Jan. 3, 1928. 1,655,381

H. PARKER

APPARATUS FOR HANDLING TUBES AND THE LIKE

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Fig. 1.

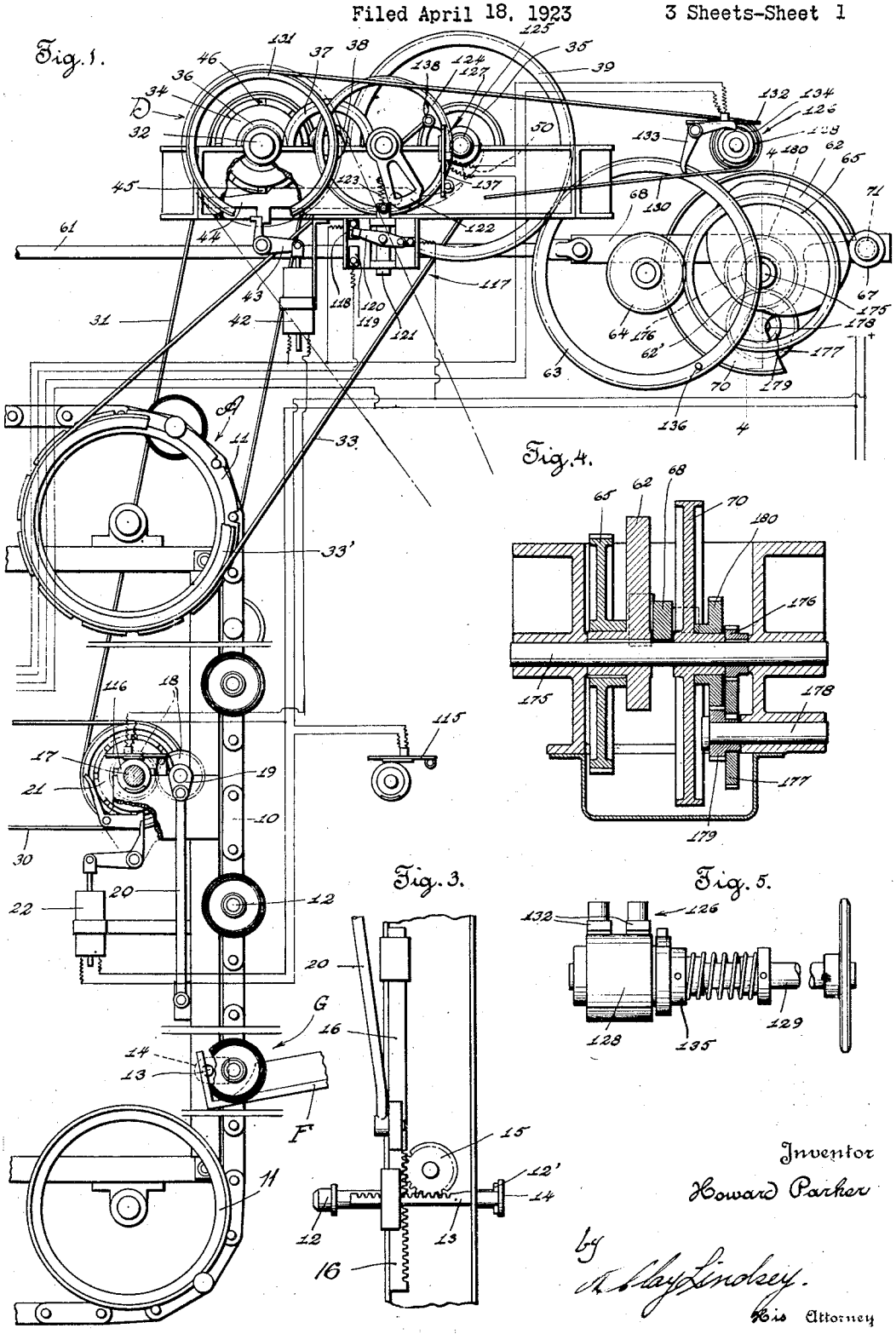


Fig. 4.

Fig. 3.

Fig. 5.

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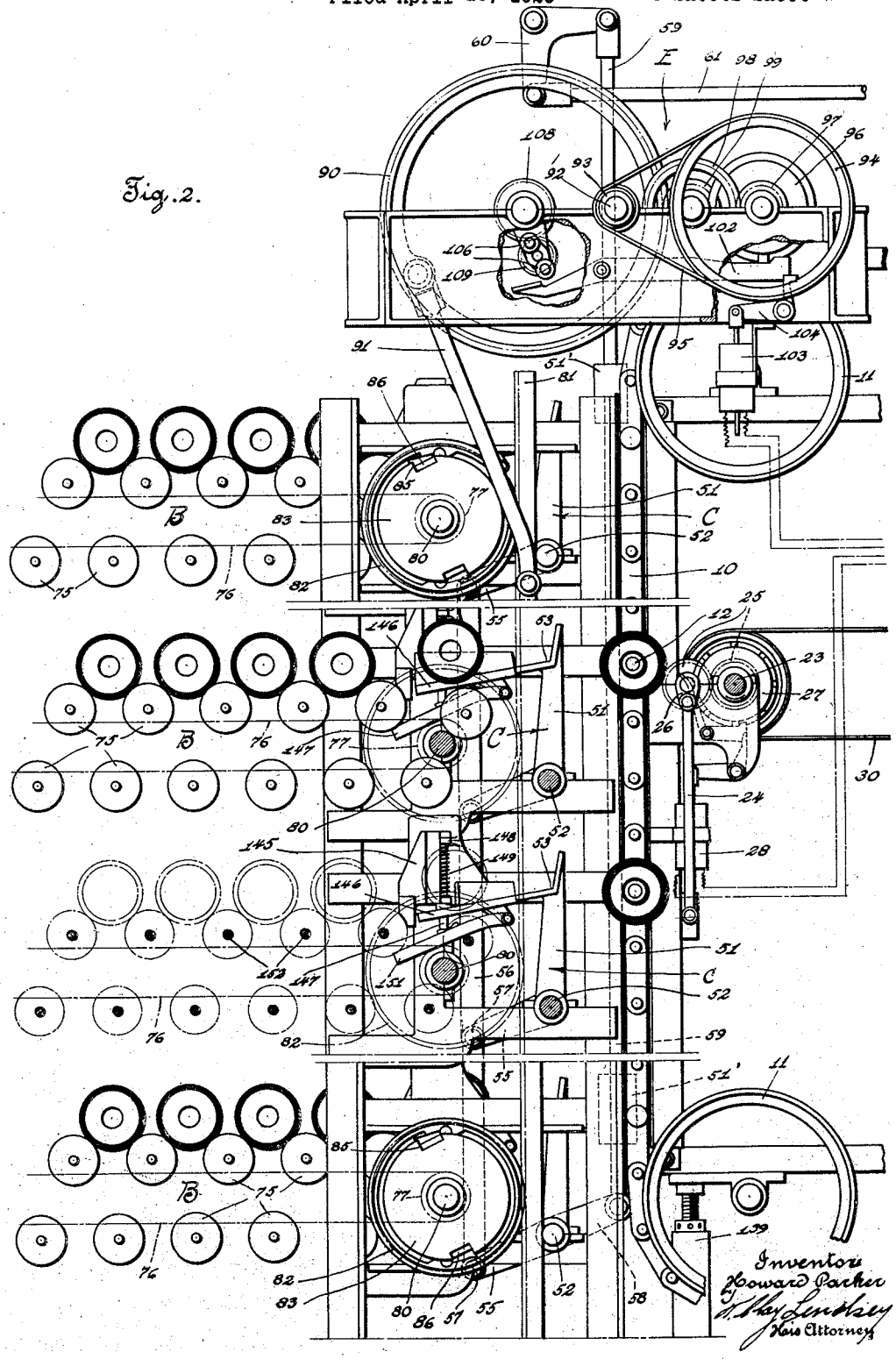
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Fig. 2.



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Fig. 6.

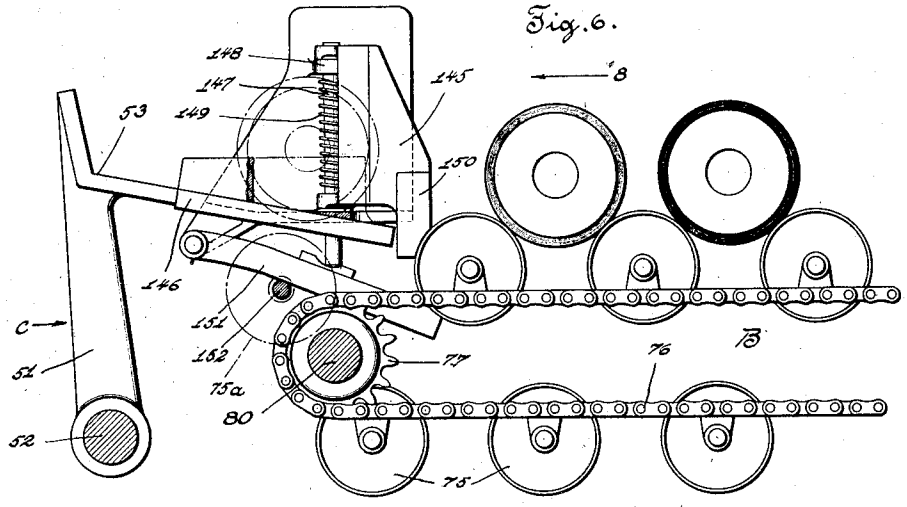


Fig. 7.

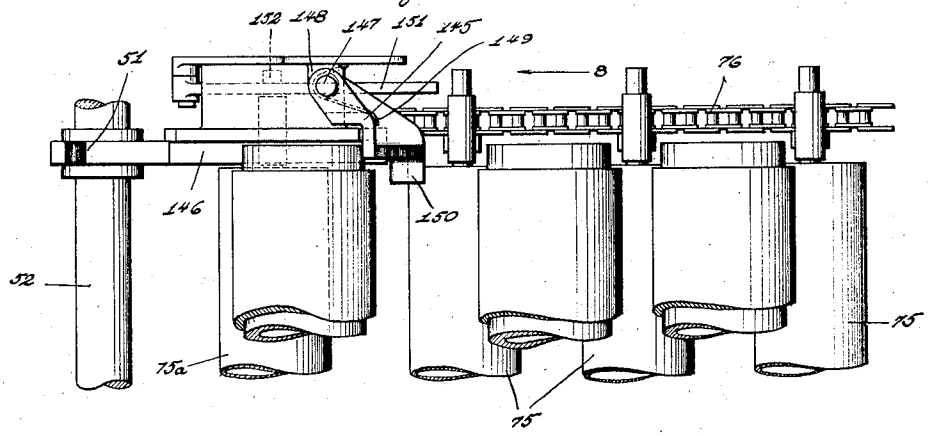
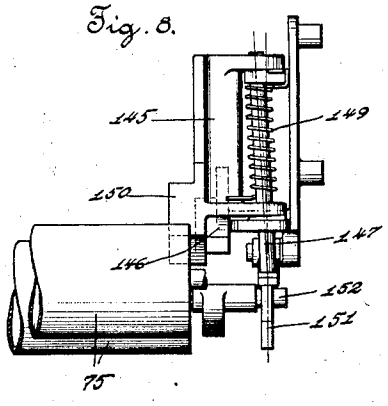


Fig. 8.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR HANDLING TUBES AND THE LIKE.

Application filed April 18, 1923. Serial No. 632,933.

This invention relates to apparatus for handling paper or pulp tubes or similar articles.

One object of the invention is to provide an improved construction and arrangement of parts for an apparatus of this character.

Another object of the invention is to provide an improved and efficient system of control by which the various parts of the apparatus are positively and accurately timed in their operation relative to each other.

Another object of the invention is to provide improved driving mechanism for the various parts of the apparatus whereby the load thereon is more conveniently applied.

Another object of the invention is to provide an improved form of apparatus of the character described by which deformation or injury of the articles handled thereby is prevented during the shifting from one portion of the apparatus to another.

As an instance of a use to which the features of the present invention may be applied, reference may be had to my co-pending application Serial No. 450,370, filed March 7, 1921, which discloses a pulp tube making machine and a drier for the pulp tubes made thereby in combination with which the handling apparatus herein described may be used.

The invention accordingly consists in the features of construction, combinations of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the application of which will be indicated in the appended claims.

In the drawings forming a part of this specification and in which similar reference characters refer to similar parts:

Fig. 1 is a diagrammatic view of the transfer conveyor at the supply end, and includes the driving and control apparatus for engaging the tubes at the supply point and disengaging them at the discharge point;

Fig. 2 is a diagrammatic view in elevation of the discharge end of the conveyor, the carriers to which the tubes are to be discharged, and shifting mechanism for transferring the tubes from the conveyor to the carriers;

Fig. 3 is a detail of the article holding devices provided on the conveyor and the means by which these devices are operated to engage and disengage the tubes;

Fig. 4 is a cross section of the driving mechanism for the shifting mechanism, being taken along the line 4—4 of Fig. 1;

Fig. 5 is a detail of a switch for controlling the disengaging means for the article holding devices at the discharge end of the conveyor;

Fig. 6 is a view of a shock absorbing gate interposed between the shifting mechanism and the carrier to prevent sudden dropping of the tubes onto the supporting members of the carrier;

Fig. 7 is a plan view of the gate, carrier and shifting mechanism shown in Fig. 6; and

Fig. 8 is an end view of the gate shown in Figs. 6 and 7, and looking in the direction of the arrows 8 of said figures.

Referring to the drawings, and more particularly to Figs. 1 and 2, the apparatus comprises a conveyor A having a vertical run passing a supply point G, a horizontal run extending from the supply end to the discharge end, a vertical run at the discharge end along which there are a plurality of discharge points, and a horizontal return run leading back to the supply point; a plurality of carriers B which may lead into and through a suitable drier or other treating chamber and which are provided with upper and lower runs, the articles being adapted to lie on the upper run; and shifting mechanisms C provided between the vertical run at the discharge end of the transfer conveyor A and each of the carriers B for the purpose of transferring or shifting the tubes from the conveyor A simultaneously one to each of the carriers B. There is also provided a driving mechanism D by means of which the transfer conveyor A is stepped forward intermittently upon each delivery of a tube thereto, and by means of which the shifting mechanisms C are actuated to shift the tubes from

the transfer conveyor A to the carriers B. This driving means D also controls a driving mechanism E for stepping forward the carriers each time there is a delivery of tubes thereto.

As described in the co-pending application above referred to, pulp tubes are formed by depositing pulp upon a cylindrical mandrel by a machine which automatically discharges the tube and mandrel when the walls of the tube become of proper thickness. Upon such discharge, the tubes are guided to the transfer conveyor A down an inclined guide or chute F leading to the supply point G.

The transfer conveyor A comprises a pair of chains 10 parallel to each other throughout their length and provided with pairs of alined mandrel engaging devices between which the mandrels are supported. These chains are guided throughout the runs of the conveyor by suitable pulleys 11 disposed at the points where the direction of the runs change.

Supported on the chains 10 there are provided suitable alined mandrel holding devices such as chucks 12 which are slidable transversely of the chains 10 for the purpose of withdrawal from the mandrels when it is desired to release them. At the supply point G, these chucks 12 are engaged with the ends of the mandrel supplied thereto from the tube forming machine or other source of supply by an apparatus shown in detail in Fig. 3 which comprises a rack 13 carrying at one end a flange 14 adapted to fit over the head 12′ of the chuck 12. This rack moves longitudinally of the chuck 12 forcing the chuck inwardly so that the mandrel is engaged. The rack 13 is operated by a pinion 15 which is, in turn, actuated by a rack 16. The power to actuate the rack 16 is supplied from a shaft 17 through a pair of gears 18 which operate a crank 19 connected with the rack 16 by a pitman 20. The shaft 17 is associated with the driving mechanism D by means of a clutch 21 which is controlled by a solenoid 22.

At each discharge point on the discharge run of the conveyor A, the chucks 12 are released in a similar manner by similar apparatus driven by shaft 23 operating the pitman 24 through suitable gears 25 and a crank 26, except that the flanges of the racks at the discharge points are under the heads of the chucks so that upon actuation of the racks the chucks are withdrawn and the mandrels released. However, at the discharge end, there is a chuck operating mechanism, such as that shown in Fig. 3, for each stage or discharge point of the conveyor. All of these chuck operating devices are actuated simultaneously by a single rack operated by the pitman 24 so that at the same time at each discharge point in front of each shifting mechanism C there is discharged a mandrel with the tube thereon. The shaft 23 is associated with the driving mechanism D by means of a clutch 27 which is controlled by the solenoid 28. The clutch 27 is entirely similar to the clutch 21 and in each case, upon being operated by the solenoids 28 and 22, respectively, the shafts 23 and 17 make one complete revolution, whereupon they are disconnected from the source of power by automatic disengagement of the clutch. During this revolution of the shaft 17, the racks at the supply point are first moved inwardly to engage the chucks 12 with the mandrels and are then withdrawn to their normal position. During one complete rotation of the shaft 23, the racks at the discharge points are moved outwardly to disengage the chucks and then moved inwardly to normal position. For purposes of convenience, the continuously rotating portions of the clutches 21 and 27 are connected together by the chain 30 so as to drive them from a single power source. They are thus both driven from the driving mechanism D by a chain 31 associated with the main drive shaft 32.

As has been before stated, the conveyor A is stepped forward upon each delivery of a tube at the supply point G and after that tube has been engaged with the chuck. This motion is imparted to the conveyor by the driving mechanism D through a chain 33 and sprocket 33′. That portion of the driving mechanism D which imparts motion to the conveyor A comprises a clutch 34 associated with the main driving shaft 32 by means of which a sprocket 35 is driven through suitable reduction gears 36, 37, 38 and 39. These latter reduction gears are so proportioned that one revolution of the gear 39 advances the conveyor A a distance equal to the distance between two successive pairs of chucks 12. Thus, the motion begins with a pair of chucks 12 at the supply point G and stops with the next succeeding pair of such chucks in indentical position. The clutch 34 is controlled by a solenoid 42 which operates the bell crank 43 permitting a lever 44 to drop, whereupon a pawl, such as 45, drops into engagement with a corresponding slot 46 in the rotating part of the clutch to key the two parts together, as it were. The cessation of motion is brought about through the release of the clutch effected by raising the lever 44 to push the pawl 45 into its non-engaging position shown in Fig. 1. The lever 44 is raised by means of a cam 50 which rotates on the shaft of the gear 39 and is so disposed thereon that it contacts with the end of the lever 44 somewhat before the time at which the pawl 45 reaches its normal position. When the lever 44 is raised in this manner, the bell crank 43 latches it in this position, after which the cam 50 continues to rotate until out of engagement with the

end of the lever at which time the pawl 45 is pushed back into non-operative position by the other end of the lever 44.

As above mentioned, there is provided at each discharge point on the discharge run of the conveyor A a shifting mechanism C for transferring the tubes from the conveyor to the carriers B. In this embodiment, there are preferably ten carriers superposed one above the other, each carrier being constructed identical with every other. There are, therefore, ten shifting mechanisms C and ten corresponding discharge points for the conveyor A. Each shifting mechanism C comprises a pair of rocker arms 51 which oscillate to and fro between the carriers B at the drier portal and the conveyor A. These rocker arms are fastened at their bases to rocking shafts 52 from which they receive their motion, and terminate at the top or free ends in forks 53 which are shaped to support the ends of the mandrels during the process of shifting or transfer of the tubes. There are two such rocker arms to each shifting mechanism, and they are attached to the rocker shafts 52 and spaced apart thereon at the proper distance to support the opposite ends of a tube mandrel. The shifting mechanisms C work in unison and to accomplish this there is provided on each rocker shaft 52 an arm 55, all of which are attached at their swinging ends by means of pivots 57 to a connecting link member 56. By means of this link 56, any vertical movement transmitted thereto moves all of the rocker arms 51 simultaneously. The lowermost rocker shaft 52 is also provided with an arm 58 which is attached at its swinging end to a vertical connecting rod 59 which extends above the transfer conveyor to a bell crank 60. From this bell crank another link or connecting rod 61 extends horizontally to the driving mechanism D to be actuated thereby.

That portion of the driving mechanism D, which is adapted to actuate the connecting rod 61 and thereby the shifting mechanisms C, comprises a cam 62 which is driven by the gear 39 through the medium of reduction gears 63, 64 and 65 at such a speed that for every two steps forward of the conveyor A there is one rotation of the cam 62. The gears 39 and 63 are equal in size and therefore one revolution of the latter is completed at each step forward of the conveyor A. The end of the connecting rod 61 is attached to a slide 68 upon which is mounted a cam following roller 67 against which the cam 62 acts to rock the rocker arms 51 backward into position in the path of the conveyor A. The arm 58 or other suitable member is weighted as at 51′ so as to move the arms rearwardly into tube receiving position. It will be seen that by virtue of this mechanical connection between the conveyor drive and the shifting mechanism drive a carefully timed action, which is very desirable, may be had between the operation of the conveyor and that of the rocker arms.

As has been above described, it is desired that there be ten tubes before the carriers B before any shifting of the tubes to the carriers is made; that is to say, one tube before each carrier, and, consequently, under these circumstances, it is not desired that the shifting mechanisms C operate for each two steps formed of the conveyor A. Therefore, there is provided means for nullifying the operation of the cam 62 against the cam following roller 67 for four out of five revolutions of the cam. This means comprises a generally circular disc 70 concentric with the cam 62 with portions of its edge cut away almost to the center for a distance somewhat less than one-quarter of its periphery, and a roller 71 carried by the end of the slide 68 and adapted to bear against the circular part of the periphery of the disk 70. The disk 70 is rotated once to every five revolutions of the cam 62, or once to every ten shifts of the conveyor. The shaft 175 upon which the cam 62 is keyed, as well as the gear 65, is also provided with a small gear 176 driving a gear 177 on a countershaft 178. The countershaft 178 is also provided with a gear 179 meshing with a gear 180 rotatable on the shaft 175 and keyed to the disk 70. The gear ratios of the gears 176, 177, 179 and 180 are such that one revolution of the disk 70 is completed for every five revolutions of the cam 62.

The adjustment of the various drives, that is for the conveyor and the shifting mechanism, is such that, whenever ten tubes have collected in front of the drier and are starting on their last shift into position to be released by the chuck disengaging mechanism above described, the disk 70 is in such a position before the roller 71 that that section cut away from the disk and which amounts to approximately one-fourth of the periphery, is opposite the roller 71. At this time, also, the cam 62 is in such position that in moving it presents a receding periphery to the roller 67. Acting under these circumstances, the weighted rod 59 causes the roller 67 to follow the receding contour of the cam 62, and the rocker arms 51 are caused to move out from their position adjacent the carriers B and toward the discharge side of the conveyor A. When roller 67 has arrived at the point of least radius on the cam 62, the rocker arms 51 will have reached their destination and come to rest in proper position to receive the tube mandrels which are descending to meet them with the conveyor A.

When the conveyor with its load completes its tenth step forward, the ten tubes lie at rest in the forks 53 of the rocker arms 51 and, thereupon, the entire ten sets of chucks are withdrawn simultaneously upon

energization of the solenoid 28 and the apparatus is ready for shifting the tubes onto the carriers B. Because of the physical connection between the drives of the shifting mechanisms and the conveyor, the entire system remains at rest until another tube is delivered at the supply point G whereupon another shift of the conveyor is begun. During the advance of the conveyor A, the cam 62 is again set in motion and completes the second half of its revolution. In so doing, it presents a periphery of increasing radius to the roller 67 and forces it back, reversing its former movement, and thus, in turn, through the connecting rod 61, bell crank 60 and the vertical connecting rod 59, the rocker arms 51 are moved forwardly to their original position, shifting with them all ten tubes to deliver them onto the carriers B.

Somewhat prior to the completion of the revolution of the cam 62, the point of its greatest radius is brought before the roller 67, and the cam periphery, which for a distance thereafter is concentric with the axis, continues to maintain the roller at its extreme position. While the roller is thus held, the disk 70 is rotated to such an extent that it presents its circular periphery to the roller 71, and the relative positions are such that for the next four revolutions of the cam 62, the roller 67 and the mechanism connected thereto remains stationary because the disk prevents the cam following roller 67 from following the contour of the cam 62. This operation is repeated for every ten steps forward of the conveyor A.

The carriers B onto which the shifting mechanisms C deposit the tubes are preferably of the type described in the above mentioned application and comprise a plurality of supporting rollers 75 carried on endless chains 76. The tubes, with the mandrels thereon, lie supported between these rollers and are rotated so as to present their surfaces evenly to the action of a drying medium, such as, for instance, a current of air passed thereover. Each carrier has an upper and lower run, and it is upon the upper run that the tubes are carried, the lower being the return run. At the portal end of the drier, the carrier chains are guided about suitable sprockets 77 on the shaft 80 so that at each step of the carrier forward, there is presented another roller 75 to support the tube which is to be placed thereon by the shifting mechanism C.

The stepping forward of the carriers is accomplished by the carrier driving mechanism E which drives a rack 81 which, on its upward stroke, rotates the shaft 80 through the medium of a pinion mounted on the shaft 80. There are two parts provided in the pinion, one indicated at 83 being an inner drum rigidly mounted on the shaft 80, and an externally gear toothed member 82 rotatable in one direction on the inner member 83. A ratchet tooth 85 is provided on the inner member 83 which cooperates with a pawl 86 on the outer member so that upon the up stroke of the rack 81 the rotation of the gear toothed member 82 rotates the inner member 83 and, consequently, moves the carrier B forward. Upon the down stroke of the rack 81, however, the pawl 86 disengages with the ratchet tooth 85 and no motion of the carrier is effected.

The reciprocation of the rack 81 upward and downward is brought about by the driving mechanism E which includes a crank wheel 90 connected with the rack 81 by means of a pitman 91. The crank wheel 90 is rotated and driven by a power driven shaft 92 on which is mounted a sprocket 93, which is associated with a larger sprocket 94 by a chain 95, and the power therefrom is intermittently transmitted by a clutch 96 through suitable reduction gears 97, 98 and 99 to the crank wheel 90. The clutch 96 is similar in construction to the clutch 34 and is controlled by a lever 102 which, in turn, is controlled by a solenoid 103 operating a bell crank 104 which latches and unlatches the lever 102. The other end of the lever 102 is depressed to accomplish the automatic disengagement of the clutch, through the medium of a pair of rollers 106 which are rotated by the crank wheel 90 and which are alternately brought into contact upon such rotation by means of a stationary gear 108 and a planetary gear 109 upon which the rollers 106 are mounted. The ratio of the gears 108 and 109 is such that on succeeding revolutions of the crank wheel 90, the rollers 106 will alternately strike against the end of the lever 102 to disengage the clutch 96. Thus, if one of the rollers be removed, such release will not take place for every revolution, but only upon alternate revolutions of the crank wheel. Such an operation is desirable when the tubes on the mandrels are of such diameter that they would rub against each other or otherwise interfere when positioned between the supporting rollers 75 of the carriers. By making two forward steps of the carriers B for one delivery of tubes thereof, the center to center distance of the mandrels lying on the carriers will be doubled, thus providing greater space for them.

The motion of the crank wheel 90 is started from such a position that there is a slight down stroke of the rack 81 at the beginning of the motion. In this way, the clutch is fully engaged before any great amount of power is required to be transmitted to the carriers B. There is no cessation of motion in the crank wheel 90 until a revolution has been completed and, therefore, during the power stroke of the rack 81, the motion is

started gradually and stopped gradually, the clutch 96 being released during an interval of substantially no work. This minimizes the wrenching of the clutch and relieves the parts of excessive strains and wear.

The complete chain of operations of the apparatus so far explained will be briefly described in connection with an explanation of the control through which actuation of the parts is effected, and the advantages resulting from certain features or arrangements of the control will be pointed out. In the tube machine described in the aforementioned application, the pulp is delivered to a mandrel in the form of a web and is wound thereon in a series of convolutions until a tube wall of predetermined thickness has been built up, and then the tube machine is automatically tripped so that the formed tube, together with the mandrel on which it is wrapped, will be delivered from the tube machine onto the run-way or chute F located at the supply point of the conveyor. After a tube is so delivered, certain mechanism associated with the timing devices of the tube machine are actuated, and this mechanism includes a switch diagrammatically shown at 115. It is, of course, to be understood that the tube machine is here referred to merely for the purpose of explaining one combination. This tube machine forms no part of the present invention. The method and apparatus herein claimed have, evidently, numerous applications; the tubes or other articles handled may be supplied to the conveyor in any suitable or desired manner; and the initiation of the control may be affected by the tubes themselves or otherwise, instead of by the switch 115. Upon closing of this switch, the solenoid 22 is energized, whereupon the chuck engaging mechanism, shown in Fig. 3, and disposed at the supply point G of the transfer conveyor, is actuated to move the chucks inwardly and thereby engage the same with the mandrel delivered to that point. Upon actuation of the chuck engaging means, the switch 116, associated with the shaft 17 thereof, is closed causing energization of the solenoid 42. Upon energization of this solenoid, the clutch 34 is engaged so that the transfer conveyor is driven forwardly one step by the drive mechanism D and then the clutch is disengaged by the cam 50 as heretofore described. Nine tubes are successively delivered to the supply point and engaged with the transfer conveyor, and the transfer conveyor is stepped forwardly each time a tube is delivered thereto without resulting in any actuation of the chuck disengaging means. When the tenth tube is delivered to the supply point, it is engaged with the transfer chains, and the conveyor then starts to move forwardly one step. At this time, the cam 62 comes into play (being uncovered by the cut-way portion of the disk 70) and engages the cam follower 67 so as to move the rod 61 and thereby throw the shifting arms 51 rearwardly beneath the now descending tubes on the discharge run of the conveyor, it being understood that there are now ten tubes on this run of the conveyor being brought to the respective ten discharge points at which the shifting arms are located. The shifting arms come to rest in their retracted position, being held in this state by the dwell or low concentric portion 62′ of the cam 62. The conveyor continues to move on its tenth step until the ends of the mandrels are substantially resting on or in close proximity to the retracted shifting arms.

Associated with the driving mechanism D is the switch 117 which includes a normal contact 118 and the alternate contact 119 and switch blade 120, the latter being pivoted between its ends to a reciprocating plunger 121 which is moved downwardly by the segment 122 in order to bring the contact blade into engagement with the alternate terminal 119. The contact blade 120 is returned to its normal position by a spring 123. The segment 122 is carried by a gear 124 which is driven by a gear 125 fixed to the shaft which carries the gear 39. The gears 125 and 124 are in the ratio of ten to one, so that the gear 124 is driven one complete revolution for every ten actuations of the driving mechanism D, that is to say, the segment 122 is effective to close the switch 117 upon intervals of ten shifts of the transfer conveyor. The switches 116 and 117 are so connected in series that upon closing of the switch 116 when the tenth tube, for instance, is engaged with the mandrel, the solenoid 42, as stated, is energized, whereupon the driving mechanism D comes into play, and at the same time the switch blade 120 of the switch 117, having been thrown onto alternate contact 119, the solenoid 103 is energized with the result that the driving mechanism E is effective to rotate the crank wheel 90 one revolution during which time the carriers are driven forward one step, and during this movement of the carriers, tubes which have previously been delivered to the portal end of the drier are brought to rest upon the supporting rollers and move forwardly one step as will hereinafter be described more in detail. The switch 117, it will be seen, selects the time of energization of the solenoid 103, while the switch 116 insures that the energization of the solenoid will be merely momentary. At this time, it will be understood that step movement of the drier carriers has already been initiated and the transfer conveyor has just about completed its tenth step, and then, through the closing of the switches 126 and 127 (the switch blade 120 having been thrown

back by the spring 123 into the normal position shown in Fig. 1) are closed to energize the solenoid 28 whereupon the clutch 27 is engaged, and the chuck disengaging means actuated to withdraw the chucks from the mandrels at the discharge points so that the mandrels will now rest free on the retracted shifting arms. The arms remain in this retracted position until the next step of the conveyor. The switch 126 includes a commutator 128 loose on the shaft 129 continuously driven by a chain 130 from a sprocket 131 fixed to the shaft 32. The shaft 129 can, of course, be driven in any suitable manner, preferably at a relatively fast rate of speed, and for this purpose gears or other arrangements may be employed. Cooperating with the commutator, which includes a cylinder of insulating material having a contact strip on its face, is a pair of brushes 132. The commutator is normally held against rotation by a pawl lever 133 one end of which engages in the notch 134 in the commutator. When the pawl lever 133 is free of the commutator, the latter is driven with the shaft 129 through the friction disk 135. On the gear 63, which rotates one complete revolution upon each actuation of the transfer conveyor, is a pin 136 which engages and trips the pawl lever 133 just before the transfer conveyor comes to a stop. The switch 127 includes a pair of spring brushes or contact fingers 137 suitably carried by the frame work and a contact member 138 carried by the gear 124 which, as stated, rotates once during a period of ten actuations of the driving mechanism for the transfer conveyor. The contact brushes 132 of the switch 126 and the contact fingers 137 of the switch 127 are connected in series with the solenoid 28 and also in series with the normal contact 118 and the switch blade 120 of the switch 117. It will now be seen that the switch 127 is closed only upon every tenth actuation of the driving mechanism for the conveyor, so that the solenoid 28 will be energized to disengage the chucks only when there is a tube in front of each of the drier carriers. In other words, this switch 127 selects the period of energization of the solenoid 28 and, since this switch is a relatively slow acting one, the switch 126 is interposed so as to very closely and nicely determine the momentary energization of the solenoid 28 at a precise predetermined time, and at such time, the tubes are substantially at rest on the retracted shifting arms. It will be understood that, after the tubes are thus disengaged, the clutch 34 is disengaged, whereupon the parts come to rest in the positions described. After the eleventh tube, which would be the first tube of the next series of ten, is delivered to the supply point G, it is engaged with the transfer conveyor, and the driving mechanism D is again operated, whereupon the cam 62 will throw the shifting arms forwardly to deliver the tubes to the drier, as hereinafter described more in detail in connection with explanation of certain mechanism for easing the tubes onto the supporting rollers of the carriers. During the next eight steps of the transfer conveyor, the disk 70 prevents actuation of the arms by the cam 62.

It will be noted from the foregoing description that the control for the disengagement of the chucks, the actuation of the shifting arms, and the driving of the drier carriers is effected by means intimately associated with the driving mechanism for the transfer conveyor, thus obtaining a unity of control by means of which a proper adjustment and inter-action of the parts may be effectively maintained to insure that the various mechanisms operate with the greatest nicety and precision as to time and sequency. The various parts are thus so synchronized as to effect the handling of the tubes or other articles throughout the entire system of transfer with that desired precision which is most effective. It will further be noted that with the present arrangement, actuation of the shifting arms is effected by mechanism associated with the driving mechanism of the transfer conveyor, permitting the driving mechanism for the drier carriers to effect its function in an easy and efficient manner while, at the same time, the parts are so co-related and controlled as to operate in proper sequence.

It is sometimes found desirable to make the tubes of different sizes, or the walls of different thickness. When the size of the tube is changed, the delivery run of the transfer conveyor is vertically adjusted through a suitable device such as that indicated at 139 so that, when the conveyor is brought to rest, the tubes will be in the proper position relative to the retracted shifting arms. It will be noted that with the control herein described, since the switches for energizing the solenoid 28 of the chuck retracting devices are directly operated by the driving mechanism D for the transfer conveyor, it is possible to adjust the height of the vertical run of the transfer conveyor without adjusting the switches 126 and 127 which is a feature of advantage.

Certain mechanisms for easing the tubes onto the supporting rollers of the drier carriers, for the purpose of preventing injury to the tubes, have been previously mentioned and will now be described in detail. These mechanisms include gates 145, one being positioned at each side of the forward end of each drier carrier. One of these gates is shown in detail in Figs. 6, 7 and 8.

Referring to these figures, there is shown at the forward end of each carrier and at

either side thereof an inclined run-way 146 which forms a continuation of the fork 53 of the shifting mechanism C when the latter is in its delivering position, and these run-ways extend forwardly beyond the ends of the carriers B. Each run-way consists of a member of L-shape in cross section, the lower leg of which acts as a track which supports the end of the mandrel, it being understood that the tubes are not quite as long as the mandrels. The track is of such height that a soft tube rolling theredown will not come into contact with the roller 75ª therebeneath. The vertical leg of the run-way acts as a guide for the end of the mandrel. The run-ways are relatively steep in order that the tubes passing theredown will clear the top of the endmost roller 75ª and, if the tubes were permitted to drop against the carrier rollers, the impact of the tubes, by reason of their momentum, would injure the tube wall. In order to avoid this, the gates 145 are interposed between each carrier and its associated shifting mechanism so as to intercept and obstruct the movement of the tube and to retard its movement as it is brought to final position between the rollers. Each of these gates is fixed to a vertical pin 147 journalled for sliding movement in fixed bearings 148. Each gate is so shaped that its lower forward corner 150 engages against the surface of the roller 75 immediately in advance thereof, whereby the gate is normally held against swinging open. While in this position, the gates form a positive bar to the progress of the tube mandrels as they roll down the inclined run-ways from the shifting arms.

Whenever a tube mandrel is delivered by the shifting arms, it rolls down the run-way until it encounters the stop gates and as long as the drier carrier remains stationary, the mandrel will be blocked in this position against the stop gates. When the drier carrier is set in motion for a shift ahead, the end of the gate bearing against the roller immediately in advance thereof will, under the weight of the tube mandrel bearing thereagainst, swing slowly open, it being understood that the end of the gate will engage the forwardly moving roller until the latter has moved out of the arc of movement of the gate. After this the gates are free to swing beyond the ends of the mandrel which has been engaging thereagainst, permitting the mandrel to sink with an easy movement down between the roller against which the gate has previously been in engagement and the next succeeding roller.

After the mandrel has been discharged onto the rollers, the gates are returned to perform their function upon the next succeeding tube. The normal tendency of each gate is to swing back into its stopping position. As shown in Fig. 8 the pin 147 is canted inwardly, thereby permitting the gate 145, which is pivoted thereon, to swing back into stopping position by means of its own weight. This return movement is further effected by raising the gate above the next succeeding roller which would obstruct its return. The gate is, therefore, raised by lever member 151 which is pivoted at one end and is adapted to ride on the gudgeons 152 at the end of the rollers. The lever 151, upon being raised by the gudgeon 152, in turn raises the pin 147 on which the gate 145 is mounted and also compresses the spring 149. This action lifts the gate free of the rollers and permits it to swing back to its normal obstructing position, whereupon the roller 75, which up to this point has kept the lever 151 raised, passes beyond the end of the lever and permits the spring 149 to return the gate 145 and pin 147 to stopping position.

Thus, by the above construction, are accomplished, among others, the objects hereinbefore referred to.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim as my invention:—

1. A supply point, a discharge point, a transfer conveyor including article holding devices traversing said points, means for disengaging said holding devices from the articles at the discharge point, means for driving said conveyor, and means directly controlled by said conveyor driving means independently of said conveyor to actuate said disengaging means.

2. A supply point, a plurality of discharge points, a conveyor provided with article holding devices traversing said points, said conveyor being adapted to receive articles one by one and to deliver a plurality of articles simultaneously one at each discharge point, means for engaging said devices with articles supplied thereto, means for moving said conveyor ahead one step each time an article is delivered thereto, means for disengaging said holding devices from the articles at said discharge points and directly controlled by said conveyor moving means

independently of said conveyor and in timed relation thereto, and an electrical system of control including a switch for initiating actuation of said engaging means.

3. A discharge point, a conveyor provided with article holding devices traversing said point, means for driving said conveyor, means for disengaging said devices from the articles at the discharge point, and controlling means for said disengaging means directly and periodically actuated by said driving means, said controlling means being independent of said conveyor but actuated in timed relation thereto.

4. A discharge point, a conveyor provided with article holding devices traversing said point, a receiving mechanism adjacent said discharge point, means for relatively adjusting said conveyor and receiving mechanism, means for driving said conveyor, means for disengaging said devices from the articles at the discharge point, and controlling means for said disengaging means periodically actuated by said driving means said controlling means being independent of said conveyor and receiving mechanism.

5. A supply point, a plurality of discharge points, a conveyor traversing said points and provided with article holding devices, said conveyor being adapted to receive articles one by one from said supply point and deliver a plurality of articles simultaneously one at each discharge point, receiving mechanism at each discharge point, means for adjusting said conveyor relative to said receiving mechanisms in accordance with variations in the diameters of the articles handled, means for driving said conveyor forward one step each time an article is engaged therewith, means for disengaging said devices from the articles at the discharge points, and controlling means for said disengaging means periodically actuated by said driving means independently of said conveyor and receiving mechanisms.

6. A supply point, a plurality of discharge points, a conveyor provided with article holding devices traversing said points, said conveyor being adapted to receive articles one by one from said supply point and deliver a plurality of articles simultaneously one at each discharge point, means for driving said conveyor, means for engaging said devices with articles at the supply point, means for disengaging said devices from the articles at the discharge points, and controlling means for said disengaging means including a pair of switches mechanically connected with said driving means, one of said switches being actuated upon a predetermined number of actuations of the other switch.

7. A supply point, a discharge point, a conveyor provided with article holding devices traversing said points, means for engaging said devices with the articles at the supply point, means for driving said conveyor ahead one step each time an article is engaged therewith, means for disengaging said devices from the articles at the discharge point, and mechanism for receiving the articles from said conveyor at the discharge point mechanically actuated by said driving means.

8. A supply point, a discharge point, a conveyor traversing said points and provided with article engaging devices, mechanism for receiving articles from the discharge point, means for driving said conveyor, and means mechanically associated with and actuated by said driving means to move said mechanism into position to receive an article and then to advance the same after the article is delivered thereto.

9. A supply point, a discharge point, a conveyor traversing said points and provided with article engaging devices, a pivoted receiving arm at the discharge point, and means associated with and actuated by said driving means for moving said arm rearwardly into position to receive an article from the conveyor and then to move it forwardly after the article is received thereby.

10. A supply point, a discharge point, a conveyor traversing said points and having article engaging devices, driving means to move said conveyor one step forward each time an article is delivered thereto, shifting arms for the articles at the discharge point, and mechanism associated with and actuated by said driving means to move said arms into and out of the path of said conveyor.

11. A supply point, a discharge point, a conveyor provided with article holding devices traversing said points, driving means for said conveyor, means for engaging said devices with the articles at the supply point, means for disengaging said devices from the articles at the discharge point, mechanism adjacent the discharge point for receiving articles therefrom, and means mechanically connected with said driving means for moving said mechanism into position to receive an article from the conveyor and then to advance it after the article is delivered thereto.

12. A supply point, a discharge point, a conveyor traversing said points and having article engaging devices, driving means to move said conveyor one step forward each time an article is delivered thereto, receiving mechanism for the article at the discharge point, and a cam connected with and driven by said driving means for actuating said receiving mechanism.

13. A supply point, a plurality of discharge points, a conveyor traversing said points and having article engaging devices, said conveyor being adapted to receive articles one by one from said supply point

and deliver a plurality of articles simultaneously one at each discharge point, driving means to move said conveyor one step forward each time an article is delivered thereto, shifting arms for the articles at each discharge point, and a cam connected with and driven by said driving means to move said arms into and out of the path of said conveyor.

14. A supply point, a plurality of discharge points, a conveyor traversing said points and having article engaging devices, said conveyor being adapted to receive articles one by one from said supply point and deliver a plurality of articles simultaneously one at each discharge point, driving means to move said conveyor one step forward each time an article is delivered thereto, shifting arms for the articles at each discharge point, and a cam connected with said driving means to move said arms into and out of the path of said conveyor, said cam having portions for retaining said arms at rest in each of their extreme positions.

15. A supply point, a discharge point, a conveyor traversing said points and having article engaging devices, driving means to move said conveyor one step forward each time an article is delivered thereto, mechanism for receiving articles from said conveyor at the discharge point, a cam connected with said driving means for actuating said mechanism, and means to render certain operations of said cam ineffective.

16. A supply point, a discharge point, a conveyor traversing said points and having article engaging devices, driving means to move said conveyor one step forward each time an article is delivered thereto, shifting arms for the articles at the discharge point, a cam connected with said driving means to move said arms into and out of the path of said conveyor and means to render certain operations of said cam ineffective.

17. A supply point, a discharge point, a conveyor traversing said points, driving means to move said conveyor one step forward each time an article is delivered thereto, receiving mechanism for the articles at the discharge point, and operating mechanism for said receiving mechanism including an actuating cam and a second cam operated at a different speed from that of the first cam to render certain operations of said first cam ineffective.

18. A supply point, a discharge point, a conveyor traversing said points and having article engaging devices, driving means to move said conveyor one step forward each time an article is delivered thereto, shifting arms for the articles at the discharge point, and mechanism associated with said driving means to move said arms into and out of the path of said conveyor, including a cam operated by said driving means and a second cam operated at a rate different from that of the first cam to render certain operations of said first cam ineffective.

19. A supply point, a discharge point, a transfer conveyor including article holding devices traversing said points, means for disengaging said holding devices from the articles at the discharge point, receiving mechanism at the discharge point, means for driving said conveyor, means controlled by said driving means to actuate said disengaging means, and means directly associated with and actuated by said driving means for operating said receiving mechanism.

20. A supply point, a discharge point, a transfer conveyor, including article holding devices traversing said points, means at the discharge point for receiving articles therefrom, means for disengaging said holding devices from the articles at the discharge point, means for periodically driving said conveyor, a cam driven by said driving means for actuating said receiving mechanism, and an electrical switch associated with said driving means for controlling said disengaging means.

21. A supply point, a discharge point, a transfer conveyor including article holding devices traversing said point, a carrier, shifting mechanism for transferring articles from the discharge point to said carrier, means for disengaging said holding devices from the articles at the discharge point, means for periodically driving said conveyor, means for periodically driving said carrier, a cam mechanically connected with said conveyor driving means and driven in timed relation thereto for actuating said shifting mechanism, a switch associated with said conveyor driving means for controlling said disengaging means, and a switch associated with said conveyor driving means for controlling said carrier driving means.

22. A supply point, a discharge point, a transfer conveyor including article holding devices traversing said points, shifting arms at the discharge point adapted to move in one direction into the path of said conveyor to receive an article therefrom and then back to advance the article, means for disengaging said holding devices from the articles at the discharge point, means for driving said conveyor, a cam positively driven in timed relation with said driving means and arranged to hold said shifting arms in receiving position, and means associated with said driving means controlling said disengaging means while said arms are in receiving position.

23. A supply point, a plurality of discharge points, a conveyor traversing said supply and discharge points, means for periodically driving said conveyor, means

for disengaging said holding devices from the articles simultaneously one at each discharge point, and a pair of switches operated by said driving means and controlling said disengaging means, one of said switches being operable at each advance of said conveyor, and the other of said switches being operable upon a predetermined number of advances of said conveyor.

24. A supply point, a plurality of discharge points, a conveyor traversing said supply and discharge points, means for periodically driving said conveyor, shifting mechanism to receive the articles simultaneously one from each said discharge point, and means entirely controlled and driven by said conveyor driving means to operate said shifting mechanism.

25. A supply point, a plurality of discharge points, a conveyor traversing said supply point and said discharge points, means for periodically driving said conveyor, a shifting mechanism to receive said articles simultaneously one at each discharge point, and a cam mechanically connected with and directly controlled by said driving means to operate said shifting mechanism.

26. A supply point, a plurality of discharge points, a shifting mechanism to receive the articles simultaneously one from each discharge point, a cam connected with said driving mechanism and arranged to operate said shifting mechanism upon delivery of an article at said supply point, and a second cam associated with said driving mechanism to nullify a predetermined number of the operations of the first said cam.

27. A supply point, a plurality of discharge points, a conveyor traversing said supply and discharge points, means for driving said conveyor, means for disengaging the articles from said conveyor simultaneously one at each discharge point, shifting mechanism to receive the articles from said discharge points, means operated by and associated with said driving means to control said disengaging means, and means mechanically connected with said driving means to acuate said shifting mechanism.

28. A supply point, a plurailty of discharge points, a conveyor traversing said supply and said discharge points, driving means for said conveyor, means for disengaging the articles from said conveyor simultaneously one at each discharge point, a shifting mechanism one at each discharge point to receive the articles thereat, a pair of switches operative at different speeds by said driving means to actuate said disengaging means when a predetermined number of articles are delivered to said discharge points, a cam connected with said driving means to actuate said shifting mechanism, and a second cam connected with said driving means to render a predetermined number of rotations of the first said cam ineffective.

29. A supply point, a plurality of discharge points, a conveyor provided with article holding devices traversing said supply and discharge points, means for engaging said devices with the articles at the supply point, means for driving said conveyor one step each time an article is engaged therewith, means for simultaneously disengaging said holding devices from the articles one at each discharge point after a predetermined number of articles have been supplied to said conveyor, a plurality of receiving mechanisms one at each discharge point for receiving articles therefrom, means mechanically associated with and actuated by said driving means for moving said receiving mechanisms each time articles are delivered thereto, and a system of control for automatically controlling the actuation of all of said means in the stated sequence.

30. A supply point, a plurality of carriers, transfer mechanism including a conveyor, receiving articles from said supply point and shifting mechanisms to move the articles from said conveyor to said carriers, means for moving said transfer conveyor each time an article is delivered thereto, means mechanically associated with and actuated by said conveyor moving means for actuating said shifting mechanisms each time the number of articles delivered to said conveyor corresponds to the number of carriers, and means controlled by said conveyor driving means for moving said carriers each time articles are delivered thereto.

31. A carrier, means to deliver articles to said carrier, means to step said carrier forward each time an article is delivered thereto, and a stop gate interposed between said delivering means and said carrier, said stop gate being arranged to open by pressure of the article thereagainst.

32. A carrier having supporting rollers thereon, means to deliver articles to said carrier to be supported between said rollers, means to advance said carrier upon each delivery of an article thereto, and a stop gate normally resting against and being controlled by one of said rollers to retard the delivery of an article to said carrier.

33. A carrier, an inclined runway over said carrier and adapted to support the opposite ends of a mandrel, and means at each side of said carrier and associated with said runway for easing the mandrel from said runway onto said carrier.

34. A carrier, a runway, a stop gate at said runway having a vertically disposed hinge whose pivot is out of perpendicular in the direction that will cause the gate to

swing to normal position after the tube has passed.

35. A carrier comprising spaced roller supports, a runway, a stop gate at said run-way and adapted to be held in closed position by said roller supports and to open upon advance of said carrier, and means actuated by said roller supports to raise and return the said gate to its normal position.

36. A conveyor having a discharge point, a shifting mechanism at said discharge point for the articles carried by said conveyor, a carrier onto which said shifting mechanism is adapted to deposit said articles, and means interposed between said shifting mechanism and said carrier for easing the articles as they are delivered to said carrier.

37. A conveyor having a discharge point, a shifting mechanism for the articles carried by said conveyor at said discharge point, a carrier onto which said shifting mechanism is adapted to deposit said articles, means to step said carrier forward each time an article is deposited thereon, and a stop gate interposed between said shifting mechanism and said carrier opened by the advance of said carrier.

38. A runway, mechanism for delivering articles thereto, mechanism for receiving articles therefrom, stop means interposed between said runway and receiving mechanism and arranged to be opened by the pressure of the articles thereagainst upon actuation of one of said mechanisms, and means for automatically returning the said stop means to operative position.

39. A carrier comprising spaced roller supports, a runway comprising a pair of inclined guides or supports at opposite sides of said carrier; a stop gate positioned adjacent to the lower end of each of said guide members, each stop gate comprising a gate member, an inclined pin to which the gate member is secured, vertical bearings on which said pin is mounted for vertical movement, a spring associated with said pin normally urging the gate member into operative position, said gate member having a face or shoulder against which the article is adapted to rest, and a portion adapted to rest against said roller supports, a pivoted lever cooperating with said pin, and gudgeons on said rollers adapted to raise said pin and gate to clear said rollers upon the return of said gate.

40. A carrier, an inclined run-way over said carrier and adapted to support the opposite ends of a mandrel, means at each side of said carrier and associated with said run-way for easing the mandrel from said run-way to said carrier, said means being controlled by said carrier.

41. A carrier provided with rolls adapted to support mandrels therebetween, an inclined run-way over said carrier and adapted to support the opposite ends of a mandrel and down which run-way mandrels are adapted to roll under the force of gravity, and means controlled by and located at each side of said carrier and associated with said run-way for easing the mandrels from said run-way onto said carrier, said means being operated by the weight of mandrels thereagainst.

42. A carrier, means for intermittently advancing said carrier, an inclined run-way, and means controlled by the advance of said carrier, and operated by the weight of articles moving down said run-way for easing the articles from said run-way onto said carrier.

43. A carrier, a run-way, a stop gate at the lower end of said run-way provided with a vertically disposed hinge to permit opening of said gate under the weight of articles passing down said run-way and upon the advance of said carrier, and means to raise and return said gate to its normal closed position.

44. A carrier, a run-way adapted to support the opposite ends of a mandrel, a pair of stop gates one at each side of said carrier and at the lower end of said run-way for easing the mandrels from said run-way onto said carrier, each of said stop gates having a vertically disposed hinge whose pivot is out of perpendicular in the direction that will cause the gates to swing to normal positions after the mandrel has passed.

45. A carrier, a run-way adapted to deliver mandrels thereto, and a stop gate at the lower end of said runway for easing articles from said run-way onto said carrier, said gate being normally held closed by said carrier and being opened by the weight of a mandrel thereagainst upon the advance of said carrier.

46. A run-way adapted to support the opposite ends of a mandrel, mechanism for delivering mandrels to said run-way, carrier mechanism adapted to receive the mandrels from said run-way, and means at each side of said carrier mechanism and controlled by one of said mechanisms for easing the mandrels from said run-way onto said carrier mechanism.

47. An inclined run-way down which articles pass by gravity, intermittently actuated mechanism for delivering articles to said run-way, intermittently actuated mechanism for receiving articles from said run-way, and stop means at the lower end of said run-way for easing the articles from said run-way to said receiving mechanism, said stop means being normally held in operative position by one of said mechanisms and being opened by the weight of an article thereagainst upon movement of said last-mentioned mechanism.

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