indexed simutlaneously one position ahead. The contact brushes **235—235** are shown in Fig. 5 in engagement with the first contact **232** of each of the banks A and B. It will be understood that the next time the switch **224** closes and the operating coil **229** is energized, the contact brushes **235—235** will be indexed simultaneously to engage the second contact **232** of each of the banks A and B.

As shown in Fig. 5, the even numbered contacts **232—232** of the bank A are connected together and in series with the solenoid **174** of the pump bypass valve **160**. The solenoid **174**, in turn, is connected in parallel with an operating coil **239** of a time delay relay **240**.

Thus, when the contact brushes **235—235** of the banks A and B of the stepping relay **230** are positioned in engagement with the even numbered contacts **232—232**, the solenoid **174** and the operating coil **239** of the time delay relay **240** are energized from the bus lines **220** and **221**. An operating coil **244** of a time delay relay **245** is designed to be connected in parallel with the operating coil **239** through a normally closed contact **247** of the time delay relay **240**. The contact **247** is set to open a predetermined time after the energization of the operating coil **239** of the time delay relay **240**. An operating coil **249** of a time delay relay **250** is arranged to be energized from the bus lines **220** and **221** when the contact brushes **235—235** are in engagement with the odd numbered contacts **232—232** the banks A and B of the stepping relay **230**. An operating coil **254** of a time delay relay **255** is connected in parallel with the operating coil **249** of the time delay relay **250** through a normally-closed contact **251** of the latter. The contact **251** is set to open a predetermined time after the energization of the operating coil **249** of the time delay relay **250**.

The contact brushes **235—235** and contacts **232—232** of banks A and B of the stepping relay **230** are arranged to be shunted by normally-closed, instantaneously operated contacts **261** and **262**, respectively, of the time delay relays **240** and **250**, respectively. The solenoids **201** and **202** of the valve **197** are designed to be energized by the closure of normally-open, instantaneously operated contact **266** and **267**, respectively, of the time delay relays **240** and **250**, respectively.

The solenoid **211** of the valve **205** may be connected across the bus lines **220** and **221** by the closure of a contact **271** of the limit switch **141** when the plunger **135** of the latter is actuated by the cam **130**. Connected in parallel with the solenoid **211** is an operating coil **274** of a relay **275**. Similarly, the solenoid **212** of the valve **205** may be energized upon the closure of a contact **281** of the limit switch **142** when the plunger **136** of the latter is actuated by the cam **130**. Connected in parallel with the solenoid **212** is an operating coil **284** of a relay **285**. The contact **271** may be shunted by a series connection of a normally-open, instantaneously operated, contact **287** of the relay **275** and a normally-closed, instantaneously operated contact **288** of the relay **285**. The contact **281** may be shunted through a series connection of a normally-closed, instantaneously operated contact **291** of the relay **275** and a normally-open, instantaneously operated contact **292** of the relay **285**.

The solenoid **181** of the distributor bypass valve **180** may be energized either through a series connection of a normally-open, instantaneously operated contact **294** of the time delay relay **240** and a normally-closed, instantaneously operated contact **295** of the relay **285** or through a series connection of a normally-open, instantaneously operated contact **297** of the time delay relay **250** and a normally-closed, instantaneously operated contact **298** of the relay **275**. The solenoid **185** of the distributor reversing value **172** is connected across the bus lines **220** and **221** in series with a normally-open contact **302** of the limit switch **122**. The contact **302** is closed when the plunger **119** of the limit switch **122** is actuated by either the cam **81** or the cam **82**. Connected in parallel with the solenoid **185** is an operating coil **304** of a relay **305** having a normally-open, instantaneously operated contact **307** and a normally-closed, instantaneously operated contact **308**.

The contact **302** may be shunted by the closure of a contact **309** of the time delay relay **255**. The contact **309** is set so that it will open a predetermined time after the time delay relay **255** is deenergized. The closure of a contact **311** of the limit switch **121**, when the plunger **118** of the later is actuated by either the cam **81** or the cam **82**, energizes the solenoid **186** of the distributor reversing valve **172** which is connected in parallel with an operating coil **314** of a relay **315**. The relay **315** is

provided with a normally-closed, instantaneously operated contact 316 and a normally-open, instantaneously operated contact 317. The contact 311 of the limit switch 121 may be shunted by the closure of a normally-open contact 319 of a time delay relay 245. The contact 319 is set to open a predetermined time after the time delay relay 245 is deenergized.

The contact 302 of the limit switch 122 is connected in parallel with a series connection of the contact 307 of the relay 305 and the contact 316 of the relay 315. Similarly, the contact 311 of the limit switch 121 is connected in parallel with a series connection of the contact 308 of the relay 305 and the contact 317 of the relay 315.

The counter 225 is driven by the sheave 60 and is designed to close the contact 224 momentarily each time a predetermined length of the strand 11 passes over the sheave. This predetermined length of the strand 11 will be assumed to be that length which will about completely fill a takeup reel, such as the reels 31 and 32.

Operation

It will be assumed that the strand reeling apparatus is operating, that the motor 47 is energized and that the takeup reel 31 is partially filled. The motor 55 is deenergized at this time, but the takeup reel 32 is mounted on the reel supporting cones 27 and 28. The piston rod 94 of the stepping cylinder 95 is in its fully retracted, lefthand position and the piston rod 106 of the bumper cylinder 105 is likewise in its lefthand position, as illustrated in Fig. 1. As the strand 11 advances continuously, the distributor carriage 70 is reciprocated to distribute the convolutions of the strand in uniform layers upon the winding drum 34 of the takeup reel 31. At this time the reciprocation of the piston rod 84 of the distributor cylinder is controlled by the cam 82 which operates the limit switches 121 and 122 alternately.

When the limit switch 121 is operated by the cam 82, as shown in Fig. 1, the contact 311 closes to energize the solenoid 186 of the distributor reversing valve 172, thereby reversing the direction of flow of the hydraulic fluid in the lines 176 and 178. The hydraulic fluid now enters the lefthand end of the distributor cylinder 85 and is exhausted from the righthand end thereof so that the distributor carriage 70 is moved to the right at a speed proportional to the rotational speed of the motor 47. The movement of the distributor carriage 70 is reversed again when the cam 82 operates the limit switch 122, since the operation of the latter deenergizes the solenoid 186 and reenergizes the solenoid 185 of the distributor reversing valve 172. In this manner the distribution of the strand 11 continues throughout the reeling of the strand 11 upon the takeup reel 31.

When the takeup reel 31 begins to fill up the motor 55 is energized preparatory to a cutover operation. Thereafter, when the length-measuring counter 225 indicates that the takeup reel 31 has the predetermined length of the strand 11 wound thereon, the cutover operation is initiated. The contact 224 is closed momentarily and the stepping relay 230 is caused to index ahead one position. As a result, the contact brushes 235—235 are shifted to the second contacts 232—232 of the banks A and B of the stepping relay 230, whereby the solenoid 174 of the pump bypass valve 160 is energized to direct the hydraulic fluid discharged by the pump 152 to the distributor reversing valve 172 and to bypass the hydraulic fluid discharged by the pump 151 to the hydraulic fluid reservoir 157. Simultaneously, the time delay relays 240 and 245 are energized, whereby the contact 261 opens immediately to deenergize the time delay relays 250 and 255.

Energization of the time delay relay 240 closes the contact 266 immediately to energize the solenoid 201 of the valve 197 and the solenoid 202 of the same valve is deenergized by the opening of the contact 267 simultaneously. With the solenoid 201 energized, the valve 197 is connected so as to exhaust the pilot line 195 and, accordingly, the lefthand end of the stepping cylinder 95 is connected to the air reservoir 190 so that the piston rod 94 thereof is thrown rapidly to the right carrying with it the distributor cylinder 85.

Simultaneously, the solenoid 181 of the distributor bypass valve 180 is energized to open the latter, whereby the both ends of the distributor cylinder 85 are interconnected. As the distributor cylinder 85 is moved rapidly to its righthand operating position it pulls the distributor carriage 70 to the right until the stop 116 thereon strikes the resilient collar 115 on the bumper member 112. This causes the distributor carriage 70 to stop in a position such that the guide fingers 64—64 direct the strand 11 to the lefthand end of the winding drum 34 of the empty reel 32 immediately adjacent to the inner reel head 35.

As the strand 11 is transferred from the full takeup reel 31 to the empty takeup reel 32, one of the fingers 57—57 on each of the rotating snagger wheels 55 and 56 catch a length of the strand and carry it against the cutter 59, whereby the strand is severed and the new leading end thereof is attached to the winding drum 34 of the empty takeup reel 32. Thus the reeling of the strand 11 commences at the desired point on the winding drum 34 of the empty takeup reel 32, which point is at the extreme lefthand end of the winding drum immediately adjacent to the inner reel head 35.

The movement of the piston rod 94 of the stepping cylinder 95 into its fully extended, righthand position moves the cam 130 into engagement with the actuator 136 of the limit switch 142 to close its contact 281. The closure of the contact 281 energizes the solenoid 212 of the valve 205 and the operating coil 284 of the relay 285 which opens its contact 288 to deenergize the solenoid 211 of the valve 205 and the operating coil 274 of the relay 275. The energization of the solenoid 212 admits air under pressure to the lefthand end of the bumper cylinder 105 and exhausts the other end thereof, whereby the piston rod 106 and attached bumper members 111 and 112 are moved to their righthand operating positions in which the bumper members will not interfere with the distribution of the strand 11 upon the takeup reel 32.

Simultaneously, the opening of the contact 295 of the now energized relay 285 deenergizes the solenoid 181 of the distributor bypass valve 180, whereby the latter is closed. With the distributor bypass valve 180 closed, the reciprocation of the piston rod 84 and attached distributor carriage 70 is re-initiated. The solenoid 185 of the distributing reversing valve 172 is deenergized at this time and the solenoid 186 of that valve is energized through the still closed contact of the time delay relay 245. Accordingly, the distributor carriage 70 commences its movement in a righthand direction and continues moving in this direction until the cam 81 strikes the actuator 119 of the limit switch 122 to reverse its movement. At a predetermined time during this initial movement of the distributor carriage 70 to the right, the contact 319 opens due to the fact that the time delay relay 245 was deenergized when the contact 247 opened shortly after the energization of the time delay relay 240.

Now that the cutover operation is completed, the reeling operation on the takeup reel 32 proceeds in the normal manner previously described in connection with the takeup reel 31. The takeup reel 31 is stopped subsequently, is removed from the reel-supporting cones 25 and 26 and is replaced by another empty takeup reel 31. Thereafter, when the takeup reel 32 is nearly full, the drive motor 47 is again energized to rotate the empty takeup reel 31 and the apparatus is again in readiness for the next cutover operation. When the length-measuring counter 225 operates again, the strand 11 is transferred from the takeup reel 32 to the empty takeup reel 31 in a manner similar to that described hereinabove. However, this time, the distributor carriage 70 is stopped initially

by the bumper member 111 in a position such that the reeling of the strand will commence at the extreme right-hand end of the winding drum 34 of the takeup reel 31.

It will be understood that the invention is not limited to the particular apparatus described hereinabove, since such apparatus is merely an exemplary embodiment thereof. Manifestly, various modifications and embodiments may be made within the spirit and scope of the invention.

What is claimed is:

1. Strand reeling apparatus for taking up a continuously advancing strand alternately upon rotatably driven takeup reels, which apparatus comprises a movable strand guide, distributing means for reciprocating the strand guide relative to the winding surfaces of the takeup reels, indexing means for shifting the strand distributing means alternately from a first operating position wherein the strand guide distributes the strand upon the winding surface of one takeup reel to a second operating position wherein the strand is distributed similarly upon another takeup reel, means for operating the indexing means to transfer the distributing means alternately from one operating position to the other, and movable means held stationary during the shifting of the strand distributing means for positively stopping the strand guide momentarily at predetermined positions with respect to the takeup reels while the distributing means is being shifted to transfer the strand from one takeup reel to another so as to cause the strand guide to direct the strand initially to a predetermined point on each takeup reel, the movable means being movable after the strand distributing means has been shifted to permit normal distribution of the strand on the other takeup reel.

2. Strand reeling apparatus for taking up a continuously advancing strand alternately upon rotatably driven takeup reels, which apparatus comprises a movable strand guide, distributing means for reciprocating the strand guide relative to the winding surfaces of the takeup reels, indexing means for shifting the distributing means alternately from a first operating position wherein the strand guide distributes the strand upon the winding surface of one takeup reel to a second operating position wherein the strand is distributed similarly upon another takeup reel, means for operating the indexing means to transfer the distributing means alternately from one operating position to the other, and a pair of spaced, movable bumper members held stationary during the shifting of the strand distributing means for engaging and positively stopping the strand guide momentarily at predetermined positions with respect to the takeup reels while the distributing means is being shifted to transfer the strand from one takeup reel to another so as to cause the strand guide to direct the strand initially to a predetermined point on each takeup reel the bumper members being movable after the strand distributing means has been shifted to permit normal distribution of the strand on the other takeup reel.

3. Strand reeling apparatus for taking up a continuously advancing strand alternately upon rotatably driven takeup reels mounted side-by-side in axial alignment, which apparatus comprises a strand guide slidably mounted for movement parallel to the rotational axes of said takeup reels, a fluid actuated distributing cylinder operatively connected to the strand guide for reciprocating said strand guide relative to the winding surfaces of the takeup reels, indexing means for shifting the distributing cylinder alternately from a first operating position wherein the strand is distributed upon the winding surface of one takeup reel to a second operating position wherein the strand is distributed similarly upon another takeup reel, and means for positively stopping the strand guide momentarily at predetermined positions with respect to the takeup reels independently of the movement of the distributing cylinder while said cylinder is being shifted to transfer the strand from one takeup reel to the other so as to cause the strand guide to direct the strand initially to a predetermined point on each takeup reel.

4. Strand reeling apparatus for taking up a continuously advancing strand alternately upon rotatably driven takeup reels mounted side-by-side in axial alignment, which apparatus comprises a strand guide mounted slidably for movement parallel to the rotational axes of said takeup reels, a fluid actuated distributing cylinder operatively connected to the strand guide for reciprocating the strand guide, indexing means for shifting the distributing cylinder alternately from one operating position wherein the strand is distributed between the opposite ends of the first takeup reel to a second operating position wherein said strand is distributed similarly upon a second takeup reel, means for operating the indexing means to transfer the strand from the first takeup reel to the second takeup reel, a movable bumper positioned for engaging and stopping the strand guide positively at a predetermined position while the distributing cylinder is being shifted from the first operating position to the second operating position whereby the strand guide directs the strand initially to a predetermined point on the second takeup reel, and means for shifting the bumper out of the path of the reciprocation of the strand guide as the strand guide is reciprocated thereafter by the distributing cylinder to distribute the strand between the ends of the second takeup reel.

5. Strand reeling apparatus for taking up a continuously advancing strand alternately upon rotatably driven takeup reels mounted side-by-side in axial alignment, which apparatus comprises a strand guide mounted slidably for movement parallel to the rotational axes of said takeup reels, a fluid-actuated distributing cylinder operatively connected to the strand guide for reciprocating the strand guide, indexing means for shifting the distributing cylinder alternately from one operating position wherein the strand is distributed between the opposite ends of a first takeup reel to a second operating position wherein said strand is distributed similarly upon a second takeup reel, means for operating the indexing means to transfer the strand from one takeup reel to another takeup reel, a pair of spaced, movable bumpers, one of said bumpers being positioned for engaging and stopping the strand guide positively at a predetermined position while the distributing cylinder is being shifted from the first operating position to the second operating position, whereby the strand guide directs the strand initially to a predetermined point on the second takeup reel, and means for shifting the engaged bumper out of the path of reciprocation of the strand guide as the strand guide is thereafter reciprocated by the distributing cylinder to distribute the strand between the ends of the second takeup reel, the other bumper being shifted simultaneously to a position such that it will engage and stop the strand guide positively at a predetermined location when the indexing means is subsequently operated to transfer the strand back to the first takeup reel whereby the strand guide then directs the strand initially to a predetermined point on the first takeup reel.

6. Strand reeling apparatus for taking up predetermined lengths of a continuously advancing strand alternately upon rotatably driven takeup reels mounted side-by-side in axial alignment, which apparatus comprises a strand guide mounted slidably for movement parallel to the rotational axes of said takeup reels, a fluid-actuated distributing cylinder operatively connected to the strand guide, means for actuating the distributing cylinder to reciprocate the strand guide, indexing means operatively connected to the distributing cylinder for shifting the distributing cylinder from one operating position wherein the strand is distributed upon a first takeup reel to a second operating position wherein the strand is distributed similarly upon a second takeup reel, means for operating the indexing means when a predetermined length of the strand has been wound upon one of the takeup reels to transfer the strand from that takeup reel to the other takeup reel, fluid-bypass means actuated simultaneously with the indexing means for interconnecting the opposite

ends of the distributing cylinder for allowing the strand guide to be stopped and to facilitate free movement of the distributing cylinder with respect to the strand guide, a pair of spaced movable bumpers, one of said bumpers being positioned for engaging and stopping the strand guide positively at a predetermined position independently of the movement of the distributing cylinder while the latter is being indexed from the first operating position to the second operating position whereby the strand guide directs the strand initially to a predetermined point on the second takeup reel, means for deactuating the fluid-bypass means so as to reinitiate the reciprocation of the strand guide, and means for shifting the engaged bumper out of the path of reciprocation of the strand guide, the other bumper being shifted simultaneously to a position such that it will engage and stop the strand guide positively at a predetermined position when the indexing means is operated subsequently to transfer the strand to the first takeup reel whereby the strand guide then directs the strand initially to a predetermined point on the first takeup reel.

7. Strand reeling apparatus for taking up a continuously advancing strand alternately upon rotatably driven takeup reels mounted side-by-side in axial alignment, which apparatus comprises a strand guide mounted slidably for movement parallel to the rotational axes of said takeup reels, a fluid-actuated distributing cylinder operatively connected to the strand guide, means for actuating the distributing cylinder to reciprocate the strand guide, a fluid-actuated stepping cylinder operatively connected to the distributing cylinder for shifting the distributing cylinder from one operating position wherein the strand is distributed upon a first takeup reel to a second operating position wherein said strand is distributed similarly upon a second takeup reel, means for actuating the stepping cylinder periodically to transfer the strand alternately from one takeup reel to the other takeup reel, a bypass valve actuated simultaneously with the stepping cylinder for interconnecting the opposite ends of the distributing cylinder for allowing the strand guide to stop and to facilitate free movement of the distributing cylinder with respect to the strand guide, a pair of spaced, movable bumpers, one of said bumpers being positioned for engaging and stopping the strand guide positively at a predetermined position independently of the movement of the distributing cylinder while the latter is shifted from the first operating position to the second operating position, whereby the strand guide directs the strand initially to a predetermined point on the second takeup reel, means operated immediately thereafter for deactuating the bypass valve so as to reinitiate the reciprocation of the strand guide, and means operated simultaneously for shifting the engaged bumper out of the path of reciprocation of the strand guide, the other bumper being shifted simultaneously to a position such that it will engage and stop the strand guide positively at a predetermined location when the stepping cylinder is subsequently operated to transfer the strand to the first takeup reel whereby the strand guide then directs the strand initially to a predetermined point on the first takeup reel.

8. Strand reeling apparatus for taking up a continuously advancing strand alternately upon rotatably driven takeup reels mounted side-by-side in axial alignment, which apparatus comprises a strand guide mounted slidably for movement parallel to the rotational axes of said takeup reels, a fluid-actuated distributing cylinder operatively connected to the strand guide, means for actuating the distributing cylinder to reciprocate the strand guide, a fluid-actuated stepping cylinder operatively connected to the distributing cylinder for shifting the distributing cylinder from one operating position wherein the strand is distributed upon a first takeup reel to a second operating position wherein said strand is distributed similarly upon a second takeup reel, means for actuating the stepping cylinder periodically to transfer the strand alternately from one takeup reel to the other takeup reel, a bypass valve actuated simultaneously with the stepping cylinder for interconnecting the opposite ends of the distributing cylinder for allowing the strand guide to stop and to facilitate free movement of the distributing cylinder with respect to the strand guide, a pair of spaced, movable bumpers, one of said bumpers being positioned for engaging and stopping the strand guide positively at a predetermined position independently of the movement of the distributing cylinder while the latter is shifted from the first operating position to the second operating position, whereby the strand guide directs the strand initially to a predetermined point on the second takeup reel, means for deactuating the bypass valve so as to reinitiate the reciprocation of the strand guide, and a fluid-operated bumper cylinder operated simultaneously with said last-mentioned means for shifting the engaged bumper out of the path of reciprocation of the strand guide, the other bumper being shifted by the bumper cylinder simultaneously to a position such that it will engage and stop the strand guide positively at a predetermined location when the stepping cylinder is subsequently operated to transfer the strand to the first takeup reel whereby the strand guide then directs the strand initially to a predetermined point on the first takeup reel.

References Cited in the file of this patent

UNITED STATES PATENTS

2,122,485	Nelson	July 5, 1938
2,424,021	Cook	July 15, 1947
2,546,636	Hanson et al.	Mar. 27, 1951
2,546,637	Robson	Mar. 27, 1951