March 29, 1960 W. E. STALHUTH 2,930,536

REELING APPARATUS

Filed May 15, 1957 4 Sheets-Sheet 1

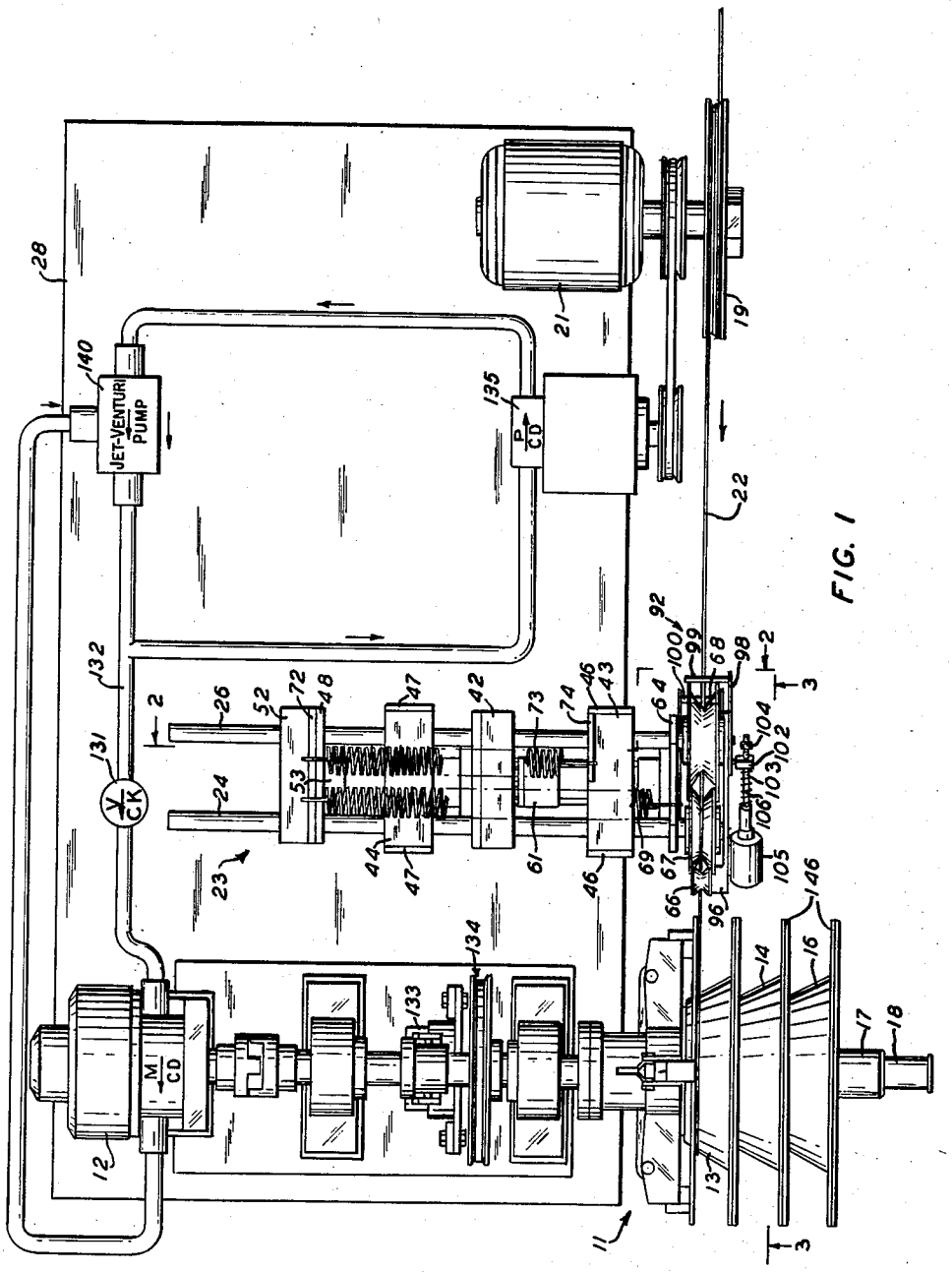


FIG. 1

INVENTOR.
W. E. STALHUTH
BY A. C. Schwarz, Jr.
ATTORNEY

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4 Sheets-Sheet 2

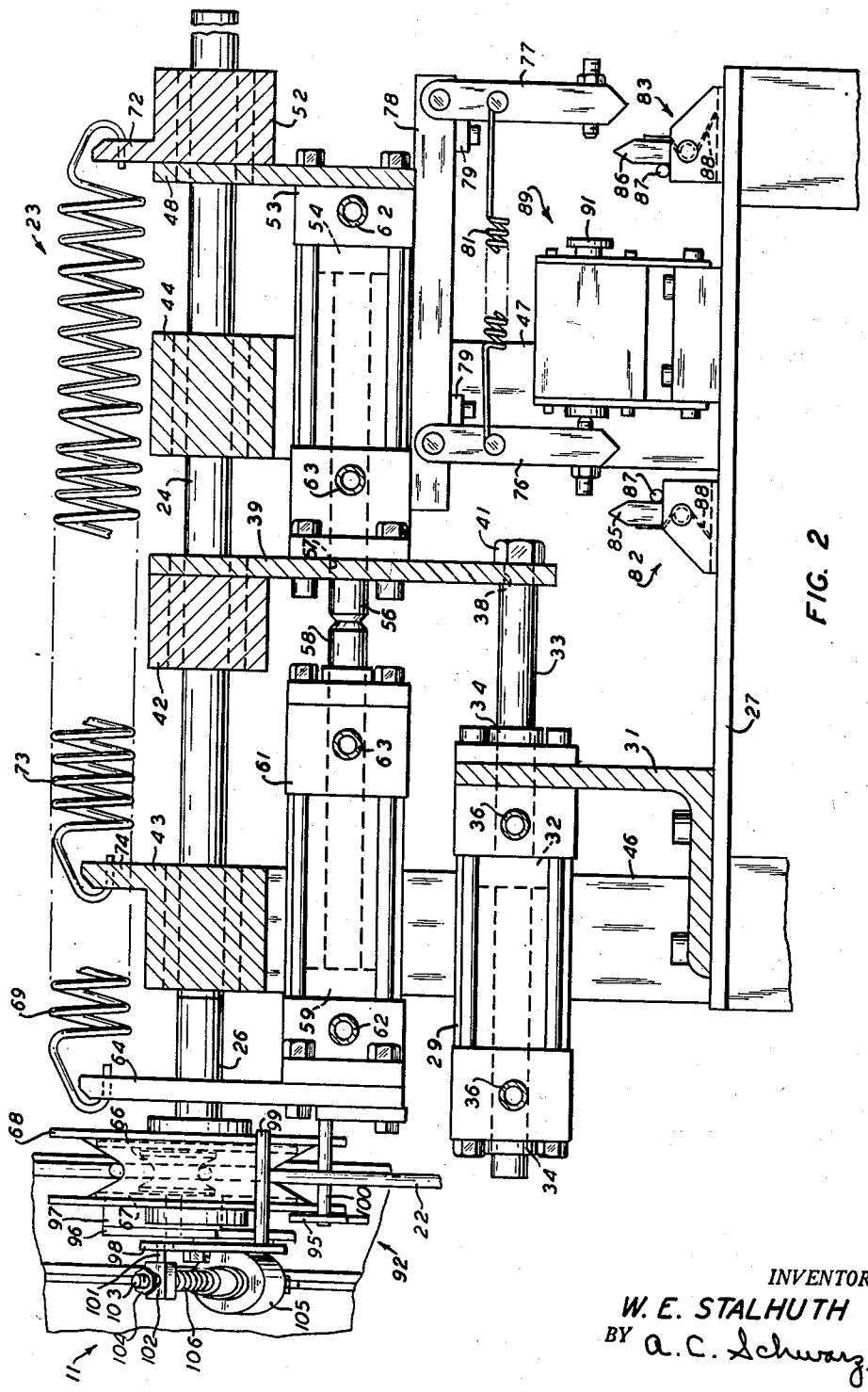


FIG. 2

INVENTOR.
W. E. STALHUTH
BY A. C. Schwarz, Jr.
ATTORNEY

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4 Sheets-Sheet 3

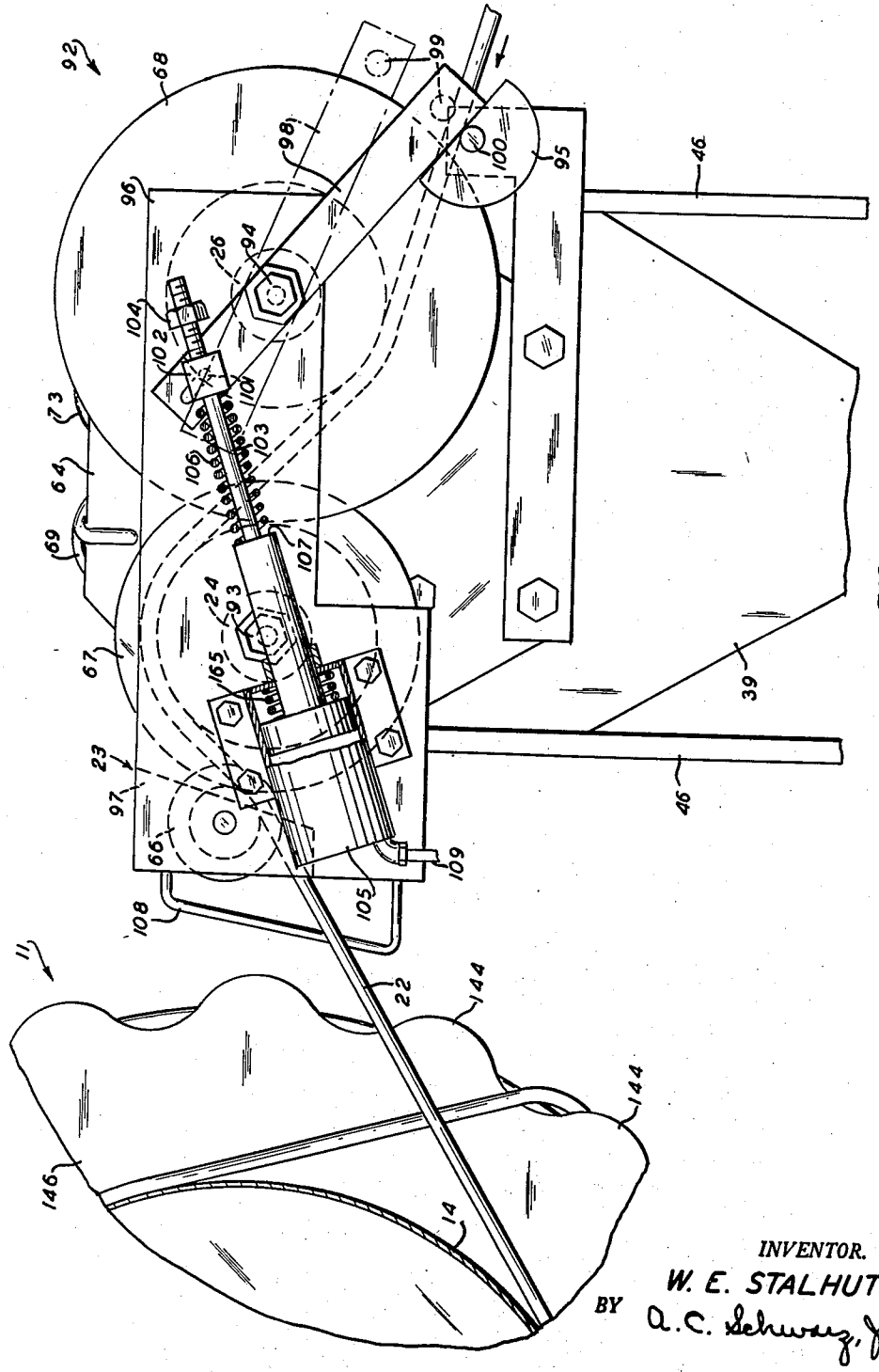


FIG. 3

INVENTOR.
W. E. STALHUTH
BY A. C. Schwarz, Jr.
ATTORNEY

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4 Sheets-Sheet 4

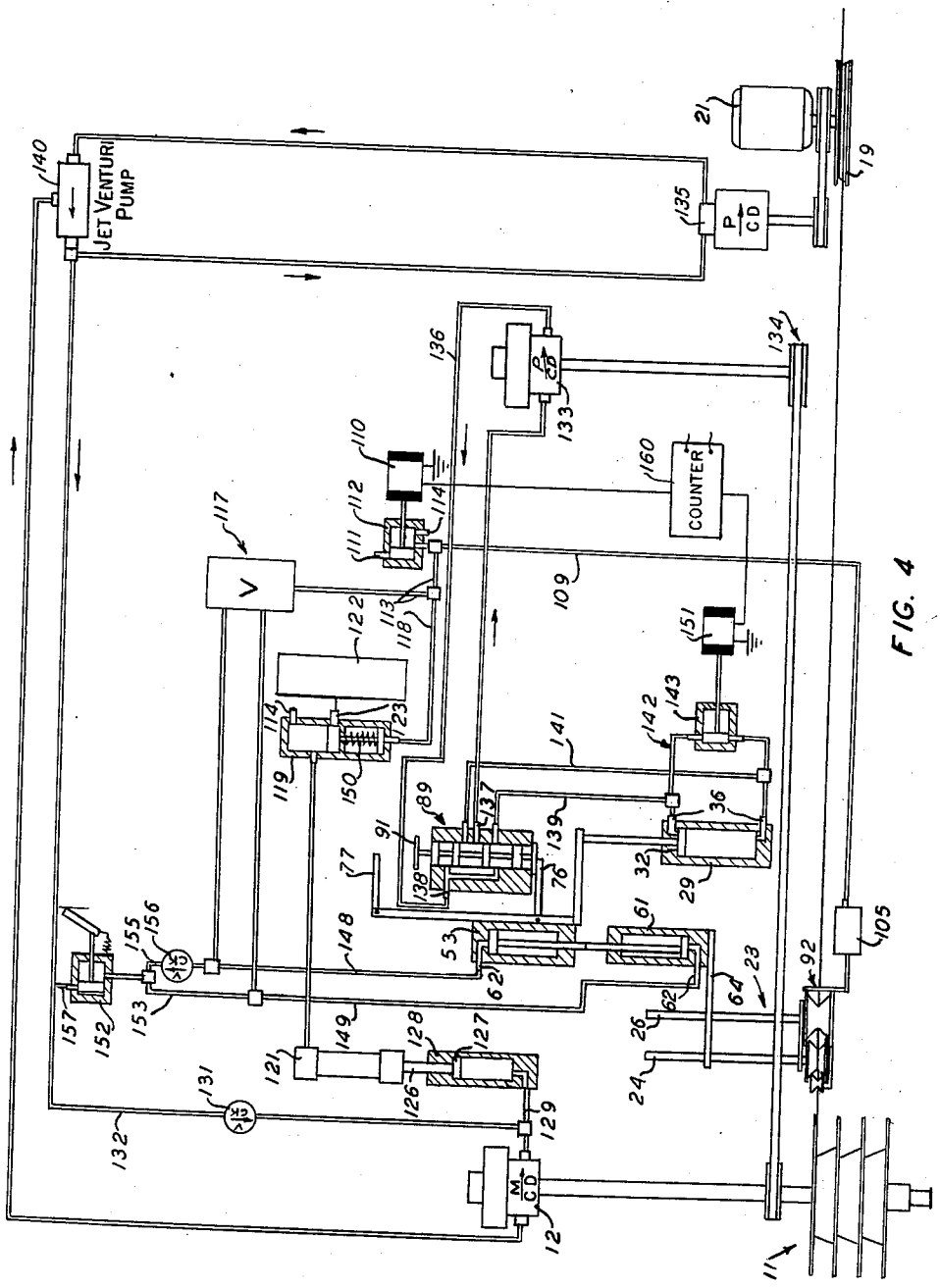


FIG. 4

INVENTOR.
W. E. STALHUTH
BY R. C. Schwarz, Jr.
ATTORNEY

United States Patent Office 2,930,536
Patented Mar. 29, 1960

2,930,536

REELING APPARATUS

William E. Stalhuth, Euclid, Ohio, assignor to Western Electric Company, Incorporated, New York, N.Y., a corporation of New York

Application May 15, 1957, Serial No. 659,263

14 Claims. (Cl. 242—25)

This invention relates to apparatus for coiling strand material, and more particularly to anti-looping devices, which may be utilized for eliminating crossover difficulties in apparatus for coiling strand material upon a multisection coiling head or other reeling apparatus.

Many coiling operations involve the use of multisection coiling heads. These coiling heads are made up of several coiling sections, formed by scalloped or serrated dividers, upon which a continuous length of wire or other filamentary material is wound sequentially. This type of coiling head necessitates the use of a distributing means which will index automatically, when a section has been filled with a predetermined length of wire, from a position guiding a strand on the filled section to a position guiding the strand to an empty section.

Since the point at which the strand is applied on an empty section is nearer the center of rotation of the section than is a like point on a full section, for equal strand velocities the rotational velocity of an empty section should be greater than the rotational velocity of a full section if a positive takeup tension is to be maintained. Therefore, a transfer of a strand from a loaded section to an empty section requires an acceleration of the coiling head by a driving means.

However, for certain coiling operations, it has been found impractical to control the tension in the strand solely by the acceleration of the coiling head, since it is difficult to cause sufficient acceleration of the coiling head to maintain proper tension in the strand at the time of the crossover. It is necessary for the strand to be tensioned sufficiently so that it will be pulled down between scallops or serrations or crimped around the edge of the divider sufficiently to prevent the strand from sliding along the peripheral edge of the divider, otherwise the strand will tend progressively to unwind from the full section to the empty section and the difference in the lengths of the convolutions on the full and empty section will form a surplus of strand which will tend to form a progressively larger loop where the strand crosses over the divider and will thereby affect the coiling operation.

Existing apparatus of the type above-described satisfactorily accomplished certain coiling operations for which it had been designed, but failed in certain other coiling operations for which the apparatus subsequently was used. The operators found that if they pinched the strand at the proper time a satisfactory crossover was attained in these other coiling operations. However, it was hazardous for the operators to tension the strand in this manner.

The present invention is an improvement in such apparatus which eliminates undesirable results obtained when the strand is transfererd from a full section of the coiling head to an empty section of the coiling head. When the crossover of the strand to the empty section of the coiling head is initiated, compressed air is fed to a piston-cylinder assembly, the rod of which is connected to a pivoted arm. On the end of the pivoted arm, a pinching rod is mounted which is moved toward a stationary

pinching rod. The strand, which is passing between the movable and the stationary pinching rods, is thereby retarded by the pinching action of the rods.

It is an object of the present invention to provide new and improved apparatus for coiling strand material.

Another object of this invention is to provide new and improved apparatus for coiling strand material upon a multisection coiling head or other reeling apparatus.

An apparatus illustrating certain features of the present invention may include a coiling head, means for rotating the coiling head, means for guiding the strand material to the coiling head, means for reciprocating the guide means to distribute the material evenly upon the coiling head, means to index the guide means from one operating position to another and means to retard the movement of the strand material being guided toward the coiling head during the indexing operation.

Other objects and features of the invention will be more readily understood from the following detailed description, when read in conjunction with the accompanying drawings, in which:

Fig. 1 is a top plan view of an apparatus embodying the invention;

Fig. 2 is an enlarged cross section taken along line 2—2 of Fig. 1;

Fig. 3 is an enlarged cross section taken along line 3—3 of Fig. 1, with portions broken away for the purposes of clarity and with the distributing means in a different operating position, and

Fig. 4 is a schematic diagram of the fluid system for the apparatus shown in Fig. 1.

Referring now to the drawings wherein like numerals designate the same or similar elements throughout the several views, in the coiling apparatus of the present invention, which is an improvement in the apparatus as illustrated and described in Patent No. 2,733,869, granted to T. T. Bunch on February 7, 1956, a multisection coiling head designated generally by the numeral **11** is driven by a hydraulic motor **12**. The coiling head **11** is similar to that illustrated and described in Patent No. 2,709,051, granted to T. T. Bunch on May 24, 1955, and is made up of individual scalloped, coiling sections **13**, **14** and **16**, which are nested together upon a coiling arbor **17** and held thereon by suitable latching means **18**. A capstan **19** driven by an electric motor **21** supplies a strand **22** from a supply source (not shown) to one of the sections **13**, **14** or **16** of the coiling head **11**. Distributing and indexing means, designated generally by the numeral **23**, are provided at a position intermediate of the capstan **19** and the coiling head **11**.

The strand distributing means **23** reciprocates transversely of the winding surfaces of the coiling sections **13**, **14** or **16** and is utilized to direct the strand **22** to form successive convolutions of strand on each layer of strand **11** as each section **13**, **14** or **16** is being filled. The indexing and distributing means **23** are mounted upon reciprocating rods **24** and **26** supported on a platform **27** (Fig. 2) which is in turn supported on a base member **28**.

The indexing and distributing apparatus **23** is shown in greater detail in Figs. 2 and 3 and includes a hydraulic distributing cylinder **29**, supported by a bracket **31** secured to the platform **27**. A piston **32** is slidably mounted within the cylinder **29** for reciprocating the distributing means to position the strand **22** which is wound in successive convolutions across the winding surface of the successive sections **13**, **14** and **16** of the coiling head **11**. A piston rod **33** attached to the piston **32** protrudes from both ends of the cylinder **29** through leak-proof bushings **34**—**34**, which prevent the escape of a hydraulic fluid under pressure. Hydraulic fluid ports **36**—**36** are provided at each end of the cylinder for communication

with a hydraulic circuit illustrated schematically on Fig. 4. The rod 33 is projected in both directions from the piston 32 to give an equal amount of displacement in both directions.

One end of the rod 33 is externally threaded and is secured in an aperture 38 in the lower end of a vertical hanger plate 39 by a nut 41. The opposing end of the plate 39 is secured rigidly to and supported by a bearing 42 which is secured slidably to the rods 24 and 26. The rods 24 and 26 are interconnected and are retained slidably in bearings 43 and 44 for reciprocating movement. The bearings 43 and 44 are supported by upright members 46 and 47, secured fixedly to the platform 27. Mounted slidably on the reciprocating rods 24 and 26 and depending therefrom are the front hanger plate 39 and a rear hanger plate 48. Bearings 42 and 52 are provided on each of the plates 39 and 48 to facilitate their sliding engagement with the reciprocating rods 24 and 26.

A pneumatic cylinder 53 is secured fixedly at either end to the hanger plates 39 and 48. A piston 54 is positioned slidably within the pneumatic cylinder 53 for reciprocation of a piston rod 56, which extends through the left end of the cylinder 53 and an aperture 57 in the front hanger plate 39. The piston rod 56 abuts a similar piston rod 58, attached to a piston 59, which is received slidably for reciprocation within a pneumatic cylinder 61. The cylinders 53 and 61 cooperate to form means for indexing the distributing means 23 to successive positions wherein the strand 22 is distributed on successive sections 13, 14 and 16 of the coiling head 11. Pneumatic supply ports 62—62 and breather ports 63—63 are provided at opposite ends of each of the cylinders 53 and 61.

The cylinder 61 is secured at its left end, as viewed in Fig. 2, to a connecting plate 64, which is fixed rigidly to and depends from the reciprocating rods 24 and 26. Longitudinal movement of the cylinder 61 is transmitted to the rods 24 and 26 and guide sheaves 66, 67 and 68 which are mounted rotatably upon the rods 24 and 26. The flanges of the sheave 68 enshroud the flanges of the sheave 67. A bias spring 69 secured at one end to the connecting plate 64 and at the other end to a lug 72 on the bearing 52, urges the plate 64 and the attached rods 24 and 26 toward the rear hanger plate 48 and thus urges the cylinders 53 and 61 toward each other for returning them to their normal positions, as shown in Figs. 1 and 2.

Since the front hanger plate 39 is fastened to the threaded end of the piston rod 33 by the nut 41, any reciprocation of the piston rod 33 is transmitted to the cylinders 53 and 61 by means of the plate 39. The piston rod 58 of the cylinder 61 is held in abutting relationship with the piston rod 56 by the pressure of the bias spring 69 and, thereby, longitudinal movement of the piston rod 56 will be transmitted to the connecting plate 64 and the attached rods 24 and 26 through the rod 58 and cylinder 61.

A spring 73 is secured to the projecting lug 72 on the bearing 52 and to a projecting lug 74 on the bearing 43 and support member 46 which acts to urge the piston 32 of the distrbuting cylinder 29 to the left, as viewed in Figs. 1 and 2, so that the strand 22 is always directed to the left edge of the section 13, 14 or 16, as viewed in Figs. 1 and 2, onto which the strand 22 is directed when the distributor means 23 indexes from one section 13, 14 or 16 to another section 13, 14 or 16 by the action of the cylinders 53 or 61.

A pair of depending arms 76 and 77 are mounted pivotally on a base plate 78 which is secured rigidly to the lower side of the cylinder 53. The arms 76 and 77 are held normally against stops 79—79 by an interconnected spring 81. A pair of detents, designated generally by the numerals 82 and 83, have pivotally mounted fingers 85 and 86 which are held normally in a vertical position against stops 87—87 by spring members 88—88, are mounted spacedly on the platform 27 and cooperate with the arms 76 and 77 for causing a snapping action thereof.

Upon movement of the cylinder 53 to the left or right, as viewed in Fig. 2, one of the arms 76 or 77 will engage one of the corresponding fingers 85 or 86, respectively, which will retard the movement of the contacting portion of the arm 76 or 77 which is moving toward a four-way valve, designated generally by the numeral 89, and cause the arm 76 or 77 to pivot in a direction which is opposed by the force of the spring 81. The opposing arm 76 or 77 which is moving in a direction away from the valve 89 will cause the finger 85 or 86 associated therewith to be pivoted outwardly against the action of the spring 88 and allow escape of the arm 77 or 76. Further movement of the cylinder 53 to the right or left causes the appropriate arm 76 or 77 to ride over the finger 85 or 86 and become disengaged therewith, thus resulting in the arm 76 or 77 striking the end of a spool 91 with sufficient force to move the spool 91 of the four-way valve 89 mounted on a platform 27 thus causing fluid being directed to one end of the cylinder 29 to be directed to the other end and in turn cause the reversal of the direction of travel of the piston 32 of the cylinder 29 and thus reverse the travel of the cylinder 53 until the spool 91 of the four-way valve 89 is struck by the other arm 77 or 76. This results in the reciprocation of the distributing means 23 for distributing the strand 22 transversely of the winding surface of each section 13, 14 or 16 of the coiling head 11.

A pinching device, designated generally by the numeral 92 (Fig. 3), mounted rigidly to the distributing means 23 by being secured to the rods 24 and 26 by hexagonal, socket-type cap screws 93 and 94, respectively, secured in an internally threaded tap in adjacent ends thereof. A plate 96 is secured adjacent to the sheaves 66, 67 and 68 and in juxtaposition with the ends of the rods 24 and 26. The sheave 66 has a relatively small diameter and is mounted rotatably on a projecting portion 97 of the plate member 96. The sheaves 66, 67 and 68 are so constructed and positioned that the flanges of successive sheaves overlap each other.

An arm 98 is secured pivotally to the rod 26 by the cap screw 94, one end of the arm 98 supporting a movable pinching rod 99, the other end of the arm 98 being slidably secured to a cylindrical projection 101 on a block 102 which is slidable on one end of a piston rod 103 associated with a piston-cylinder assembly 105 mounted on the plate 96 by appropriate means. The block 102 is secured slidably to the piston rod 103 by a nut 104 and is urged toward the nut 104 by a cylindrical, helical spring 106 bearing against a projecting shoulder 107 adjacent to the opposing end of the rod 103. The rod 99 is urged toward a stationary pinching rod 100 which is secured to and projects outwardly from the plate 64. The rod 100 is terminated with a substantially semicircular member 95 which is positioned adjacent to the sheave 68 and on the outside thereof which prevents the strand 22 from coming off the sheave 68.

A strand guide 108 is secured to one end of the plate 96 which serves to push the strand 22 to the left, as viewed in Fig. 2, during the indexing operation.

Air under pressure from a suitable supply (not shown) is introduced to the pneumatic system at an inlet line 111 (Fig. 4) at a normally-closed, solenoid-operated, three-way valve 112. The valve 112 may be selectively operated by a solenoid 110 to connect a line 113 either to inlet line 111 or to an exhaust line 114. The line 113 is connected to the piston of the assembly 105 through a line 109 and is also connected to an appropriate valving means 117 for selectively connecting the line 113 to the pneumatic supply ports 62—62 on the cylinders 53 and 61 associated with the rods 24 and 26 for indexing the distributing means 23.

A pilot line 118 supplies air under pressure from a

point on the line 113 to a pilot on a three-way, normally-closed valve 119. The valve 119 connects selectively a pneumatic cylinder 121 to a suitable pneumatic supply 122 connected to an inlet line 123 or to the exhaust line 114. A piston rod 126, in the pneumatic cylinder 121, is connected operatively to a piston 127 in the hydraulic system. The lower end of a cylinder 128 associated with the piston 127, as viewed in Fig. 4, is connected to the fluid motor 12 by the fluid line 129. A check valve 131 is inserted in a feed line 132 to the motor 12 to prevent fluid from backing up in the motor feed line 132.

A hydraulic pump 133, driven by means of a pulley and belt arrangement, designated generally by the numerial 134, connected to the drive shaft of the fluid motor 12, pumps fluid from a hydraulic fluid supply (not shown) to a fluid line 136 through a pair of ports 137 and 138 in the four-way valve 89 and back to the pump 133. A pair of fluid lines 139 and 141 are connected to the ports 36—36 in the ends of the distributing cylinder 29. The ports 36—36 are also interconnected by a fluid circuit, designated generally by the numeral 142, which includes a normally-closed, solenoid-operated valve 143. The direction of the hydraulic fluid flow in the fluid lines 139 and 141 depend on the position of the spool 91 in the four-way valve 89 which is operated by the arms 76 and 77 as a result of the reciprocation of the piston 32 associated with the distributing cylinder 29, in a manner previously described.

It should be noted that the pump 133 is always driven at a rate proportional to the speed of the motor 12 and rotational speed of the coiling head 11, therefore, any change in the speed of the coiling head will cause a commensurate change in the rate at which distributing means 23 is moved with respect to the winding surface of the coiling head 11.

A hydraulic circuit for supplying fluid to the motor 12 for driving the coiling head 11 is not illustrated in detail but may be any appropriate means. The particular circuit utilized by the applicant includes a constant-displacement pump 135 and a jet-Venturi pump 140, and is identical to that illustrated and described in Patent 2,802,337, granted August 13, 1957 on application, Serial No. 383,681, filed October 1, 1953, for "Hydraulic Drive Systems" in the name of T. T. Bunch, which includes the hydraulic motor 12 which is designed to drive the coiling head 11 with such torque for coiling that the strand 22 will remain under substantially constant tension and with such torque to accelerate the coiling head 11 during the crossover so as to pull the strand 22 down between scallops 144 in dividers 146 (Fig. 3) between the sections 13, 14 and 16 in the coiling head 11, provided strand 22 is not so heavy that the inertia of the previously coiled material exceeds the design limits and provided that strand 22 is not so stiff as to resist forming.

It is necessary to maintain an accurate control of the energy imparted to the fluid motor 12 during the acceleration period, otherwise there would be a danger of breaking the strand 22 if the energy imparted is too great. There is also the danger of not maintaining a positive takeup tension in the strand 22 if the energy imparted through the motor 12 is insufficient.

When it is desired to coil strand material of such weight that allowance for the coil inertia mass becomes critical or when it is desired to coil strand material of such stiffness and resiliency and the strand 22 rebounds from between the scallops 144 in the dividers 146, then it is necessary to utilize the present improved anti-looping means to preclude crossover difficulties.

After the acceleration period, the cylinder 121 is again connected to the exhaust line 114 by the valve 119 which is returned to its normal position by the action of a spring 150, and hydraulic fluid under pressure in the line 129 is allowed to refill the cylinder 128 in preparation for the subsequent indexing and crossover operation.

A foot-actuated valve 152 is provided in the pneumatic circuit to connect lines 153 and 155 to a line 157

which allows the air in the cylinders 53 and 61 to be exhausted to the atmosphere, after the coiling cycle is completed in preparation for a subsequent operation.

A conventional footage counter 160, responsive to the number of feet of strand 22 being fed to the coiling head, is utilized to control certain operations of the coiling apparatus by energizing a suitable control circuit containing the solenoid 110 and a solenoid 151 when a predetermined length of the strand 22 has been coiled on each of the sections of coiling head 11.

When the counter 160 is de-energized, after a predetermined period of time, the solenoid 110 returns to its normal de-energized position and the pressure in the cylinder 105 is removed by the valve 112. This occurs after the pinching rods 99 and 100 have been utilized to retard the movement of strand 22 to the coiling head 11 during the critical interval of the cross-over operation from a full section of the coiling head 11 to an empty section of the coiling head 11. When the pressure is released from the cylinder 105, the pinching rod 99 is moved away from the stationary pinching rod 100 by the action of a spring 165.

Operation

The strand 22 is supplied to the coiling head 11 by the capstan 19 from a supply source (not shown). The strand engages the sheaves 66, 67 and 68 rotatably mounted on the plate 96 and on the rods 24 and 26, respectively, which form a tortuous plane path for guiding the strand 22 initially to the outermost portion of each of the sections 13, 14 and 16 of the coiling head 11. The coiling head 11 is driven by the fluid motor 12 to coil the strand 22 thereupon as it is supplied from the supply source. During the coiling operation the sheaves 66, 67 and 68 are reciprocated by the hydraulic cylinder 29 and the piston 32 therein which are operably connected thereto to distribute the strand 22 evenly upon the section 13, 14 or 16 to which the strand 22 is being directed.

It is assumed that for the purpose of this description, that the coiling operation has begun already and that the innermost section 13 has been filled with a length of strand 22. A counter 160 (Fig. 4) energizes the electric circuit when the predetermined length of strand 22 has been wound upon the rotating section 13. After a time delay, the solenoid 110 on the three-way valve 112 is energized to connect the inlet line 111 to the line 113 introducing a compressed air pulse through appropriate valving means 117 to one of the indexing cylinders 53 or 61 associated with the indexing of the sheaves 66, 67 and 68 through line 148 or 149 and simultaneously to the cylinder 105 associated with the pinching rod 99 through the line 109. The counter 160 also energized the solenoid 151 of the valve 143 which opens the valve 143 and allows the fluid in opposing ends of the cylinder 29 to have free passage therebetween through the circuit 142. The pulse is terminated when the counter 160 de-energizes the electrical circuit. The introduction of compressed air in the indexing cylinder 61 forces the cylinder 61 bodily to the left which indexes the sheaves 66, 67 and 68 and the guide 108 to the left, which in turn guides the strand 22 onto the intermediate coiling section 14 and adjacent to the left side thereof, as viewed in Figs. 1 and 2, as a result of the action of the spring 73 and the opening of the valve 143. The compressed air is prevented from passing to the cylinder 53 by the use of a check valve 156.

When the air cylinder 105 is actuated, simultaneously with the indexing of the sheaves 66, 67 and 68 and surge of hydraulic fluid to the motor 12 to accelerate the same, the projecting shoulder 107 on the rod 103 thereof pushes against the spring 106 to actuate the block 102 to the right, as viewed in Fig. 3, which in turn pivots the arm 98 about the cap screw 94 in the rod 26 to move the pinching rod 99 toward the pinching rod 100 which is secured to and extending outwardly from the plate 64 which is secured

rigidly to the cylinder 61. The strand 22 is thereby retarded by the spring limited pinching action of the rods 99 and 100 during the critical interval during the time which the strand 22 is crossed over from the full section 13 of the coiling head 11 to the empty section 14 of the coiling head 11. The pinching rod 99 is moved away from the pinching rod 100 when the piston rod 103 is returned to the left by the spring 165 when the pressure in the cylinder 105 through the line 109 is removed by the valve 112.

Simultaneously, with the indexing operation, acceleration of the coiling head 11 is accomplished by the motor 12. The introduction of the initial pulse of compressed air actuates the pilot on the three-way valve 119. The valve 119 admits compressed air from the supply source 122 to the righthand end of the pneumatic cylinder 121. The influx of compressed air forces the piston rod 126 which is connected to a piston 127 in the hydraulic fluid cylinder 128 to the left introducing a surge of hydraulic fluid from the cylinder 128 into the fluid motor 12 through the line 129. This surge of fluid causes an acceleration of the motor 12 and the driven coiling head 11 during the transfer of the strand 22 from the section 13 to the section 14 in an attempt to maintain the positive takeup tension in the strand 22.

When the intermediate section 14 of the coiling head has been filled with the predetermined length of strand 22, the counter 160 causes the electrical circuit to repeat the actions described when the previous section had been filled including actuation of the solenoid-operated valves 112 and 143. A second pulse of compressed air is introduced to the line 113 from the inlet line 111 and is supplied to the pinching cylinder 105 and also to the indexing cylinders 53 and 61 through the valve means 117 and the check valve 156 forcing the cylinder 61 bodily another step to the left which carries with it the slidably mounted rods 24 and 26 and the attached sheaves 66, 67 and 68 and the guide 108. The strand 22 is thereby transferred from the intermediate section 14 to the left side of the end section 16, as viewed in Fig. 2, for continuing the coiling operation on section 16.

Simultaneously, the rotation of the coiling head 11 is accelerated to compensate for the reduction in diameter from the full section 14 to empty section 16 and to maintain the positive strand tension with light material and to avoid excessive strand slack with heavy material by actuating the valve 119 in the manner previously described to admit compressed air to the cylinder 121 which causes a surge of hydraulic fluid to be delivered to the fluid motor 12 from the cylinder 128.

When the air cylinder 105 is actuated, simultaneously with the indexing of the sheaves 66, 67 and 68 and surge of hydraulic fluid to the motor 12 to accelerate the same, the arm 98 is pivoted about the screw 94 in the rod 26 to move the pinching rod 99 toward the pinching rod 100. The strand 22 is thereby retarded by the pinching action of the rods 99 and 100 during the time that the strand 22 is crossed over from the full section 14 of the coiling head 11 to the empty section 16 of the coiling head 11.

When the end section 16 of the coiling head 11 is full, the counter 160 operates another electrical circuit (not shown) to stop the rotation of the capstan 19 and the supply of the strand 22 to the coiling head 11 thereby, and also for causing the coiling apparatus to stop.

The foot-actuated valve 152 is operated, after the coiling cycle, to connect the lines 153 and 155 to the line 157 which allows the air in the cylinders 53 and 61 to be exhausted to the atmosphere which in turn allows the stretched bais spring 73 to return the sheaves 66, 67 and 68 of the distributing means 23 to a position opposite the coiling section 13. The valve 152 is then closed after a short period of time.

When the section 16 is full, the solenoid 151 on the normally-closed valve 143 also is energized allowing any fluid in the left end of the cylinder 29 to be evacuated and transferred to the right end through the circuit 142. This causes the piston 32 to occupy the extreme left-hand position and thereby places the sheaves 66, 67 and 68 in a position opposite the outer edge of the coiling section 13. The sheaves 66, 67 and 68 and thus the distributing means 23 are now in a position for the start of a new coiling operation to fill an empty coiling head 11 in the manner heretofore described.

While the above apparatus has been disclosed as being operated by fluid means, it is obvious that other means, such as electrical means, could be utilized.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. An apparatus for coiling strand material upon a multisection coiling head, which comprises means for rotating the coiling head, distributing means for guiding a strand material to a section of the coiling head, means for indexing said distributing means to a position for guiding the strand material to another section of the coiling head, means actuated simultaneously with the indexing means for accelerating the coiling head, and fluid operated means actuated simultaneously with the indexing means and the accelerating means for pinching the strand material and thus retarding the motion of the strand material during the critical interval of time during which the distributing means and the strand material guided thereby is being indexed from one section of the coiling head to another section of the coiling head for maintaining a positive takeup tension in the strand material.

2. An apparatus for coiling filamentary material, which comprises a rotatable multisection coiling head, means for rotating said coiling head, distributing means for directing said strand material to the coiling head, means for moving the distributing means transversely of the winding surface of said coiling head to insure an even distribution of said strand material upon each section of said coiling head, indexing means for effecting relative movement between the coiling head and the distributing means for transferring the strand material from a full section of the coiling head to an empty section of the coiling head, means actuated simultaneously with the indexing means for accelerating the coiling head, and means actuated simultaneously with said accelerating means for pinching said strand material during the indexing of the distributing means and the strand material directed thereby from the full section of the coiling head to the empty section of the coiling head to augment the accelerating means for maintaining a positive takeup tension on the strand material during the indexing operation.

3. An apparatus for coiling strand material, which comprises a rotatable multisection coiling head, a fluid motor for driving said coiling head, distributing means for directing said strand material to the coiling head, fluid actuated means for indexing said distributing means from a position opposite a full section of said coiling head to a position opposite an empty section of said coiling head, fluid actuated means for causing intermittent pinching of a portion of said strand material being directed to said coiling head by said distributing means, and means for injecting fluid into said pinching means, said fluid motor and said indexing means simultaneously for causing an acceleration of said coiling head, a pinching of a portion of said strand material and the indexing of said distributing means, for maintaining a positive takeup tension on the strand material during the indexing operation.

4. Coiling apparatus for sequentially coiling strand

material upon a plurality of sections of a scalloped, multisection coiling head, which comprises distributing means for directing the strand material to a predetermined section of said coiling head, means for indexing said distributing means from one section of said coiling head to another section of said coiling head, and fluid operated pinching means for retarding the advancement of the strand material simultaneously with the indexing of the distributing means from one section of said coiling head to another section of said coiling head for pulling the strand material into a notch formed by adjacent scallops on the coiling head, whereby the strand material is prevented from forming an undesirable loop during the indexing operation.

5. Apparatus for coiling strand material, which comprises a coiling head, a fluid motor for rotating said coiling head, distributing means for guiding said strand material to a portion of said coiling head, means for indexing the distributing means to a position for guiding the strand material to another portion of said coiling head, means for accelerating the fluid motor during the indexing period, and pinching means for retarding the advancement of the strand material momentarily during the indexing period.

6. An apparatus for coiling strand material, which comprises a coiling head, means for rotating said coiling head, distributing means for guiding said strand material to a portion of said coiling head, means for indexing said distributing means to a position for guiding said strand material to another portion of said coiling head, and means for pinching said strand material for retarding the motion thereof only during the indexing operation.

7. A coiling apparatus for strand material, which comprises a frame, a coiling head, means for rotating said coiling head, a distributing means mounted on said frame for movement transversely of the winding surface of said coiling head, an anti-looping device secured to and moved with said distributing means, which comprises a piston-cylinder assembly mounted on said distributing means, means for actuating said assembly, a pinching rod secured rigidly to said distributing means, a pivotally mounted arm one end of which is secured to the piston rod of said piston-cylinder assembly for actuation thereby, and a pinching rod secured to the opposing end of said arm for relative movement with respect to said rigid rod for pinching the strand material therebetween for retarding the movement of the strand material.

8. In an apparatus for coiling strand material, comprising a rotatable, multisection coiling head having scalloped dividers between the various sections thereof, a fluid-operated motor for rotating said coiling head, a distributing means for guiding said strand material to a section of said coiling head, means for indexing said distributing means for sequentially guiding said strand material to the various sections of the coiling head, means for pinching the strand material and thus causing retardation of said strand material during the indexing operation operatively connected to said indexing means for movement thereby, and means for causing simultaneous actuation of said pinching and retarding means and said indexing means when a predetermined length of said strand material has been coiled upon a section of said coiling head.

9. Apparatus for coiling strand material, which comprises a multisection coiling head, a fluid-operated motor for rotating said coiling head, means for supplying fluid to said motor to operate the same at a substantially constant power output, distributing means for guiding the strand material to a first section of the coiling head, means for moving the distributing means transversely of the winding surface of the coiling head to insure an even distribution of said strand material upon a section of the coiling head, means for pinching the strand material and thus retarding the advancement of the strand material being guided towards the coiling head secured to and moved with said distributing means, means for indexing said distributing means and said pinching and retarding means relative to the coiling head to a position for guiding the strand material to another section of said coiling head, means actuated simultaneously with the indexing means to accelerate the motor and thus the coiling head momentarily during the indexing operation, and means for actuating the pinching and retarding means simultaneously with the accelerating means for maintaining a positive takeup tension on the strand material during the indexing operation.

10. An apparatus for coiling strand material upon a multisection coiling head, which comprises means for rotating the coiling head, distributing means for guiding strand material to a section of the coiling head, means for indexing said distributing means to a position for guiding the strand material to another section of the coiling head, and pinching means actuated simultaneously with the indexing means for retarding the motion of the strand material during the critical interval of time during which the distributing means and the strand material guided thereby is being indexed from one section of the coiling head to another section of the coiling head for maintaining a positive takeup tension in the strand material.

11. An apparatus for coiling filamentary material, which comprdises a rotatable multisection coiling head, means for rotating said coiling head, distributing means for directing said strand material to the coiling head, means for moving the distributing means transversely of the winding surface of said coiling head to insure an even distribution of said strand material upon each section of said coiling head, indexing means for effecting relative movement between the coiling head and the distributing means for transferring the strand material from a full section of the coiling head to an empty section of the coiling head, and means actuated simultaneously with the indexing means for pinching said strand material during the indexing of the distributing means and the strand material directed thereby from the full section of the coiling head to the empty section of the coiling head for maintaining a positive takeup tension on the strand material during the indexing operation.

12. An apparatus for coiling strand material, which comprises a rotatable multisection coiling head, means for driving said coiling head, distributing means for directing said strand material to the coiling head, means for indexing said distributing means from a position opposite a full section of said coiling head to a position opposite an empty section of said coiling head, means for causing intermittent pinching of a portion of said strand material being directed to said coiling head by said distributing means, and means for actuating said pinching means and said indexing means simultaneously for causing a pinching of a portion of said strand material and the indexing of said distributing means and thus maintaining a positive takeup tension on the strand material during the indexing operation.

13. Apparatus for coiling strand material, which comprises a coiling head, means for rotating said coiling head, distributing means for guiding said strand material to a portion of said coiling head, means for indexing the distributing means to a position for guiding the strand material to another portion of said coiling head, and pinching means for retarding the advancement of the strand material momentarily during the indexing period.

14. Apparatus for coiling strand material, which comprises a multisection coiling head, a fluid-operated motor for rotating said coiling head, means for supplying fluid to said motor to operate the same at a substantially constant power output, distributing means for guiding the strand material to a first section of the coiling head, means for moving the distributing means transversely of

the winding surface of the coiling head to insure an even distribution of said strand material upon a section of the coiling head, means for pinching the strand material and thus retarding the advancement of the strand material being guided towards the coiling head secured to and moved with said distributing means, means for indexing said distributing means and said pinching and retarding means relative to the coiling head to a position for guiding the strand material to another section of said coiling head, and means for actuating the pinching and retarding means simultaneously with the indexing means

for maintaining a positive takeup tenson on the strand material during the indexing operation.

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