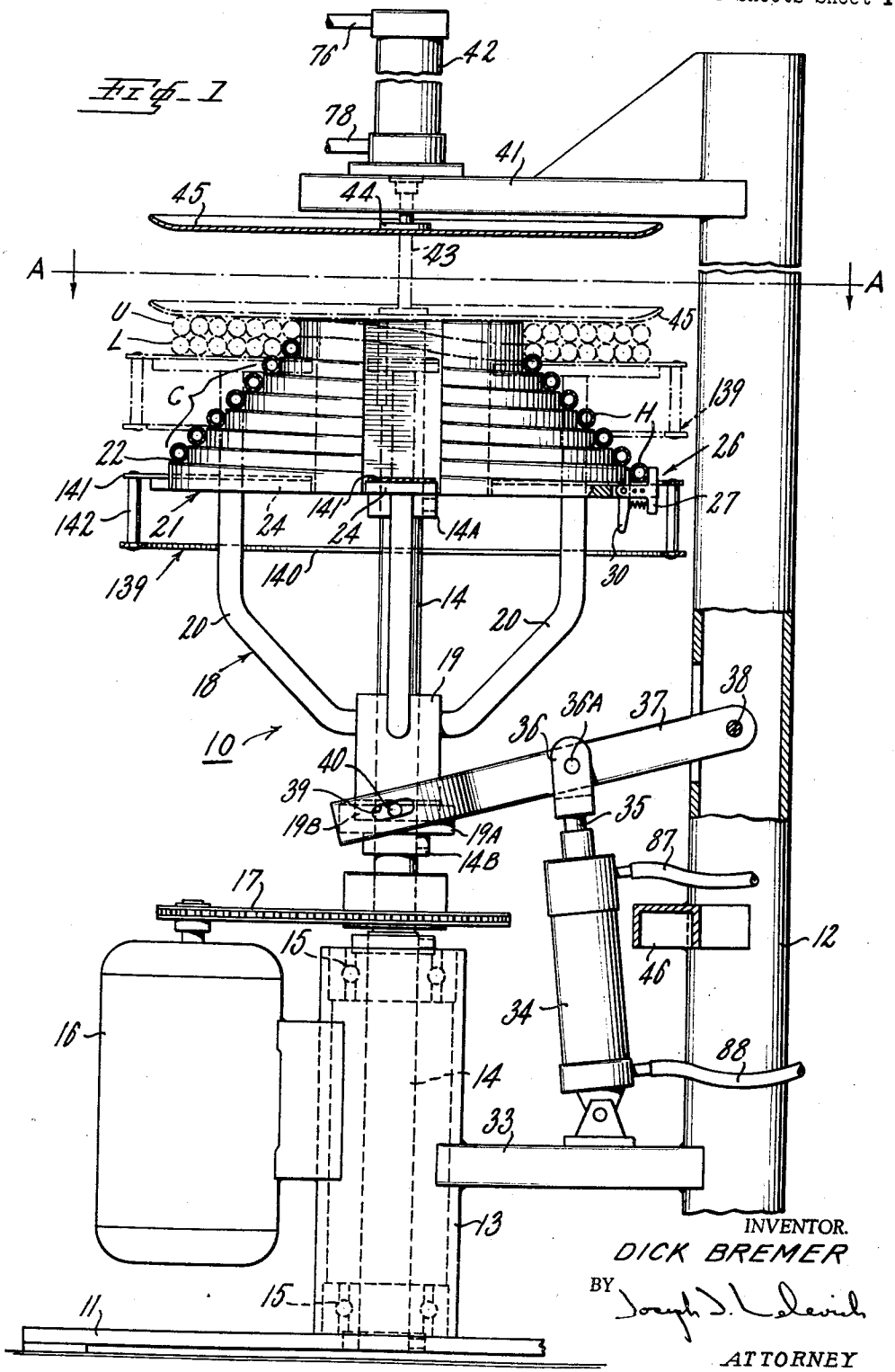
March 29, 1960 D. BREMER 2,930,539

COILING MACHINE

Filed April 1, 1957 3 Sheets-Sheet 1

Fig. 1



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COILING MACHINE

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Fig. 2

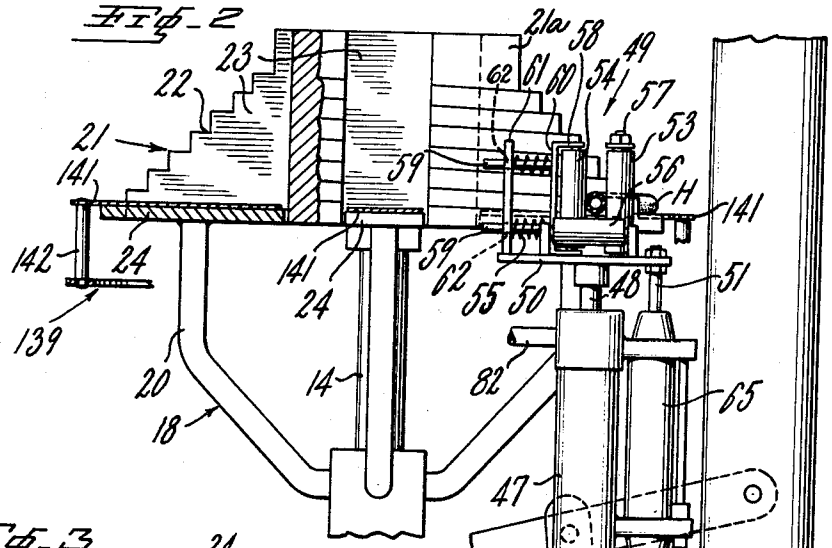


Fig. 3

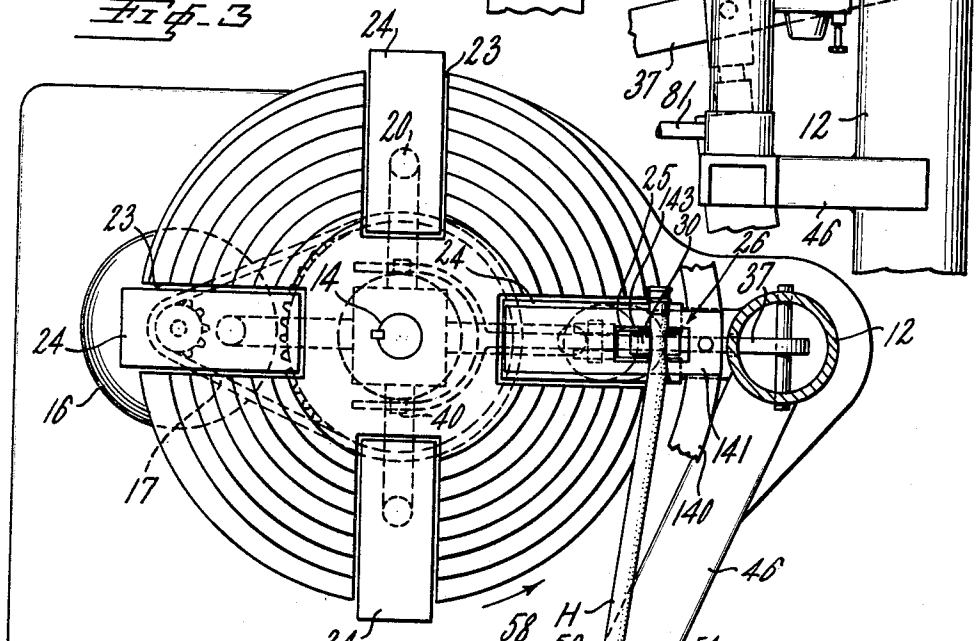


Fig. 4

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Fig. 6

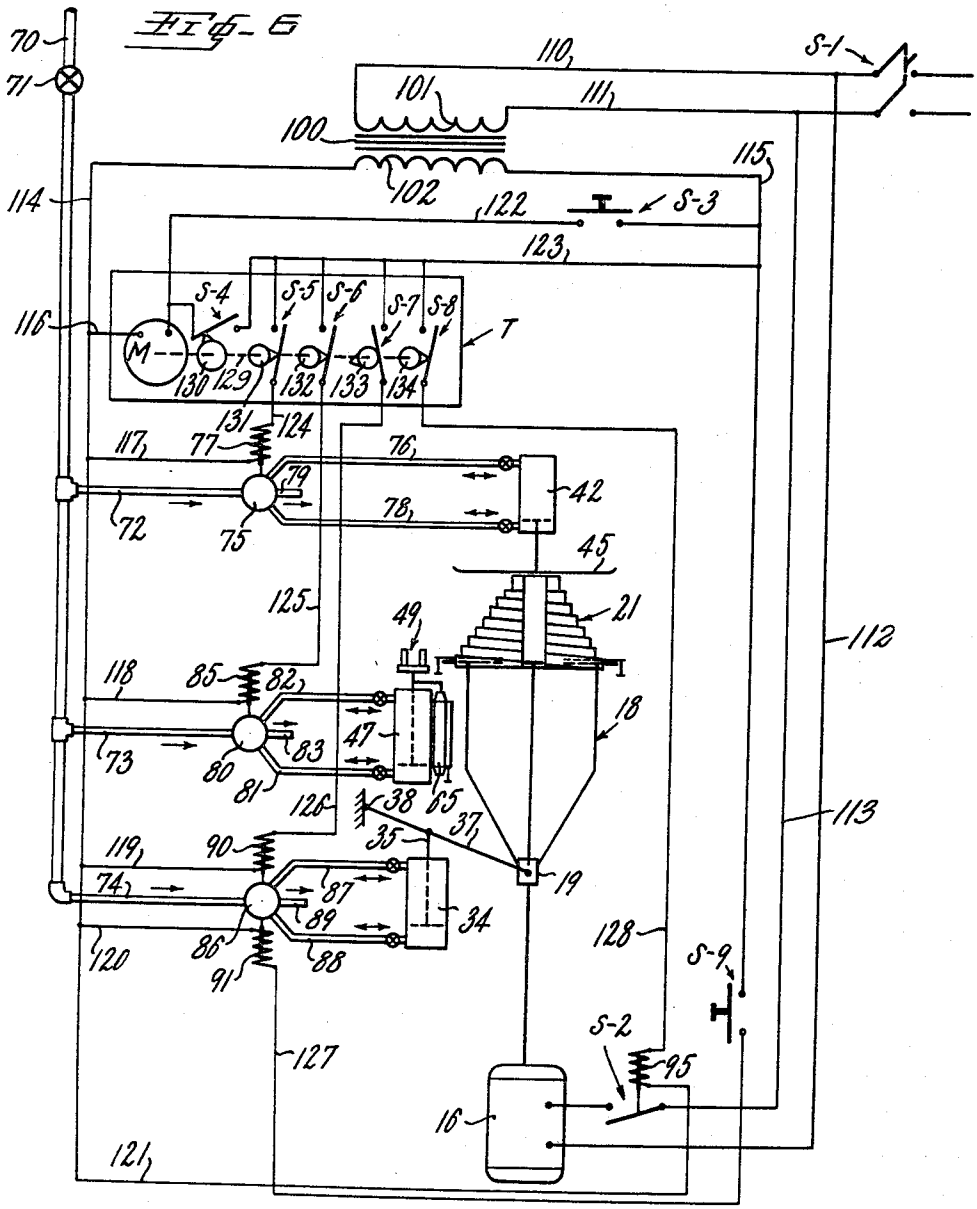
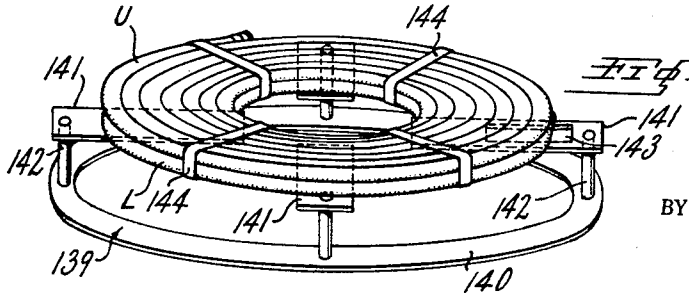


Fig. 5



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2,930,539

COILING MACHINE

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Application April 1, 1957, Serial No. 649,760

2 Claims. (Cl. 242—54)

This invention relates to an apparatus for coiling lengths of a flexible elongated member, particularly a hose in the form of two flat spirals superimposed on each other.

In packaging 25 and 50 foot lengths of a conventional garden hose, it is customary to manually form one, or two superimposed flat spirals, prior to taping the spirals together. At the present time the spirals are wound manually and although an experienced person may perform the work fairly rapidly, i.e., in about 20 seconds for a 50 foot length, for quantity production the cost of such skilled labor is high and the work is tedious.

Accordingly, it is an object of this invention to provide a machine which will be automatic after its operation is commenced and which will coil the hose much more quickly than could be done by hand, i.e., in approximately 8 seconds for 50 feet, and which does not require the services of a skilled person.

Another object of the invention is to provide an automatic coiling machine which is readily adaptable to the coiling of any flexible elongated member capable of being coiled, such as rope, wire and tubing, whether metallic or not, but particularly to the coiling of conventional plastic or rubber garden hose.

A further object of the invention is to provide a machine which will coil a portion of the hose in a conical spiral, telescope it into a flat spiral, and coil the remainder of the hose into a second flat spiral over the first, and thus form two flat spirals superimposed over each other from one length of hose.

In the drawings:

Fig. 1 illustrates a side elevational view of the machine, with some parts being shown in sections, broken away, and in different positions during the coiling operation;

Fig. 2 is an end elevational view with parts in section of the portion of the machine showing the hose guide;

Fig. 3 is a plan view taken on line A—A of Fig. 1;

Fig. 4 is an enlarged view showing the hose clamping means;

Fig. 5 is a perspective view of a hose wound by the machine; and

Fig. 6 is a diagrammatic view of the machine illustrating the fluid and electrical control systems.

The machine **10** (Fig. 1) embodying this invention is adapted to coil a length of hose into two superimposed flat spirals L and U. This is done by the machine first winding a portion of the hose into a conical spiral C, starting with the largest coil at the bottom of the cone and proceeding to the smallest at the top of the cone, telescoping the conical spiral C into a flat spiral L by moving the hose coils axially upwardly to the level of the smallest coil, and finally coiling the remainder of the hose outwardly as a second flat spiral U over the lower spiral L.

In general, the various components of the machine **10** comprise a frame on which are mounted a hose winding reel **21**, a spider **18** for telescoping the conically wound

hose portion, a guide **49** (Fig. 2) for directing the hose to the reel **21**, a guard plate **45** for confining the hose to the reel **21** during the winding operation, electrical and hydraulic power means for actuating these components, and an electrical system for their effective control. The reel **21** is rotated by means of an electric motor **16** while the other components, **18**, **49** and **45**, are operated by fluid cylinders **34**, **47** and **42** respectively. The motor **16** and the fluid cylinders are in turn effectively controlled by the electric system illustrated in Fig. 6.

The frame, Fig. 1, of the machine **10** comprises a base **11** of any desirable shape to which is secured a cylindrical tubular upright **12** and a hollow, cylindrical housing **13**. A main support shaft **14** is rotatably mounted by means of bearings **15** within housing **13**.

Keyed to the top of the shaft **14** is a hose coiling reel **21**. It is generally cone shaped and provided on its outer periphery with an upwardly and inwardly converging groove **22** having a plurality of convolutions into which the hose can be wound as a conical spiral C. The apex of the cone is a projecting cylindrical portion **21***a*, Fig. 2, that provides a hub on which the hose can be wound outwardly as a flat spiral U. Also, as seen in Fig. 3, reel **21** is provided with a series of four slots **23**. The slots **23** penetrate the peripheral surface of the conical portion of reel **21** and extend radially inwardly to a center circle which has a diameter equal to at least that of the smallest convolution of spiral or groove **22** and extend axially from the base of the reel to the topmost convolution and cylindrical portion **21***a*. A variable speed, electric motor **16** is mounted on one side of housing **13** and rotates shaft **14**, and therefore reel **21** by means of chain drive **17**.

Beneath reel **21**, slidably mounted on shaft **14** and rotatable therewith, is a spider **18** comprising a hollow, cylindrical sleeve or hub **19** slidably keyed on shaft **14**, and four arms **20** diverging outwardly and upwardly into slots **23** of reel **21**. Secured to the ends of arms **20** are an equal number of horizontal plates **24** which fit within each of the slots **23**. Thus, it is readily apparent that as the spider **18** reciprocates on shaft **14**, the plates **24** will move in slots **23** between the two positions shown in Fig. 1, carrying and telescoping the hose wound as a conical spiral C on the reel **21** into a flat spiral L.

At least one of plates **24** is provided with a slot **25** (Fig. 3) into which hose clamping means **26** is removably positioned and in which an end of the hose can be secured to reel **21** so that it can be wound on the reel. Hose clamping means **26**, Fig. 4, comprises a T-shaped plate **27** removably positioned within slot **25** by means of a pair of pins **28**. The end of the horizontal arm **29** of plate **27** is bifurcated for pivotally mounting the lever **30**. As will be apparent, the upper portion of vertical arms **31** of plate **27** and upper portion of lever **30** form jaws in which an end of the hose is secured at the start of the coiling operation, which will be described in detail below. The lower portions of lever **30** and vertical arm **31** are recessed for the reception of compression spring **32** which resiliently urges the lever **30** into clamping position on the hose.

The means for reciprocating spider **18** will now be described with reference to Fig. 1. Pivotally mounted on a support **33** secured to housing **13** and upright **12** is a fluid cylinder **34** having a piston rod **35**, the end of which is bifurcated into a head **36**. A lever **37**, Fig. 1, is pivotally mounted at a point between its ends in head **36** for reciprocation therewith by means of a pin **36A**. An end of lever **37** is pivotally connected by pin **38** to upright **12** and its other end is bifurcated and secured by pin **40** which extends outwardly from thrust bearing container **19A** into slots **39** provided in the bifurcated portion of lever **37**. Within container **19A** there is a thrust

bearing 19B to take the load of spider 18 and to permit hub 19 to rotate with shaft 14 relative to container 19A, which merely reciprocates on shaft 14 but does not rotate therewith. As lever 37 is actuated by cylinder 34, it reciprocates spider 18 relative to reel 21 by engagement of pin 40 in slots 39 of lever 37. A collar 14A secured to shaft 14 serves to define the lowermost position of reel 21 and the uppermost position of hub 19 on spider 18, whereas collar 14B fixed on shaft 14 beneath the thrust bearing container 19A determines the lowermost position of spider 18 by engagement with container 19A.

Rigidly mounted at the top of upright 12 there is a horizontal support 41 carrying a fluid cylinder 42. At the free end of piston rod 43 of cylinder 42 is a hold down mount 44 which carries the hold down or guard plate 45. Plate 45 with mount 44 is rotatable on piston rod 43 and movable toward and away from reel 21. When moved to its lowermost position, the guard plate 45 is in contact with the cylindrical portion 21*a* of reel 21, as shown by the broken lines in Fig. 1, and rotates with the reel and thus provides the reel 21 with a flange which prevents the hose from leaving the reel 21.

Referring to Figs. 2 and 3, the hose guide feeding device 49 for directing the hose to reel 21 comprises a pair of spaced, vertical rollers 53, 54, positioned between two horizontal rollers 56, 56, all of which are mounted on a base plate or platform 50. Roller 53 is fixed and mounted on a vertical bolt 57 secured to plate 50. Roller 54 is held in yoke 58 which is resiliently urged laterally toward roller 53 by means of springs 55 mounted on horizontal rods 59, 59 between the vertical member 60 of yoke 58 and upright 61 rigidly secured to platform 50 and through which the horizontal rods 59, 59 move in holes 62, 62. The hose H, that is to be wound on reel 21, passes between rollers 53 and 54 which clamp the hose sufficiently to keep the hose coils taut on reel 21, but not so tight as to pull the hose out of clamp 25.

The platform 50 of hose guide 49 is rigidly secured to the top of piston rod 48 of a fluid cylinder 47 mounted in substantially a vertical position on a horizontal support 46 extending from upright 12. A piston rod 51 of an adjustable fluid resistance unit 65 mounted on cylinder 47 also is secured to platform 50. Resistance unit 65 is of a conventional type and resists in one direction only, e.g., the Bellows Hydro-Check. Thus, as piston rod 48 tends to move upward carrying hose guide 49 with it, the resistance unit 65 restrains or slows it down so that the hose guide 49 rises only as fast as the hose H is wound up the conical portion of reel 21.

The fluid system by which fluid power is supplied for actuating spider 18, hose guide 49 and guard plate 45 is illustrated in Fig. 6. Fluid, water or air, under pressure is supplied from main line 70 through a conventional shut-off valve 71 to trunk pipe lines 72, 73 and 74. From line 72 the fluid passes through a 4-way valve 75 which is solenoid actuated and spring reversed. It is a conventional Barksdale type 4-way valve in which energizing the solenoid opens one set of ports and deenergizing the solenoid reverses the valve whereby the ports are closed and another set opened. The fluid passes from valve 75 into cylinder 42 by either lines 76 or 78. When the solenoid of valve 75 is energized the fluid passes from valve 75 through line 76 into the top of cylinder 42, whereas the fluid already in cylinder 42, that is under the cylinder piston, leaves through line 78 and out line 79, and guard plate 45 is thus lowered. When the solenoid is de-energized, the valve 75 is reversed and fluid from line 72 enters the lower end of cylinder 42, the fluid in the top of cylinder 42 exits through line 76 and out line 79, and guard plate 45 is thus raised. The arrangement is such that there is fluid in cylinder 42 (as is the case also in cylinders 47 and 34) at all times, on either the top or bottom of the piston in cylinder 42, and as fluid enters one end of the cylinder, either the top or the bottom, the fluid already in the cylinder, at the opposite end of the cylinder, exits.

Hose guide cylinder 47 similarly actuates hose guide 49. Fluid in line 73 passes through a 4-way solenoid control valve 80 of the same type as valve 75 into the lower part of cylinder 47 to raise the hose guide against the resistance of unit 65. The fluid in the upper part of the cylinder 47 exits through line 82, valve 80 and trunk line 83. When the solenoid 85 is de-energized, valve 80 is reversed and the direction of the hose guide 49 is likewise reversed, since fluid from line 73 is then fed through line 82 to the top of cylinder 47 and the fluid at the bottom of the cylinder 47 is exhausted through line 81 and trunk line 83.

Fluid from line 74 is supplied to cylinder 34 for actuating spider 18. It passes through a 4-way valve 86 similar to valves 75 and 80, except that valve 86 has a double solenoid and is actuated by energizing one of the solenoids and reversed by de-energizing that solenoid and energizing the other solenoid. The valve does not reverse when a solenoid is de-energized only as in the case of valves 75 and 80, and the solenoids, therefore, need not remain energized to hold the valve in a desired position. Fluid from valve 86 passes through line 87 to the top of cylinder 34, whereas fluid already in cylinder 34 exits through line 88, valve 86 and line 89, and causes spider 18 to lower on reel 21. When the valve 86 is reversed, fluid from line 74 passes through line 88 into the bottom of cylinder 34, whereas the fluid in the top of the cylinder exits through line 87, valve 86 and line 89, and spider 18 is raised.

The electrical system controlling the machine 10 is also shown in Fig. 6. In this system, 220 volts A.C. is supplied by lines 110, 111 having a main power cut-off switch S–1. Part of the energy is utilized at this voltage in motor 16 and part transformed to 110 volts by transformer 100 for operating the solenoids of valves 75, 80, 86 and switch S–2 of motor 16. The primary coil 101 of transformer 100 is connected across lines 110, 111 from which lines 112, 113 are connected to motor 16 through solenoid actuated switch S–2. The secondary coil 102 is connected across lines 114 and 115 to which the lines numbered 116 through 128 are connected to complete the various circuits to the solenoids of the valves 75, 80, 86 and switch S–2.

Line 116 connects line 114 which motor M of timer T and push button switch S–3 in line 122 to line 115 to form a first circuit for running timer T. Another circuit between lines 114, 115 is formed by line 116 through motor M and switch S–4 and line 123. The first circuit through push button S–3 is provided to start the timer T, and since the switch is normally open, it must be held down sufficiently long to permit timer motor M to turn shaft 129 with cam 130 to allow switch S–4 to close and complete the circuit through line 123. The timer T will then run until cam 130 has turned sufficiently to open switch S–4.

Line 117 forms a circuit from line 114 through solenoid 77 and switch S–5 in timer T to line 123. On starting of the timer T, switch S–5 is closed and solenoid 77 energized, whereby valve 75 is actuated until cam 131 in timer T opens switch S–5.

Lines 118, 119 form similar circuits from line 114 through solenoids 85, 90 of valves 80, 86 through switches S–6, S–7 in timer T to line 123 and line 115. Line 120, on the other hand, forms a circuit from line 114 through solenoid 91 of valve 86 through the normally open push button switch S–9 instead of timer T. Energizing solenoid 91 actuates valve 86 and permits fluid to enter the top of cylinder 34 and retract spider 18 to its lowermost position on reel 21. This operation of the spider 18 is independent and outside of the timer T to permit time for removal of the coiled hose from the reel 21 or to hold it there if desired.

Line 121 forms a circuit from line 114, through sole-

noid 95 of switch S–2, switch S–8 in timer T, and line 123 to line 115. Energizing solenoid 95 closes switch S–2 and completes the 220 volt circuit from lines 112, 113 to motor 16.

Each of the switches S–4, S–5, S–6, S–7, and S–8 in timer T are closed and opened by timer T. All close simultaneously at the beginning of the cycle and remain closed throughout the cycle except switch S–7. The cam 133 in timer T operating switch S–7 is set to temporarily close the switch at the time the winding of the hose H into the conical spiral C on reel 21 is about finished; it then closes temporarily and solenoid 90 is energized whereby valve 86 is actuated and spider 18 caused to rise instantly. Switch S–7 need not be closed throughout the cycle since valve 86 can be reversed only by actuating solenoid 91 which requires manually depressing push button S–9.

In the operation of the machine, normally at the end of an operating cycle the guide plate 45 is in a position clear of reel 21, as shown by solid lines in Fig. 1, spider 18 is at the top of reel 21 as shown by the dotted lines in Fig. 1 and hose guide 49 is at its lowermost position as shown in Fig. 2. The operator closes switch S–1, thereby energizing transformer 100 and providing power in the lines numbered 112 through 115. Switch S–9 is then held depressed to complete the circuit to solenoid 91 of valve 86, whereby fluid enters the top of cylinder 34 and spider 18 is lowered to the position shown by the full lines in Fig. 1. The operator then inserts and clamps an end of the hose H, which is to be coiled, between lever 30 and arm 31 of clamping device 26 (Fig. 4). As seen in Fig. 3, the hose is then in position adjacent the lowermost or largest convolution of groove 22. At this point, the operator starts timer T by depressing switch S–3. The coiling cycle begins with the timer closing switches S–4, S–5, S–6 and S–8. The closing of switch S–4 completes the circuit through timer motor M and line 123 to keep the timer running throughout the period of the cycle. The closing of switch S–8 in timer T energizes solenoid 95 and completes the circuit through lines 128 and 121 to line 114. This closes switch S–2 in line 113 completing the circuit between lines 112 and 113 through motor 16 and causes the motor to rotate shaft 14 with reel 21, whereupon hose H is progressively coiled upwardly and inwardly filling the groove 22. Closing of switch S–6 by the timer T energizes the solenoid 85 which actuates valve 80 causing fluid pressure to enter into the bottom of cylinder 47 and raise hose guide 49 against the restraint of resistance unit 65 in timed relation with the winding of the hose H on reel 21. The switch S–5, likewise closed with the starting of the timer T, completes the circuit energizing solenoid 77 and actuates valve 75 to admit fluid pressure to the top side of cylinder 42. This causes the guard plate 45 to move downwardly until it is in contact with reel 21. Guard plate 45 comes in contact with reel 21 before the hose H has been completely wound in the groove 22. About the time a portion of the hose H is wound in the top convolution of groove 22, the cam 133 in timer T has turned sufficiently to close switch S–7 thereby energizing solenoid 90 which actuates valve 86 admitting pressure to the bottom of cylinder 34 whereby spider 18 rises instantly. Rising of spider 18 displaces the hose wound in the groove 22 and collapses or telescopes the conical spiral C of hose into a flat spiral L which it supports at the base of the cylindrical projection 21*a*. The reel 21, in the meantime, continues to turn and wind the remainder of the hose on the cylindrical projection 21*a* under the guard plate 45 as the second spiral U.

After a certain period of time measured from the actuation of switch S–3, the coiling machine is stopped by the timer T opening the switches within it. Reel 21 stops turning since switch S–2 is opened; guard plate 45 moves away from reel 21, since the solenoid 77 is de-energized and the valve 75 is reversed whereby pressure is admitted by line 78 to the bottom of cylinder 42. Guide 49 slowly descends or returns to its original position since valve 80 is reversed through the de-energizing of solenoid 85 and admits fluid to the top of cylinder 47. Spider 18, however, remains in its upward position shown by the dotted lines in Fig. 1 until switch S–9 is again manually closed, which the operator does after removing the coiled hose from the machine to repeat the cycle.

In order to permit removal of the hose from the machine, a tray 139, Fig. 5, comprising a ring 140, of larger diameter than the base of reel 21, and a number of horizontal plates 141 secured on vertical rods 142 attached to ring 140, is generally positioned on spider 18 as shown in Fig. 1. The plates 141 are similar to plates 24 of spider 18 and include one that has a slot 143 to admit the clamping means 26. The tray 139 supports the hose H so that lifting it from spider 18 removes the hose from the machine 10. The tray also holds the hose H in a raised position when set on some base, thereby readily permitting taping with tapes 144 to prevent uncoiling of the hose.

It will now be apparent, that the machine comprising the invention represents an entirely new concept in the coiling of elongated members such as hose, wherein the use of human labor is greatly reduced and made unnecessary at various stages of the automatic operation.

While this invention has been shown and described in a certain preferred form, it is to be understood that various changes and modifications may be made therein by those skilled in the art without departing from the principles of the invention, the scope of which is to be determined by the appended claims.

Having thus described my invention, what I claim and desire to protect by Letters Patents is:

1. In a machine for coiling an elongated flexible member, rotatable means for winding said member in both a conical spiral and a flat spiral, means movable relative to said winding means for telescoping said conical spiral into a first flat spiral on said winding means, normally deactuated means operatively connected to said telescoping means and responsive to operation of said winding means for automatically actuating said telescoping means during rotation of said winding means and upon completion of the formation of said conical spiral, means movable toward and away from said winding means for confining said member on said winding means during winding of a second flat spiral and for permitting removal of said member after winding of said second flat spiral, respectively, and means operatively connected to said confining means and responsive to operation of said winding means for automatically displacing said confining means toward said winding means during rotation of the latter and the formation of said conical and second flat spirals and for automatically displacing said confining means away from said winding means upon completion of the formation of said second flat spiral.

2. In a machine for coiling an elongated flexible member into superimposed flat coils, power operated rotatable means for winding said member in both a conical spiral and a flat spiral, means movable relative to said winding means for telescoping said conical spiral into a first flat spiral on said winding means, normally deactuated means operatively connected to said telescoping means and responsive to operation of said winding means for automatically actuating said telescoping means during rotation of said winding means and immediately upon completion of the formation of said conical spiral, means movable relatively toward and away from said winding means for confining said member on said winding means during winding of a second flat spiral and for permitting removal of said member after winding of said second flat spiral, respectively, means operatively connected to said confining means and responsive to operation of said winding means for automatically displacing said confining

means toward said winding means during rotation thereof and the formaton of said conical and second flat spirals and for automatically displacing said confining means away from said winding means upon completion of the formation of said second flat spiral, and electrical control means interconnecting both the aforesaid responsive means for actuation thereof in proper sequence and timed relation.

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