This invention relates to certain improvements in carrot counting machinery, particularly to a machine for assembly of a predetermined number of articles such as carrots into a group.

It is in general the broad object of the present invention to provide a simple, efficient and yet rapidly operating machine for assembly of a predetermined number of individually delivered articles such as carrots into a group containing a predetermined number for packaging. Such a machine, being intended to replace hand operation, must be inexpensive to manufacture, rugged, fast in operation and readily adjustable to handle various numbers of articles.

The invention includes other objects and features of advantage, some of which, together with the foregoing, will appear hereinafter wherein the present preferred form of the machine of the present invention will be disclosed.

In the drawings accompanying and forming a part hereof, Figure 1 is a side elevation, partly in section, of the machine embodying preferred features of the present invention.

Figure 2 is a plan view of the machine shown in Figure 1.

Figure 3 is a section taken along the line 3—3 of Figure 1.

Figure 4 is a section taken along the line 4—4 of Figure 1.

Figure 5 is a section taken along the line 5—5 of Figure 4.

Figure 6 is a side elevation of a switch operating mechanism.

Figure 7 is a section taken along the line 7—7 in Figure 5.

Figure 8 is a schematic view illustrating a wiring diagram.

Figure 9 is a plan view, partly in section, of a portion of the drive mechanism.

Figure 10 is a side elevation, partly in section, of a portion of the drive mechanism.

Figure 11 is a view similar to Figure 6, showing a second position of the switch operating mechanism.

The machine of the present invention can be briefly characterized as including a means for feeding the articles to be assembled one at a time, means for assembling the articles so fed until a predetermined number has been supplied and means effective upon this number being assembled for discharging the assembly as a group.

Several of the presently described machines are usually operated in a group, each machine handling a different grade and number of carrots.

The frame

In accordance with this invention I provide a suitable frame indicated generally at 12 and having suitable supports 14 thereon to position the machine in discharge position, for example, over a hopper indicated at 15, preferably that hopper shown in my co-pending application Serial Number 325,671 filed March 25, 1940, and entitled Carrot packing machinery.

The drive

The top of the frame 12 carries a plate 16 on which is mounted a suitable drive mechanism such as shaft 17 supported in bearings 18 and adapted to be constantly rotated from a suitable prime mover as by pulley 19. Mounted upon shaft 17 and engaged with a bevel gear 20 is a bevel gear 21. Gear 20 is supported for rotation on a stub shaft 22 secured to the plate by nut 23. Ratchet wheel 27 (Figure 1), has an extended sleeve portion 25 providing a bearing for its rotation on shaft 22 as well as supporting gear 20. A toothed plate 28 is mounted for rotation on sleeve 23 between the gear 20 and the ratchet wheel.

A gear 24 is mounted for rotation on the shaft 22 below the wheel 27. The gear 24 is selectively driven through a pawl 29 mounted at one end on a pin 30a carried by the gear. A pin 30b projects from the pawl intermediate its ends and through aperture 30c in the plate 28. Gear 21 drives gear 20 constantly as well as the ratchet wheel, the pawl 29 normally being held out of engagement with the ratchet wheel when finger 31 is in engagement with one of the several pins 32 on the plate 28. The controlled movement of finger 31 and its function will be presently discussed in detail—the pawl and ratchet together with the finger serve as a clutch to provide a limited and controlled rotational movement to other mechanism. However, when finger 31 releases the pin 32 with which it is engaged, spring 30 is effective to pull the pawl in to engage the ratchet, the spring being extended between pin 28d and the pin 29b. The pin 29b extends from gear 24 through slot 29e in plate 28.

When finger 31 engages a pin 32, the pawl 29 is released from engagement with the ratchet wheel. Spring 30 is too weak to rotate gear 24 and its associated mechanism to reengage the pawl with the ratchet.

To recapitulate, because plate 28 is rotatably mounted on sleeve 23 and is connected to pawl 29 by pin 29b, spring 30 will normally urge pawl 29...
into engagement with ratchet 27, thus providing a driving connection between ratchet 27 and gear 24 to which pawl 29 is pivotally connected by pin 28. When fingers 31 engage pin 32, plate 28 is held stationary, causing pin 29 to become a stationary pivot for pawl 29. As ratchet 27 continues to drive gear 24 with respect to stationary pin 29, pin 29, carried by gear 24 will cause pawl 29 to pivot about pin 29, thus disengaging ratchet wheel 27. Upon release of pin 28 from finger 41, spring 30 will move pin 29 and plate 28, causing pawl 29 to again engage ratchet 27.

The article distributor

Means are provided for receiving and distributing the individual carrots as received, this means being shown as a receiving funnel 41, mounted on an extended end of a rotatable tube 42. Mounted upon tube 42 and in mesh with gear 24 is a gear 43, rotatably mounted in the plate 46 and supporting the tube and funnel for rotation. The bottom portion of the tube is fastened to a plate 44 while a portion of the tube is cut away as at 46 to permit a carrot or other object dropping through the tube to be directed by wall 47 outward against the spring biased gate 48, hingedly mounted as at 49 on a distributor hopper structure indicated at 50 with gear 43 driven by the gear 24, the tube 42 and the other units carried thereon are rotated selectively.

The pivotal mounting for the gate 48 is provided by a shaft 49 which extends through the hopper and projects from one side thereof to carry the presently described switch operating means 51 (Figure 6).

The article receiving means

A plurality of stationary tubulks receiving receptacles 61 are provided in a vertical bank. These are positioned by members 63 in an upper right position in the frame 12. The hopper 50 is rotated about the upper end of the tube bank with its discharge opening 62 successively positioned over each tube in turn. Each receptacle or tube carries a closure 64 thereof hinged as at 66 upon the side thereof. Means are also provided for maintaining each closure 64 in article retaining position. In the form of the machine shown this retaining means includes a projecting arm 67 on each closure means extending therefrom to engage a spring biased notched arm 68 as will be further disclosed.

Control rotation of the tube bank

It will be recalled that rotation of the tube 42 and its units is in a stepwise manner; that is, each time gate 48 is moved in a clockwise direction, an object falling against it passed, under its control, through opening 62 into one of the receiving receptacles 61. Each gate opening rotates the switch operator 51 in a clockwise direction (Figure 6). The switch operator 51 includes a member 69 mounted on shaft 49. A switch control member 71, adapted to rock a switch operating lever 72, is hinged on member 69 and biased by spring 70 to form a toggle with member 69. When the gate 48 is moved clockwise, the toggle breaks and member 69 is rocked, dragging control member 71 with it. When the gate returns and moves counterclockwise the broken toggle closes and the effective length of the members 71 and 69 increases whereby they operate control element 73 in a switch structure indicated generally at 74 when the gate 48 moves counterclockwise into closed position as in Figure 6. Switch 74 is preferably one of the so-called "micro-switch" manufactured by the Micro Switch Corporation under the trade-mark Micro Switch. The switch 74 permits current passage to solenoid 16 mounted upon the plate 16. The plunger in solenoid is connected to a lever 77 which is in turn connected to an arm 51 mounted on vertical rod 62 supported for rotation on plate 16. The rod carries the finger 41, oscillating with the movement of tube 42 and hopper 50 are rotated to a position over another receiving chamber 61.

The receptacle closure means

Each receptacle or tube 61 includes a closure means 64 hinged as at 66 on the outer side thereof. An extension 67 is provided upon each closure means and a pin 65 thereon engages a notched lever 68 hinged upon the side of each tube 61 as at 75 and biased by spring 78 to retain the closure in an article retaining position.

Means are provided for closing each of the closure means and engaging each pin 65 to engage the associated notched closure. This means is shown in the form of a "ring" 79 rotatably supported by bolts 80 from the plate 44. One or more shoes 83 are mounted upon this ring which, upon each rotational movement of tube 42, is rotated. The shoe 83 in a cam-like surface 84 thereon for engaging each arm 67 and moving it into closed position if it is in open position.

The discharge control

Means are provided for opening a selected number of the receptacles 61 and discharging the contents thereof. In the preferred form of machine disclosed herein this means is shown in the form of a "micro-switch" 86 mounted upon the ring 79. A lever 87 is hinged on the ring as at 88 and is biased by spring 89 in a clockwise direction (Figure 7).

The lever includes a cam surface indicated at 85 adapted to be engaged by one of the arms 67 associated with a closed tube or receptacle. Ordinarily the lever 87 is held in that position wherein "micro-switch" 86 is open. When lever 87 is moved outwardly in a counterclockwise direction in Figure 7 by engaging one of the arms 67, the switch closes. Current is supplied the switch through wires which extend up about one of the rods 82, past the hopper 50 to a suitable power source, presently described. Included in the circuit with the switch 86 is a solenoid 90 secured upon the frame 12 of the machine and having an operating rod 99 depending therefrom to a lever 101. Lever 101 is part of a parallel beam construction indicated generally at 102 employed to support a ring 103 in a horizontal position. When solenoid 90 is energized, rod 99 is lifted. This in turn turns the parallel beam structure whereby ring 103 is raised to engage those notched arms 68 which are in a position wherein closures 64 are retained. Raising the members 71 and 69 to form a toggle in an unlatching position in which each of the closures is released and the contents of all filled tubes dropped into the hopper 15. The shoe 83 is effective to retain one of the hoppers closed and thus provide for retention of the next article fed to the machine. The number of tubes opened depends on how far arm 67 tags the shoe 83. Since this distance can be adjusted, the number can be readily changed by moving shoe 83 along ring 79.
The power control circuits

Referring particularly to Figure 8 the electrical system and the several connections will now be disclosed. A suitable source of power is supplied as the 110 volt power line indicated at 111 and 112. Line 111 is connected to one side of the coil in solenoid 76. The other side of this coil is connected by line 113 to a brush 114 associated with a ring 116 mounted upon a suitable insulator member 115 positioned about the tube 42. Three rings are provided on this member, ring 117 and ring 116 being positioned about the periphery thereof while ring 118 is positioned on the lower side of the member. Associated with each ring is a suitable brush, that indicated at 117 being associated with ring 117, that indicated at 114 being associated with ring 116, and that indicated at 121 being associated with ring 118. Ring 116 is connected by line 122 to one side of the “micro-switch” 74. The other side of the “micro-switch” is connected by line 123 to ring 117. From this ring current can pass through brush 116 to line 113 which is connected to this brush. Closing of the “micro-switch” 74 energizes the solenoid 76 and current passes through the circuit indicated.

Solenoid 80 includes a coil one side of which is connected by line 126 to the power line 111. The other side of the coil in solenoid 80 is connected by line 127 to brush 121 associated with ring 118. Ring 118 is connected by line 128 to one side of the “micro-switch” 86 while the other side of the “micro-switch” is connected by line 129 to line 123 which, as previously disclosed, leads to ring 117 and thence to brush 116 and power line 112. The various wires are secured to the rotating parts, the rings enabling power to be supplied thereto.

Operation

Briefly summarizing the operation it will be apparent that with gear 20 constantly rotated by a suitable source of power and with articles successively dropped through the hopper 41, each return movement of the hopper gate 45 will be effective to break the toggle switch control mechanism so that upon closing movement of the gate 45 the “micro-switch” 74 will be closed, solenoid 76 will be operated by a microswitch 86 and the tube 42 will be moved out of position so that the pawl 23 is free to move under the bias of spring 30 and engage its ratchet wheel. Since the actuation of the solenoid 76 is only momentary, the power application is such that finger 31 is immediately returned into position to engage the next pin 32 on plate 28 and hopper 50 is accordingly only moved one step at a time. Depending upon how far behind the shoe 83 the operating lever 87 is positioned on the ring 79, some number of articles will be collected therein as the ring is rotated about the stationary tubes before “micro-switch” 86 is closed upon a rocking movement of arm 87 by the projecting arm 67 of the first closed hopper. Upon closure of “micro-switch” 86 current flows through the solenoid 80 and the parallel beam structure 102 is raised upwardly whereby ring 116 is released from said tubes, and all brush closure means retained in closed position by the shoe 83. Inasmuch as the shoe 83 and the hopper 50 are placed in the same vertical plane, that tube in receiving position beneath the hopper 50 will always have its closure in an article retaining position.

I claim:

1. In a machine of the character described, an article discharge hopper, means supporting said hopper for rotation, a plurality of tubes arranged vertically in a bank with the upper end thereof in a receiving position in relation to said hopper, a closure hinged adjacent the bottom of each tube and movable thereon into an article retaining position on the tube, latch elements for each closure effective to retain said closure temporarily in said position, a shoe for successively engaging a latch element on each closure and moving said element to place its associated closure in said article retaining position, means supporting said shoe on said hopper, and a ring carried by said hopper for releasing those latch elements on those tubes in closed position.

2. In a machine of the character described, an article discharge hopper, means supporting said hopper for rotation, a plurality of tubes arranged vertically in a bank with the upper end thereof in a receiving position in relation to said hopper, a closure hinged adjacent the bottom of each tube and movable thereon into an article retaining position on the tube, latch elements for each closure effective to retain said closure temporarily in said position, a shoe for successively engaging a latch element on each closure and moving said element to place its associated closure in said article retaining position, means supporting said shoe on said hopper, and a ring carried by said hopper for releasing those latch elements on those tubes in closed position.

3. In a machine of the character described, an article discharge hopper, means supporting said hopper for rotation, a plurality of tubes arranged vertically in a bank with the upper end thereof in a receiving position in relation to said hopper, a closure hinged adjacent the bottom of each tube and movable thereon into an article retaining position on the tube, latch elements for each closure effective to retain said closure temporarily in said position, a shoe for successively engaging a latch element on each closure and moving said element to place its associated closure in said article retaining position, means supporting said shoe on said hopper, and a ring carried by said hopper for releasing those latch elements on those tubes in closed position.

4. In a machine of the character described, an article discharge hopper, means supporting said hopper for rotation, a solenoid controlling rotation of said hopper, a switch operated by a microswitch discharge through said hopper and controlling energization of said solenoid, a plurality of tubes arranged vertically in a bank with the upper end thereof in a receiving position in relation to said hopper, a closure hinged adjacent the bottom of each tube and movable thereon into an article retaining position on the tube, latch elements for each closure effective to retain said closure temporarily in said position, a shoe for successively engaging a latch element on each closure and moving said element to place its associated closure in said article retaining position, means supporting said shoe on said hopper, and a ring carried by said hopper for releasing those latch elements on those tubes in closed position.

5. In a machine of the character described, a plurality of vertical tubes arranged in a bank, means for discharging an article into a tube from a supply thereof, means for retaining said discharge means to position said discharge means successively over each tube in said bank, and
means for simultaneously releasing all the articles in the tubes at one time.

6. In a machine of the character described, a plurality of vertical tubes arranged in a bank, means for discharging an article into a tube, means for rotating said discharge means to position said discharge means successively over each tube in said bank, and means effective upon discharge of a selected number of articles into said tubes for releasing said articles.

7. In a machine of the character described, a plurality of vertical tubes arranged in a bank, means for discharging an article into a tube, means for rotating said discharge means to position said discharge means successively over each tube in said bank, closure means for each tube movable between an open and a closed position, and means for opening all said closure means simultaneously.

8. In a machine of the character described, a plurality of vertical tubes arranged in a bank, means for discharging an article into a tube, means for rotating said discharge means to position said discharge means successively over each tube in said bank, closure means for each tube movable between an open and a closed position, means for retaining said closure means in tube opening position, and means for closing all said closure means simultaneously.

9. In a machine of the character described, a plurality of vertical tubes arranged in a bank, means for discharging an article into a tube, means for rotating said discharge means to position said discharge means successively over each tube in said bank, closure means for each tube movable between an open and a closed position upon rotation of said discharge means, means for retaining said closure means in tube closing position, and means for releasing those closure means which are retaining articles.

10. In a machine of the character described, means for discharging one article at a time, a plurality of individual article receiving means, means for moving said discharge means after each discharge therefrom into one of said article receiving means to a position wherein said discharge means can discharge into another of said receiving means, means for retaining a plurality of articles in said receiving means, means for releasing said plurality of articles when the number thereof attains a predetermined value.

11. In a machine of the character described, a plurality of article receptacles arranged vertically in a circular bank, means for discharging a charge from a supply into each of said receptacles in turn, means for rotating said discharge means after each discharge operation thereof from one receptacle to another, a closure means for each receptacle, means for latching said closure positions prior to article discharge thereinto, and means for simultaneously releasing all latched closure means retaining an article.

12. In a machine of the character described, a plurality of article receptacles arranged vertically in a circular bank, means for discharging a charge from a supply into each of said receptacles in turn, means for rotating said discharge means after each discharge operation thereof from one receptacle to another, a closure means for each receptacle, means operable upon rotation of said discharge means for latching said closure means in receptacle closing positions prior to article discharge thereinto, and means for simultaneously releasing all latched and article retaining closure means.

WESLEY W. DODGE.