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BUNDLE TYING MACHINE

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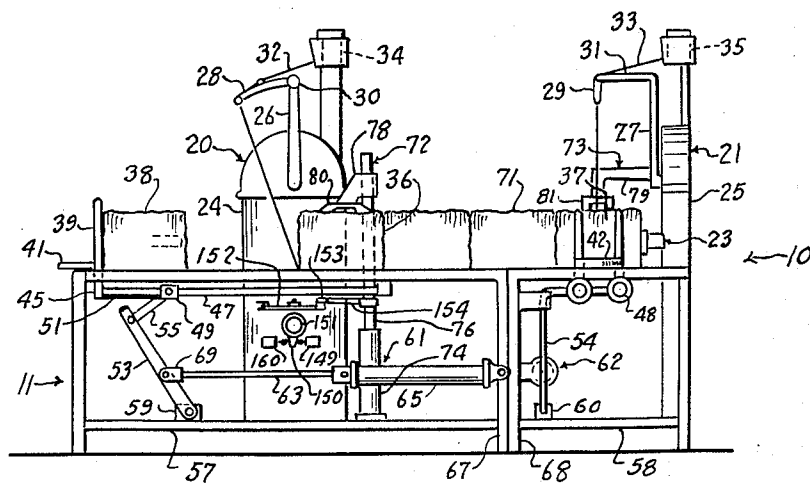
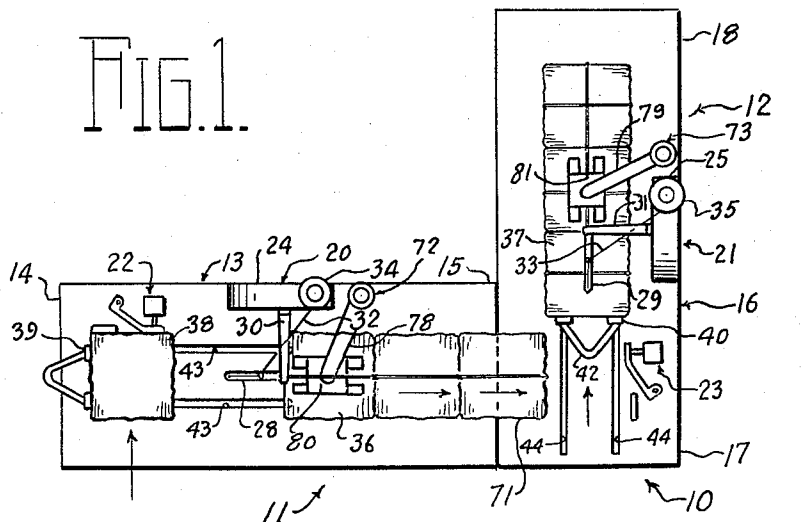


FIG. 2.

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1

2,867,166

## BUNDLE TYING MACHINE

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5 Claims. (Cl. 100—4)

This invention pertains to a bundle tying machine and more specifically to an improved cross tying machine with control means therefor.

A bundle tying machine normally comprises an elongated table, a feeding mechanism for feeding a bundle to be tied into a tying position on the table, and mechanism for tying string or line around the perimeter of the bundle, usually in a plane parallel to the direction of movement of the bundle. After the string is knotted, another bundle is moved into tying position by the feeding mechanism which pushes the previously tied bundle beyond the tying position a distance equal to the length of the new bundle. Each tied bundle, by successive pushes, is moved off the table onto a conveyor or into a receptacle or the like.

When a bundle is to be cross-tied, that is, tied by two strings lying in perpendicular planes, the machine usually comprises a second tying mechanism that is placed at right angles to the first. To prevent entanglement and interference in such a machine, the tying mechanism must operate sequentially which requires the bundle to be in tying position for substantially twice as much time as that required for a single tie. This extra time is particularly detrimental where bundles are to be tied on a production basis because two tying cycles are required in order to handle each bundle.

Such cross-tying machines are relatively complicated also, because of the numerous coordinating controls required to properly operate the two tying mechanisms. Considerably additional time is involved in the design and manufacture not only because of the additional controls but because each tying mechanism must be specially designed to avoid physical interference with the other tying mechanism.

Furthermore, the bundles cannot be fed in a linear path across the feeding table because of the presence of the housing for the second tying mechanism. Therefore, the bundles must be moved laterally off the table along an L-shaped path. This necessitates the addition of another feeding mechanism or the use of a more complicated feeding mechanism.

It will be readily seen that if either of the two tying mechanisms requires repair, the entire machine must be shut down, and production is entirely stopped. In addition to the high initial cost of such a machine, more highly skilled mechanics must be employed to keep the machine in proper running order, thus adding to operating expense.

It has been discovered that by placing two tying units in tandem, with the second positioned perpendicularly to the first and at the discharge end of the latter's feeding table, the foregoing disadvantages can be overcome. With this machine, a package that has been tied in one plane by the first unit is pushed off of the first feeding table by successive pushes and is moved to the bundle receiving position at the charge end of the second feeding table. Each package is then tied by the second unit

2

but in a plane perpendicular to the first tie. This arrangement retains each bundle in a tying position for only the length of time necessary to complete one tie and thus considerably speeds output to almost double that attainable with conventional cross-tie machines. While a tie in one plane is being made on a certain bundle, a cross tie is simultaneously being made on a previous bundle.

The initial cost of such a new machine is less than that of a machine having its two cross tie mechanisms at the same tying station. First, relatively simple controls are needed. Second, its mechanisms are simpler, resulting in fewer breakdowns. Third, no complex handling and feeding mechanisms are required to move the bundles in an L-shaped path as is necessary in machines having two tying devices and a single tying station.

With a tandem mechanism embodying the invention, if one of the two tying mechanisms becomes inoperative, production need not be entirely stopped during repair. The operable tying mechanism is operated in the usual manner and the bundles are manually rotated 90° and then fed again through this mechanism to obtain the cross tie.

With the new machine, it is essential that the feeding mechanism of the second unit be at the extreme charge end of the table at the time a package is pushed into the bundle receiving position from the discharge end of the first table. Should the feeding mechanism for the second table be forward, adjacent the tying position, for example, it would back feed a bundle which had been moved behind it into bundle receiving position off of the charge end of the table upon its return stroke. Also, if the second feeding mechanism is in an intermediate position, between the charge end and the tying position, it will be in the path of a bundle moving from the first table. The row of bundles will then be jammed between the first and second feeding mechanisms, resulting either in crushed bundles or damage to the feeding mechanism of one or both machines.

In order to co-ordinate the operation of the two bundle tying mechanisms and their feeding mechanisms it would be expected that complex relays, solenoids, electric eyes or other electrical or electronic mechanism would have to be employed. The instant invention is based upon the realization that no such complex mechanism is necessary.

In the present invention, each tying mechanism is independent of the other and is tripped whenever a bundle reaches tying position. Each feeding mechanism is independently actuated by the arrival of a bundle on the charge end of its table. Jamming or other damage to the mechanisms is prevented by a simple, almost foolproof, mechanism according to the invention wherein the actuation of the first feeding mechanism is disabled until the second feeding mechanism is ready to receive a package.

Jamming may also occur between the feeding mechanism and the tying mechanism if a second bundle is fed toward the tying position while a first bundle is being tied. The controls of the new machine also prevent this possibility from occurring.

In view of the above problems, it is an object of the present invention to provide a bundle cross-tying machine having two separate tying mechanisms and provided with a simple control for coordinating the operation of the two bundle feeding mechanisms to prevent damage or jamming, by controlling the operation of the first feeder mechanism according to the position of the second.

Another object of the invention is to provide a machine capable of higher production rates because of simultaneous tying operations on two different bundles.

Still another object of the invention is to provide a ty-

3

ing machine that is relatively simple, resulting in fewer breakdowns and lower operating costs.

A further object of the invention is to provide a tying machine capable of tying bundles when a portion thereof is inoperable.

Another object of the invention is to provide a control system for coordinating the operation of the feeding and tying mechanisms for each unit of the machine.

Other objects and advantages of the invention will be apparent from the following detailed description of a preferred embodiment thereof, reference being made to the accompanying drawings, in which—

Figure 1 is a plan view of apparatus embodying the invention;

Fig. 2 is a view in side elevation of the apparatus of Fig. 1;

Fig. 3 is a fragmentary, detailed side view of a portion of the apparatus of Figs. 1 and 2, and showing some of the controls;

Fig. 4 is a fragmentary detailed view in perspective of a part of the controls for the apparatus of Figs. 1-3, and showing some of the mechanical controls; and

Fig. 5 is a schematic view of control apparatus used with the apparatus of Figs. 1 and 2, and showing portions of the operating mechanisms controlled thereby.

A bundle tying machine, generally indicated at 10 in Figs. 1 and 2, comprises two bundle tying units 11 and 12 positioned in tandem, with the one unit 11 extending at right angles to the other unit 12. The unit 11 has a bundle receiving and feeding table 13 which has a charge end 14 and a discharge end 15. The unit 12 similarly has a table 16 having a charge end 17 and a discharge end 18. The units 11 and 12 are also identical in other respects except that their tying mechanisms 20 and 21 and their feeder actuating switches 22 and 23 are positioned on opposite sides of the tables 13 and 16 for left and right hand operation respectively.

The tying mechanisms 20 and 21 comprise upright housing 24 and 25 containing drive means for operating needle crank arms 26 and 27 to which needles 28 and 29 are attached by means of cross arms 30 and 31. The needles 28 and 29 are supplied with lines or strings 32 and 33 from spools 34 and 35 and, when swung around by the crank arms 26 and 27, feed the strings 32 and 33 around bundles to points below the tables. These portions of the strings 32 and 33 are fed by the needles 28 and 29 to points adjacent the lower ends of the strings 32 and 33 where they are held by knot-forming mechanisms (not shown) below the tables 13 and 16 and the strings are tied in knots at this point and cut by the knotting mechanisms. Apparatus for tying and cutting is disclosed in Saxton Patent No. 2,374,900, entitled "Bundle Tying Machine," issued May 1, 1945. After the strings 32 and 33 are knotted around bundles and cut, the new lower end of the strings 32 and 33 are held by the knot-forming mechanisms and the crank arms 26 and 27 and the needles 28 and 29 return through the same arcuate path to their original positions.

In Figs. 1 and 2, a bundle 36 is shown in tying position on the first table 13, having just been tied, and a bundle 37 is shown as being pushed into tying position on the second table 16. A bundle 38 is shown in the bundle receiving, or feeding, position on the first table 13. Twenty bundles or more per minute can be tied with this machine. The bundles need not be of identical shape but all bundles must be substantially the same length with the bundle tying position of the first unit 11 being an integral number of bundle lengths from the bundle receiving position of the second unit 12.

The bundles are fed along the tables 13 and 16 by their respective feeding mechanisms. These feeding mechanisms comprise pairs of vertical pushing arms 39 and 40 connected by V-shaped bars 41 and 42 which allow clearance for the movement of the needles 28 and 29 around the rear of the bundles being tied. The pushing arms 39

4

and 40 extend through slots 43 and 44 in tables 13 and 16. The arms 39 and 40 are integrally connected to slide blocks 45 and 46 (see also Fig. 3) which are slidably supported on guide rails 47 and 48. Slide blocks 49 and 50 are connected to the blocks 45 and 46 by connecting bars 51 and 52 and the slide blocks 49 and 50 are connected to levers 53 and 54 through links 55 and 56. The levers 53 and 54 are pivoted on frames 57 and 58 by ears 59 and 60 and are powered by pneumatic rams 61 and 62 which comprise piston rods 63 and 64 movable in cylinders 65 and 66. The rear ends of the cylinders 65 and 66 are mounted on table legs 67 and 68 (see Fig. 2, for example). The piston rods 63 and 64 connected to the levers 53 and 54 by yokes 69 and 70 and reciprocate the levers 53 and 54 as they move into and out of the cylinders 65 and 66. Both of the feeding mechanisms for the units 11 and 12 are similar except, of course, that the one is at right angle and reversed relative to the other.

In order to compact bundles of material such as newspapers, paper sacks, etc. and to force air out from between the items each of the units 11 and 12 has a packer 72 or 73. The packers 72 and 73 comprise pneumatic cylinders 74 and 75, piston rods 76 and 77, arms 78 and 79, and presser feet 80 and 81. The arms 78 and 79 may be vertically adjustable on the rods 76 and 77 to compensate for different bundle heights and to vary the amount of compressive force exerted on the bundles by the feet 80 and 81 when the rods 76 and 77 are in their lower positions. If the bundles to be tied are such that they do not need to be compressed the arms 78 and 79 can be adjusted upwardly on the rods 76 and 77 and the feet 80 and 81 then exert only a slight pressure on the package being tied which is sufficient to hold it in place.

The unit 11 of Figs. 1 and 2 is shown ready to feed the new bundle 38 into tying position, the previous bundle 36 having just been tied. The unit 12 is shown with the bundle 37 being pushed forwardly into bundle tying position by the pushing arms 40. If the bundle 38 were now fed (to the right in Fig. 2) into the tying position of unit 11, the last bundle in the row, bundle 71, would be pushed simultaneously onto the table 16 and into the return path of the arms 40 of the unit 12. This bundle 71 would then be back fed off of the table 16 as the arms 40 returned to their bundle receiving position. Also, if the bundle 38 were moved forwardly by the arms 39 of the unit 11 when the arms 40 of the unit 12 were in an intermediate position, the bundles 36 and 71 and those between would be jammed between the two pairs of arms 39 and 40 causing the bundles to be crushed or possibly a portion of one of the feeding mechanisms to break.

While the bundle 36 is being tied on the table 13 of the unit 11, and the needle 28, the arm 30, and the crank 26 are at the bottom of their arcuate path, serious jamming and damage would result if the pushing arms 39 were to feed the bundle 38 toward the tying position. A similar mishap would occur in connection with the second unit 12 if the pushing arms 40 were to feed another bundle, such as the bundle 71, toward the tying position while the bundle 37 is being tied and the needle 29, the arms 31, and the crank 27 are at the bottom of their arcuate paths.

To prevent these occurrences, a relatively simple control system has been developed that disables the operation of the feeding mechanism of the first unit 11 in all instances except when the feeding mechanism for the second unit 12 is in its rear or bundle receiving position. It also prevents the feeding mechanisms from feeding subsequent bundles toward the tying positions when previous bundles are being tied.

The control mechanism embodying the invention may be pneumatically actuated. An air supply line 82 (Fig. 5) supplies air to a three-way valve 83 for the unit 11 and to a three-way valve 84 for the unit 12, through a line 85 and through lines 86, 87, 88, and 89 respectively.

Pilot means are provided for actuating the valve 84 so as to feed air to the rod end of the cylinder 66 through a line 90 or to the blind end of the cylinder 66 through a line 91. The pilot means to direct air through the line 90 comprises lines 92, 93, 94, and 95 which connect a pneumatic valve 96 of the starter switch 23 and another pneumatic valve 97 between the valve 84 and the line 86.

The valve 96 is opened by a bundle moved into the bundle receiving position of the charge end 17 of the table 16 which depresses a trip lever 98 connected to the normally closed pneumatic valve 96. With a plunger 99 of the switch 23 depressed by the trip lever 98, the valve 96 will remain open until the bundle has ceased to contact it. The plunger 99 and the trip lever 98 will then return to their outer positions due to the outward force on the plunger 99 exerted by a spring within the valve housing.

The valve 97 is normally closed except when a plunger 100 is contacted by a vane 101 (see Figs. 3 and 4 particularly) attached to a shaft 102 which extends from the housing 25 of the tying mechanism 21. The shaft 102 is rotated by a gear (not shown) of the tying mechanism 21 located in the housing 25 and makes one complete rotation during each tying cycle. The vane 101 begins and ends rotation in a vertically disposed position beneath the shaft 102. The vane 101 contacts the plunger 100 and opens the valve 97 in this position.

The gear to which the shaft 102 is attached is driven by a drive gear (not shown). These gears are engaged when a rod 103 is moved inwardly. The mechanical association between the rod 103 and the gears is shown in the earlier mentioned Saxton patent and is not described in detail for this reason. A pin 104 (see Fig. 4) is attached to the rod 103 and is engageable with a yoke 105 of a lever 106 pivoted on the housing 25 in an ear 107. A paddle 108 is attached to the opposite end of the lever 106 and is cammed outwardly when contacted by a roller 109 which is connected to an arm 110 attached to the piston rod 77 of the packer 73. When the piston rod 77 is moved downwardly, as will be subsequently described, the roller 109 strikes the paddle 108 and swings the lever 106 to move the rod 103 inwardly, engaging the gears to rotate the shaft 102. The vane 101 then moves out of contact with the plunger 100 and causes the valve 97 to close.

With the valves 96 and 97 open, air flows through the lines 94 and 95 to an end of the three-way valve 84 which moves a valve plunger therein to direct air from the line 89 to the rod end of the cylinder 66. This causes the rod 64 to retract into the cylinder 66 (Fig. 3) which moves the lever 54, the pushing arms 40, and a bundle carried thereby to the tying position of the unit 12. Air from the blind end of the cylinder 66 is exhausted through a vent 111 in the valve 84 during this movement.

The rod 64 stays in its inner position until pilot air is supplied to the opposite end of the valve 84, shifting the plunger to direct the air from the line 89 through the line 91 to the blind end of the cylinder 66. This causes the rod 64 to extend and returns the pushing arms 40 to their bundle receiving position. During this return motion, air from the rod end of the cylinder 66 is exhausted through a vent 112 in the valve 84.

Pilot means for directing air through the line 91 comprises line 113 connected to the main air lines 82, 86 and 87 and lines 114, 115, and 116 through which pilot air flows to the valve 84. A valve 117 is in series with the lines 114 and 115 and is opened by the feeding lever 54 contacting a plunger 118 when in its forward position (see also Fig. 3). With the valve 117 opened, air flows from the line 114 to the line 115. The pilot air actuates the plunger in the valve 84 to direct air from the line 89 through the line 91 to the blind end of the cylinder 66 and cause the rod 64 to move out of the cylinder 66. The rod 64 remains in its extended position i. e., with the

pushing arms 40 in bundle receiving position until the valves 96 and 97 are again opened.

When the valve 117 is opened by the lever 54 reaching its forward position, pilot air also flows from the line 113 through the line 115 to a line 119. This air causes a plunger to move in a three-way valve 120 which controls the air supplied from a line 121 to the packer cylinder 75. Air from the line 121 is then passed to the rod end of the cylinder 75 through a line 122 and causes the rod 77 to move downwardly which presses the foot 81 against a bundle moved into the tying position. Air from the blind end of the cylinder 75 exhausts through a vent 123 during the downward movement. At this time, the roller 109 of the arm 110 contacts the plane 108 and causes the rod 103 to move inwardly and start the tying cycle. The vane 101 moves away from the plunger 100 as the shaft 102 is rotated. The valve 97 is then closed which prevents the lever 54 from moving a bundle carried by the pushing arms 40 to the tying position until the tying cycle for the bundle presently in the tying position is completed. Without this coaction between the valve 97 and the vane 101, another bundle could be moved into the tying position when the crank arm 27, the needle 29, and the arm 31 are at the bottom of their arcuate path. Serious damage to the bundle or the tying mechanism would thereby result.

The vane 101 opens a valve 124 just before the shaft 102 completes its rotation which is counter clockwise (Fig. 3). The opening of the valve 124 causes pilot air to flow through lines 125 and 126 from the line 113 to the other end of the packer control valve 120. This pilot air actuates the plunger in the valve 120 and causes air to flow from the line 121 through a line 127 to the blind end of the packer cylinder 75. The packer 73 then is moved to its upper position, ready for another bundle. During this upward movement, air from the rod end of the cylinder 75 exhausts through a vent 128 in the valve 120.

The three-way valve 83 of the unit 11 is also controlled by pilot air. Air is supplied to the blind end of the cylinder 65 through a line 129 when pilot air is supplied to an end of the valve 83 through lines 130, 131, and 132. A valve 133 is in series with the lines 130 and 131, and is opened by the feeding lever 53 when in its forward position. When the valve 133 is open, pilot air flows to an end of the valve 83 shifting its plunger so that air from the line 85 flows through the line 129 to the blind end of the cylinder 65. This causes the rod 63 to extend and the pushing arms 39 to return to their bundle receiving position. During this motion, air from the rod end of the cylinder 65 exhausts through a vent 134 in the valve 83.

Pilot air also flows from the line 131 through a line 135 to one end of a three-way valve 136 which controls air supplied from lines 137, 138, and 139 to the packer cylinder 74. The pilot air causes a plunger in the valve 136 to move so as to direct air from the line 139 through a line 140 to the rod end of the cylinder 74. This air retracts the piston rod 76 causing the presser foot 80 and the arm 78 to move to their lower position and press a bundle to be tied. During this movement, air from the blind end of the cylinder 74 exhausts through a vent 141 in the valve 136.

The pilot means for the opposite end of the valve 83 causes air to flow from the line 85 to the rod end of the cylinder 65 through a line 142. This differs from the corresponding pilot means for the valve 84. Air from the line 92 is supplied through lines 143, 144, 145, and 146 to the valve 83. A valve 147 having a plunger 148 and a valve 149 are (see Fig. 3 also) interposed in the lines 143, 146. The valve 147 is opened by the lever 54 striking its plunger 148 when the pushing arms 40 of the unit 12 are in their bundle receiving position. Unless the valve 147 is opened air cannot be transmitted to the appropriate end of the valve 83 to cause the pushing arms 39 of the unit 11 to move forward. Thus, it is impossible

for a bundle to be fed along the table 13 of the unit 11 unless the unit 12 is ready to receive a bundle. The possibility of damage to the bundles or either feeding mechanism is thereby eliminated.

The valve 149 is located in series with the lines 144 and 145 and operates similarly to the valve 97. Thus, the valve 149 is closed when contacted by a vane 150 attached to, and rotated by, a shaft 151. This shaft 151 makes one rotation during a tying cycle and is attached to a gear (not shown) within the housing 24 which is driven by a drive gear (not shown). The gears are meshed by inward movement of a lever 152 (see Fig. 1), similar to the lever 106, which is actuated by a roller 153 connected to an arm 154 of the packer 72. This mechanism is the same as that for unit 12 and will not be described in detail.

A valve 155 of the bundle actuated switch 22 is also interposed in this pilot means between lines 145 and 146. Operation of this valve is similar to that of valve 96, being opened when a plunger 156 and a trip lever 157 are depressed when a bundle is placed in the bundle receiving position.

When the three valves 147, 149, and 155 are open, pilot air flows to the appropriate end of the valve 83 which directs the air from the line 85 through the line 142 to the rod end of the cylinder 65 and causes the rod 63 to retract with air from the blind end of the cylinder 65 exhausting through a vent 157. For this movement, the pushing arms 40 of the unit 12 must be in bundle receiving position to open valve 147, the tying mechanism of the unit 11 must be at the top of its arcuate path with valve 149 open and a bundle must be placed in the bundle receiving position of the unit 11 with valve 155 open.

Lines 158 and 159 supply pilot air from the lines 138 and 137 to the other end of the valve 136. A valve 160 is interposed in these lines 158 and 159 and is similar to the valve 124 for the unit 12. When the shaft 151 has almost completed one rotation, and the tying cycle is almost complete, the vane 150 opens the valve 160 to supply pilot air to the valve 136. This air shifts the plunger in the valve 136 and causes air from the line 139 to be directed through a line 161 to the blind end of the packer cylinder 74. The rod 76 then moves to its upper position with air exhausting through a vent 162 during this movement.

It will be seen from the above discussion that the valve 155 functions as an actuating means for actuating the ram 61 of the unit 11 to move the pushing arms 39 forward whenever a bundle is placed in the bundle receiving position. In addition, the valve 147 operates as a disabling means, when closed, by preventing the flow of pilot air to the valve 155. The lever 54, by depressing the plunger 148 of the valve 147 to open it, thus operates as means actuated by the second feeder mechanism for overcoming the disabling means when the pushing arms 40 are in their bundle receiving position.

The valve 149 constitutes a second disabling means, when closed, for preventing forward movement of the pushing arms 39 of the unit 11 by preventing the flow of pilot air to the valve 83. Also, the valve 97 constitutes disabling means, when closed, for the pushing arms 40 of the second unit 12 by preventing the flow of pilot air to the valve 84.

The above description has been intended to serve in an illustrative and not a limiting sense, the scope of the invention being limited only by the depending claims.

What we claim is:

1. A machine for cross tying bundles comprising a first table, a feeder for moving bundles longitudinally along said table, a tying mechanism for tying a line around said bundle, a second table located at the end of said first table and extending perpendicularly relative thereto, a second feeder for moving said bundle along said second table, a second tying mechanism for tying a line around said bundle in a plane normal to the first tie, means actuated by emplacement of a bundle on the

front of the first table for actuating the first feeder, means actuated by movement of a bundle onto the front of the second table from the adjacent end of the first table for actuating the second feeder, disabling means normally preventing the actuation of the first feeder, and means actuated by the second feeder when the second feeder is in bundle receiving position for overcoming said disabling means.

2. A machine according to claim 1 and a second disabling means preventing operation of the first feeder when a bundle is being tied by the first tying mechanism.

3. A machine for cross tying bundles comprising a first table, a feeder for moving bundles longitudinally along said table, a tying mechanism for tying a line around said bundle in a plane parallel to the direction of movement of said bundle on said first table, a second table located at the end of said first table and extending perpendicularly relative thereto, a second tying mechanism for tying a line around said bundle in a plane normal to the first tie, a second feeder for moving said bundle along said second table, a normally open valve actuated by emplacement of a bundle on the front of the first table for actuating the first feeder when depressed, a second normally open valve which is closed by movement of a bundle onto the front of the second table from the adjacent end of the first table for actuating the second feeder, valve means normally closed to prevent the actuation of the first feeder, and a projection on the second feeder for opening said valve when the second feeder is in bundle receiving position.

4. A cross tying bundle machine comprising first and second tables each having a bundle receiving position, a bundle tying position, and a discharge end, said second table being placed generally perpendicularly to said first table with the bundle receiving position of said second table being adjacent the discharge end of said first table, tying mechanism for each table for tying string around a bundle when in the bundle tying position, a feeder for each table for transferring a bundle from the bundle receiving position to the bundle tying position, each of the transferred bundles moving a tied bundle occupying the respective bundle tying position one bundle length toward the discharge end of the respective one of said tables, the tied bundle on said first table serially moving other aligned bundles one bundle length toward the bundle receiving position of said second table with the last bundle in the line being moved into the bundle receiving position of said second table, the bundle tying position of said first table being spaced an integral number of bundle lengths from the bundle receiving position of said second table, means actuated by the movement of a bundle into the bundle receiving position of said first table for actuating said first feeder, means actuated by movement of a bundle into the bundle receiving position of said second table for actuating said second feeder, disabling means normally preventing the actuation of said first feeder, and means actuated by said second feeder when said second feeder is in bundle receiving position for overcoming said disabling means.

5. A cross tying bundle machine comprising first and second tables each having a bundle receiving position, a bundle tying position, and a discharge end, said second table being placed generally perpendicularly to said first table with said bundle receiving position of said second table being adjacent the discharge end of said first table, tying mechanism for each table for tying string around a bundle when in the bundle tying position, a feeder for each table for transferring a bundle from the bundle receiving position to the bundle tying position, each of the transferred bundles moving a tied bundle occupying the respective bundle tying position one bundle length toward the discharge end of the respective one of said tables, the tied bundle on said first table serially moving other aligned bundles one bundle length toward the bundle receiving position of said second table with the

last bundle in the line being moved into the bundle receiving position of said second table, the bundle tying position of said first table being spaced an integral number of bundle lengths from the bundle receiving position of said second table, means actuated by the movement of a bundle into the bundle receiving position of said first table for actuating said first feeder, means actuated by movement of a bundle into the bundle receiving position of said second table for actuating said second feeder, disabling means normally preventing the actuation of said first feeder, means actuated by said second feeder when said second feeder is in bundle receiving position for overcoming said disabling means, and second disabling means preventing the actuation of said first feeder when

a bundle is being tied by said first tying mechanism, whereby said first feeder may be actuated only when said first tying mechanism is ready to tie another bundle and said second feeder is in the bundle receiving position of said second table.

## References Cited in the file of this patent

## UNITED STATES PATENTS

|           |          |               |
|-----------|----------|---------------|
| 1,571,573 | Cranston | Feb. 2, 1926  |
| 1,629,841 | Saxton   | May 24, 1927  |
| 1,983,473 | Leaver   | Dec. 4, 1934  |
| 2,374,900 | Saxton   | May 1, 1945   |
| 2,630,750 | Eberle   | Mar. 10, 1953 |