

July 24, 1962

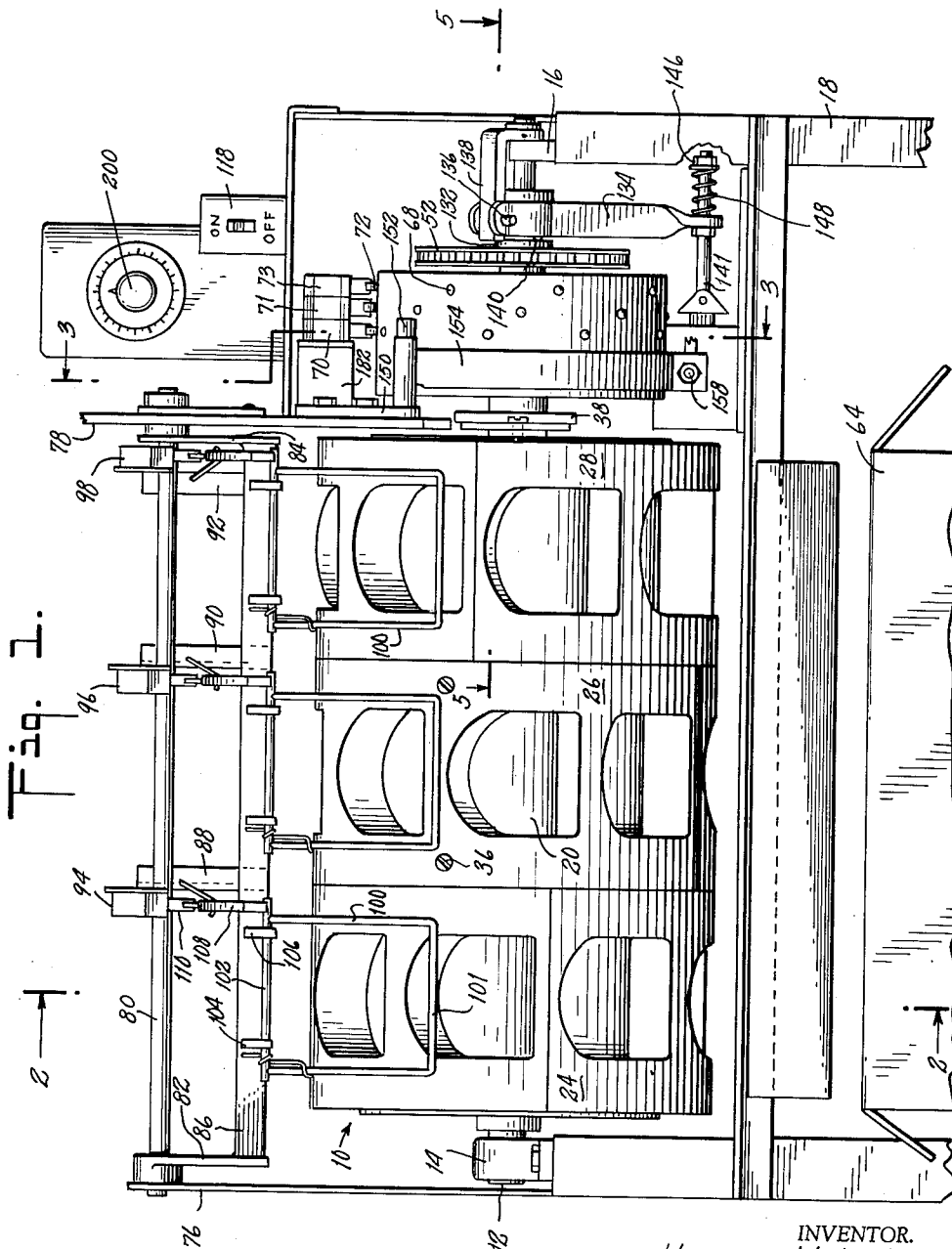
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3,045,910

AUTOMATIC COUNTING MACHINE

Filed Nov. 28, 1958

4 Sheets-Sheet 1



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Fig. 2.

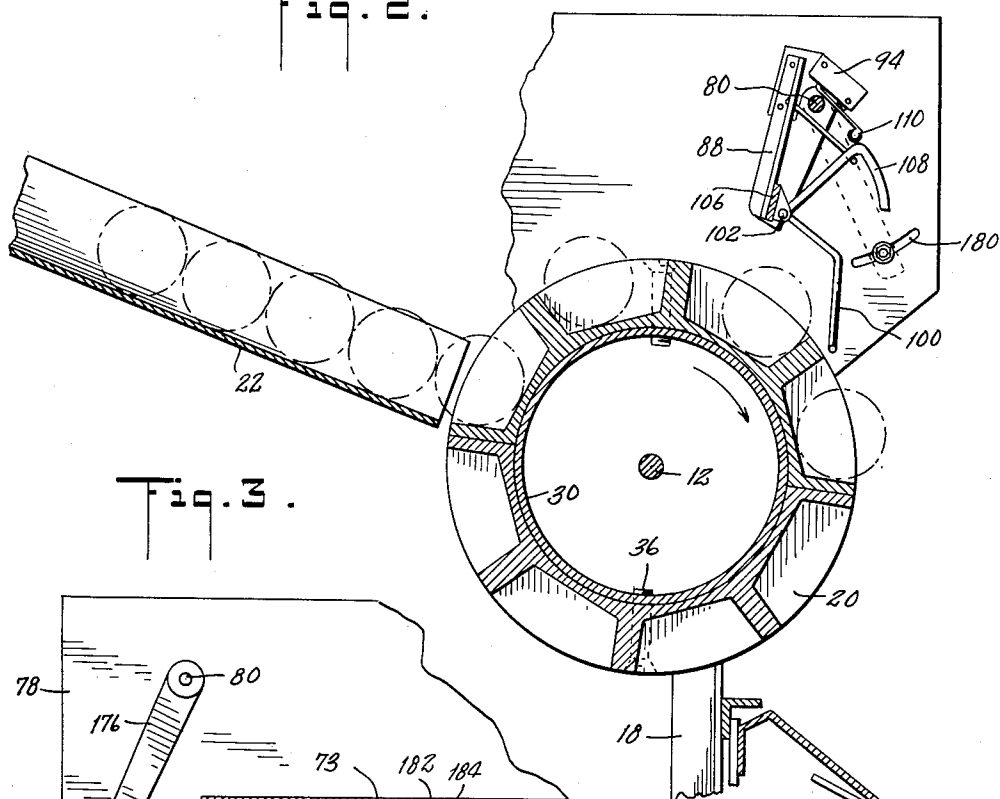


Fig. 3.

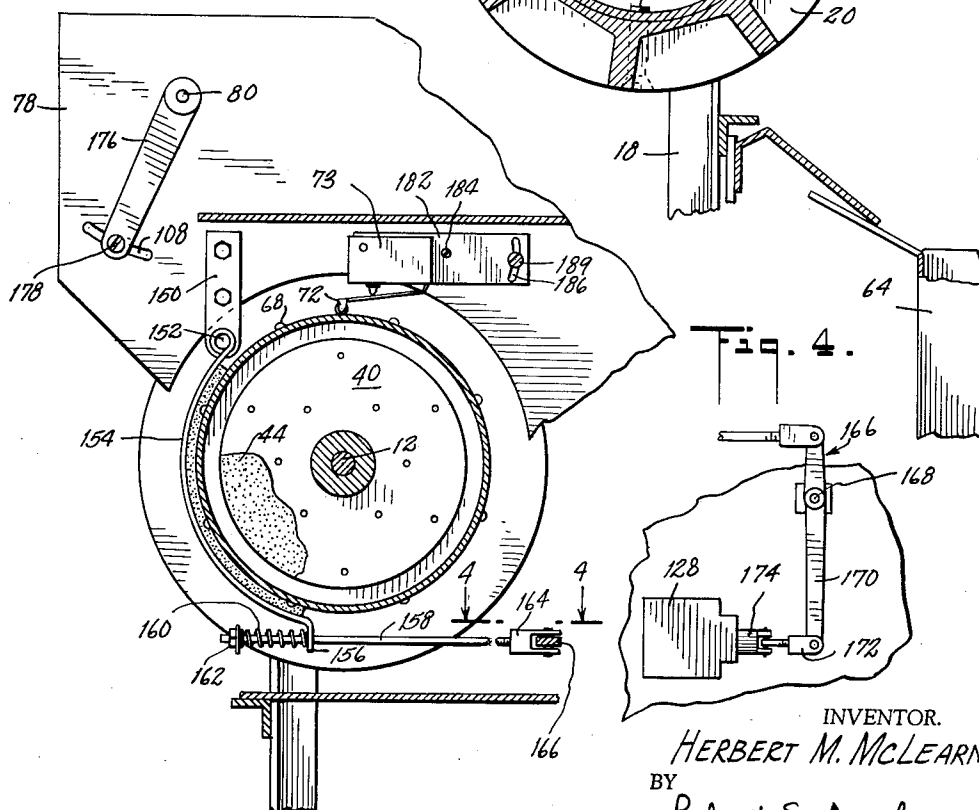
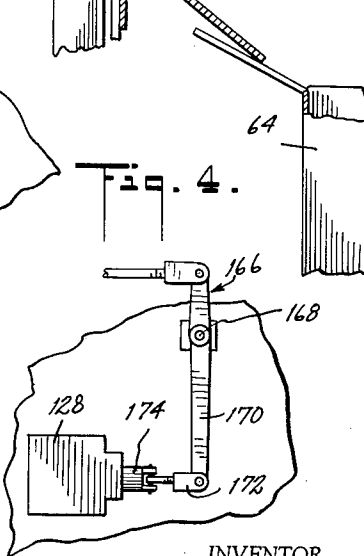


Fig. 4.



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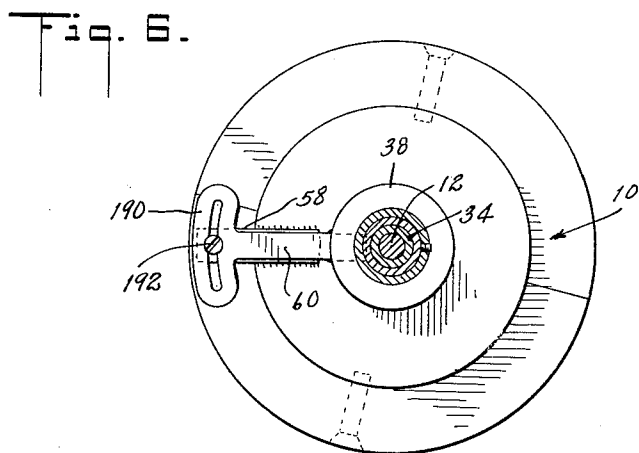
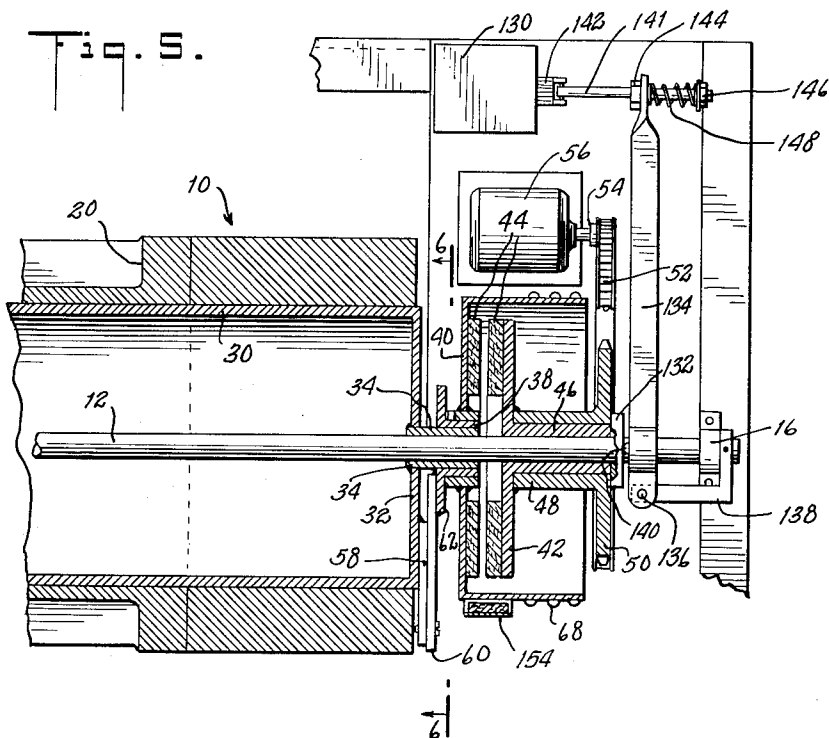
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4 Sheets-Sheet 3



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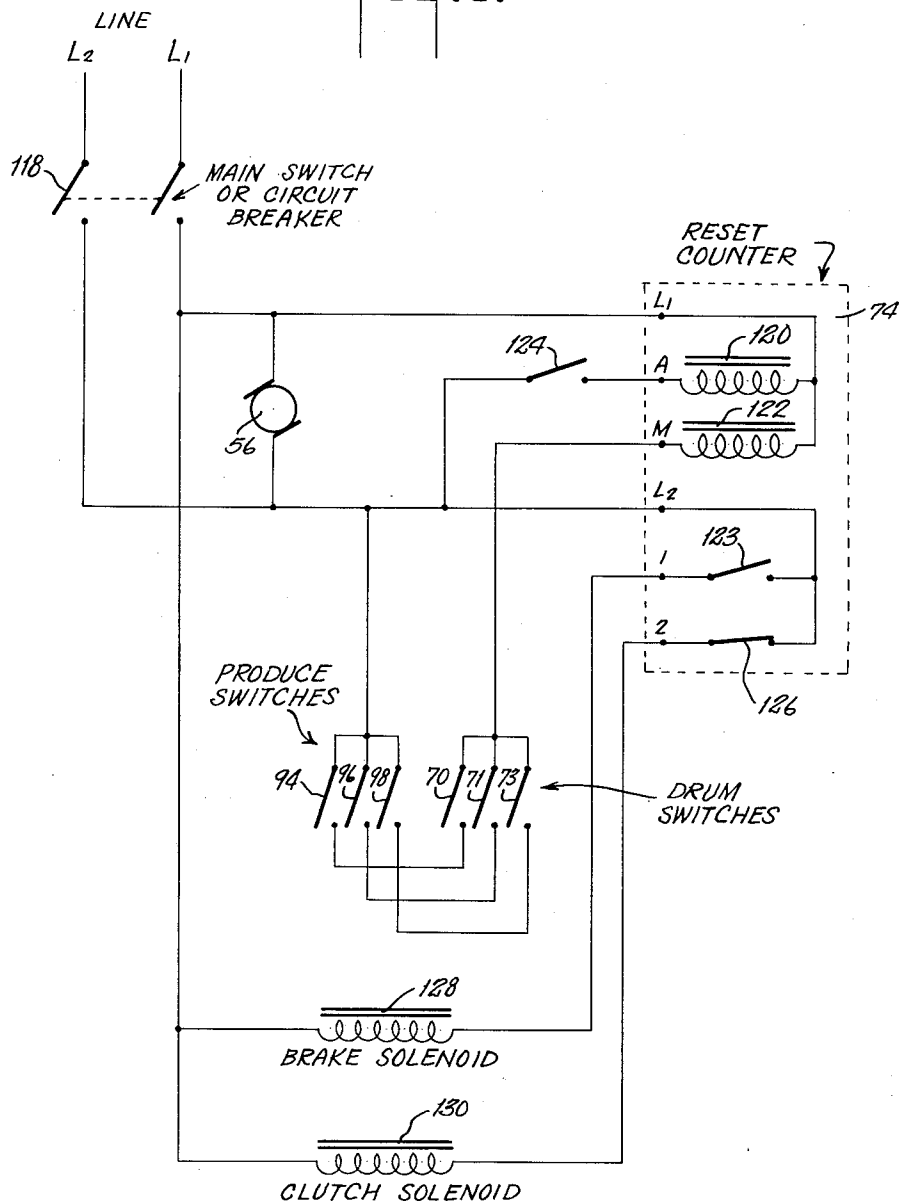
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Fig. 7.



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3,045,910

AUTOMATIC COUNTING MACHINE

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3 Claims. (Cl. 235—98)

This invention relates to mechanism for transferring a predetermined number of articles from a supply of such articles to storage and transport receptacles. More particularly, the invention relates to an article-counting and delivering mechanism which embodies a control system insuring an accurate count of delivered articles under all operating conditions.

The invention was conceived in connection with the counting and packing of citrus fruit, and reference to this particular use will serve to illustrate the utility of the invention not only in the specific environment in which it was developed, but also in the much larger field in which similar problems are prevalent.

Heretofore it has been the universal practice in the citrus industry to separate the fruit on the basis of size, and to hand pack the fruit into receptacles from bins containing the pre-sized fruit. This packing method is not only time consuming but it is also subject to variations in the count of items so packed by reason of the human factor involved, and also by reason of the fact that, in packing boxes or cartons, the place pattern of each layer of a given size of fruit is relied on to determine the count.

It is, therefore, the primary object of this invention to provide a simple mechanism which will transfer and count, both rapidly and accurately, any predetermined number of articles to be packed.

It is a specific object of the invention to provide in a machine of the class described, a control circuit and mechanisms which register an article-delivery count only when an article in fact is delivered.

To the end that the objectives hereof may be attained, the invention contemplates cyclically operating means for transferring objects individually in timed sequence from a source of objects to a receiving container. In order to insure accuracy in the count of articles delivered, the invention includes an electric switch synchronized with the article-transferring means, which switch is actuated for a predetermined interval during the article transfer portion of the cycle, and a second electric switch associated with the transferring means which is actuated only by the presence of an article in the transferring means during the transfer portion of the cycle. The two switches are in the control circuit of an electrically operated counter such that the simultaneous closure of both switches is required to advance the counter a single unit. Thus, the counter cannot be advanced unless an article is delivered. A third switch is closed by the counter when a predetermined count of articles has been reached and the operation of the counter actuated switch is employed herein to terminate the delivery operation.

A more specific understanding of the invention can be secured by reading the following description of a specific embodiment thereof, which description is written in light of the drawings forming a part of this application, and in which drawings:

FIG. 1 is a front elevational view of the machine;

FIG. 2 is a sectional view taken on line 2—2 of FIG. 1;

FIG. 3 is a sectional view taken on line 3—3 of FIG. 1;

FIG. 4 is a fragmentary view of brake operating mechanism;

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FIG. 5 is a sectional view on line 5—5 of FIG. 1;

FIG. 6 is an end elevational view on line 6—6 of FIG. 5; and

FIG. 7 is a schematic diagram of the electrical control circuit.

In the mechanism embodied in the illustrated machine, the object delivery means includes a drum 10 which is mounted for free rotation on a shaft 12. The shaft 12 is supported in end bearings 14 and 16 which are mounted on the machine frame 18. The drum 10, as shown in FIG. 1, has formed in the face thereof a plurality of article-receiving pockets 20 which, as shown in FIG. 2, are adapted to receive articles such as fruit from a supply chute or hopper 22. In the illustrated embodiment of the invention, there are three sets 24, 26 and 28 of circumferentially disposed pockets on the periphery of the drum. The pockets of each set are equally spaced from each other, but those of one set are rotatably displaced in respect to those of the other sets.

By reference to FIG. 5, it will be seen that the drum structure 10 is composed of an inner drum 30 which has end webs, such as the web 32 shown in FIG. 5, and a drum bushing mounted at the axis of each web, such as the bushing 34 of FIG. 5 by which the inner drum 30 is mounted for rotation on the shaft 12. The article-receiving pockets 20 are formed in semi-circular shoes which are attached to the inner drum 30 such that the shoes can be readily removed and replaced by others having pockets therein of a different size to adapt the machine to the processing of either larger or smaller articles. The sections of the circumferential pocket elements can be attached to the inner drum 30 by the use of suitable fastening devices, such as the screws 36 of FIG. 1. Preferably, the pocket-containing elements are of cast aluminum or similar light weight metal.

Mounted for rotation on the drum bushing 34 is a flanged hub 38 to which is attached a timing drum 40. The timing drum 40 is formed as one element of a friction clutch structure which is adapted for engagement with a drive clutch 42. Both the drive clutch 42 and the confronting web of the timing drum 40 preferably carry a facing of friction material 44. The clutch 42 has an outwardly extending hub 46 to which is attached the hub 48 of the sprocket wheel 50. The sprocket wheel 50 is engaged by a sprocket chain 52 which is driven from a sprocket 54 on the end of the shaft of an electric drive motor 56.

Fixed to the outer face of the drum web 32 is a strap 58 which, in turn, is connected to an adjusting arm 60 which is attached to and extends radially from the flange 62 of the flanged hub 38.

It can now be seen that whenever the motor 56 is energized while the clutch 42 engages the web of the timing drum 40, power will be transmitted through the flanged hub 39, the adjusting arm 60 and the strap 58, to rotate the drum 30. Under these conditions objects supplied by way of the distributing chute 22, as in FIG. 2, will be deposited into the circumferential pockets 20 of the drum and as the drum 10 is rotated in a clockwise direction, articles so carried in the pockets 20 will be discharged into a suitable receiving container 64, part of which is indicated in FIG. 1.

A structure such as that described above is sufficient for the transfer of objects from a source of supply to a receiving container, but it does not make provision for the counting of articles so delivered and the subsequent automatic control of the delivery mechanism when a predetermined count of articles has been delivered. Accordingly, the invention herein concerns itself primarily with the mechanism and controls by which an accurate count of articles delivered is maintained and by which the delivery mechanism is brought to a halt when a pre-

determined number of articles has been delivered as determined by an accurately controlled counter.

A flange 66 of the timing drum 40 carries a plurality of switch operating cams 68. The switch operating cams 68, as disclosed herein, consist of projections or buttons 5 which are adapted to control the operation of a set of timing drum microswitches 70, 71 and 73 which are best shown in FIG. 1. It will be noted by reference to FIG. 1 that the switch operating cams 68 are disposed on the face of the timing drum flange 66 in three circumferential rows which are axially spaced from each other to align them respectively, with the operating blades 72 of the three timing drum microswitches 70, 71 and 73. Furthermore, the switch operating cams 68 of each of the three circumferential rows are equally spaced one from the other in the circumferential direction as respects each individual row, but those of one row are offset in respect to those of the adjacent row by 15°. The number of switch operating cams of any of the rows circumferentially about the timing drum are determined by the number of object receiving and delivering pockets 20 in the face of the delivery drum 10. In the embodiment of the invention illustrated herein, these are eight of the article-receiving and delivering pockets 20 in each circumferential set. Consequently, each circumferential row of switch operating cams 68 will contain eight cams which are equally spaced around the periphery of the drum at 45° and their disposition is such that a cam 68 will operate a blade 72 of its related microswitch at a predetermined point of delivery cycle, as to be explained more fully.

The microswitches 70, 71 and 73 are in the control circuit of a reset counter 74 such that each time a switch operating cam 68 closes the circuit through its related timing drum microswitch, a circuit to the reset counter 74 will be conditioned to receive an advancing pulse which, if present, will advance the counter one unit. If a constant supply of articles to the transfer and delivery drum pockets 20 could be assumed, a structure such as described to this point would be adequate to deliver and count articles processed thereby. However, should one or more of the pockets 20 fail to pick up an article from the distributor 22, the number of articles actually delivered to the container 64 would no longer correspond with the count of the reset counter 74. In order to guard against the possibility of an inaccurate count, this invention contemplates the provision of a check pulse during the delivery portion of each cycle. The check pulse is produced only upon the presence of an article being transferred and delivered.

The mechanism provided for generating the check pulse is illustrated in FIGS. 1 and 2 of the drawings. Upstanding frame members 76 and 78 provide support for a shaft 80. The shaft 80 supports a pair of hangers 82 and 84 which are connected by a cross-beam 86. The cross-beam 86 has three upstanding switch supports 88, 90 and 92, related, respectively, to the article-receiving pocket sets 24, 26 and 28. On the upper ends of each of the supports is mounted a microswitch, these being the respective switches 94, 96 and 98 of FIG. 1. Each microswitch is adapted to be operated by an associated switch operating arm 100 which is in the form of a U-shaped bail having its free ends attached to a rocking shaft 102 mounted in brackets 104 and 106 affixed to the beam 86. The switch actuating arms 100 are so mounted that a cross-bar 101 thereof overlies the path through which it related series of article-receiving pockets 20 must rotate such that when a pocket containing an article is rotated past the cross-bar 101, the article will contact the cross-bar 101 and will thereby move the switch operating arm outwardly as the article rolls from the pocket into the container 64. Movement of the switch operating arms 100 is transmitted to their associated microswitches by means of a cam finger 108 which constitutes an upward extension of the rocking shaft 102.

As best seen in FIG. 2, the cam finger 108 is in the form of an inverted L such that the base thereof is adapted to move into and out of contact with an operating blade 110 of the associated microswitch. It can be seen from the foregoing, therefore, that each time a switch actuating arm 100 is moved outwardly under the influence of an object in the delivery drum therebeneath, its related cam finger 108 will move the switch blade 110 to close a circuit through the microswitch. The microswitches 94, 96 and 98 are in series respectively with the microswitches 70, 71 and 73 constituting the timing drum microswitch group. The circuit relationship of the microswitches can best be seen by reference to FIG. 7.

The specific structure of the reset counter 74 forms no part of this invention, it being sufficient for the purpose of this invention that it be settable to a preselected count and that it will count a unit for each input impulse and upon reaching the preset count, it will produce output pulses which can be used for control purposes. A number of reset counters of this character are available, one such being shown in United States Patent 2,175,865, issued October 10, 1939, to Carl L. Anderson, assignor to Eagle Signal Corporation.

In FIG. 7, the circuit is energized from a suitable source of current by way of a line switch 118. The motor 56 is in the line circuit such that it operates continuously so long as the line switch 118 is closed. The reset counter 74 includes a clutch coil 120 and a counting coil 122. The clutch coil 120 serves to reset the counter when a normally open reset switch 124 is closed upon the counter reaching its preset count. Input pulses to the counting coil 122 by which the counter is advanced step-by-step are received each time a paired set of contacts of the timing drum microswitches 70, 71 and 73 and the switch group 94—98 are closed. By reference to FIG. 7, it can be seen that the counting coil 122 of the reset counter can receive an advancing pulse only when switches 94 and 70 or 96 and 71 or 98 and 73 are simultaneously closed. Ordinarily, the time during which any of the article operated switches 94—98 are closed is relatively long, whereas the closure of any of the switches 70—73 is relatively short such that a sharp pulse is transmitted to the counting coil 122.

The output pulses from the reset counter 70 are controlled by a pair of switches 123 and 126. The switch 123 is normally open while counting but is closed when the predetermined count is reached. On the other hand, the switch 126 is normally closed while counting but is open when the count is reached. The switches 123 and 126 are consequently employed to energize respectively a brake solenoid 128 and a drum clutch solenoid 130 by which operation of the mechanism is controlled.

When the line switch 118 is closed, the motor 56 will be energized but power will not be transmitted to the transfer and delivery drum 10 unless the clutch 42 is moved into driving engagement with the web of the timing drum 40. Accordingly, the drum clutch solenoid 130 is energized through the normally closed switch 126 to move the clutch 42 into driving engagement.

FIG. 5 discloses the mechanical connection between the drum clutch solenoid 130 and the clutch 42. By reference to FIG. 5, it will be seen that the outer end of the clutch hub 46 is in contact with a thrust bearing 132 through which a clutch yoke 134 transmits movement to the clutch 42. The clutch yoke 134 is mounted to rock on a pivot pin 136 which is carried at the free end of a clutch yoke bracket 138, the bracket 138 being fixed to the end of the shaft 12. The clutch yoke is formed with a plurality of bearing points 140 which are adapted to engage the outer face of the thrust bearing 132 when the clutch yoke is rocked inwardly about the pivot pin 136. Such movement transmitted through the hub 46 of the clutch 42 will serve to engage the clutch 42 with the inner face of the web of the timing drum 40 and thereby drive the drum and transmit motion to the

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transfer and delivery drum 10, as explained before. The clutch yoke 134 extends toward the rear of the machine where it is connected to a rod 141 which is pivoted to the outer end of the core 142 of the clutch solenoid 130. The clutch yoke 134 has an eye formed through its rear end through which the rod 141 extends. A substantial portion of the rod 141 is threaded to receive a pair of nuts 144 and 146. A coil spring 148 surrounds the end of the rod 141 and bears at one of its ends against the clutch yoke and at its other end against the nut 146.

It can be seen from the foregoing that when the clutch solenoid 130 is energized and its core 142 is pulled into the solenoid coil, the clutch yoke 134 will be rocked about its pivot pin 136 such that the clutch 42 will be engaged with the web of the timing drum 40 to transmit rotary motion to the delivery drum 10.

The brake solenoid 128 which is energized when the normally open switch 123 is closed upon reaching a predetermined count is utilized to bring the delivery drum 10 to a halt as soon as the predetermined count has been reached and thus avoid overrunning of the drum with consequent error in the count of the articles delivered. The mechanical structure involved in the brake mechanism is best shown in FIGS. 1, 3 and 4. Attached to the frame member 78, as shown in FIG. 3, is a plate 150 which carries a laterally extending stud 152. The stud 152 forms a support about which a brake shoe 154 is adapted to rock. The brake shoe 154 is positioned to engage the flange 66 of the timing drum 40 at an area inwardly of the switch operating cams 68. The lower end 156 of the brake shoe 154 has an eye formed therein through which extends a brake rod 158, the brake rod 158 being coupled to the brake shoe 154 by means of a coil spring 160 which surrounds the free end of the brake rod 158 and bears at its one end against the brake shoe and at its other end against an adjusting nut 162. The brake rod 158 extends rearwardly where it is connected to a clevis 164 which is pivoted to a compound lever 166, as best shown in FIG. 4. The compound lever 166 is pivoted on a stud 168 and its longer end 170 is pivoted to a second clevis 172 which is suitably attached to the core 174 of the brake solenoid 128.

As previously stated, the brake solenoid 128 is controlled through the normally open switch 123 of FIG. 7, and is consequently deenergized during a counting operation since the switch 123 is open while counting and is closed only when the count has been reached. Therefore, upon the reaching of a predetermined count in the reset counter 74, the switch 123 will be closed thereby providing an energizing current to the brake solenoid 128. This results in the attraction of the solenoid coil 174 and the consequent operation of the compound lever 170 and the brake rod 158 to the end that the brake shoe 154 is pressed against the timing drum flange 66 with sufficient force to bring the transfer drum 10 to a halt.

It has been stated above that the circumferential pocket elements 24-28 can be removed readily and can be replaced by others of modified form to accommodate articles of various sizes by providing pockets that are either smaller or larger as the case may require. Certain accompanying adjustments are usually required when a change is wrought in the form of the delivery drum. It is obvious that the switch actuating arms 100 must be spaced farther from the periphery of the drum when large articles are being processed and that these arms must be brought closer to the drum when smaller articles are being processed. In order to make a simple adjustment of the switch actuating arms possible, an adjusting lever 176 is fixed to the end of the shaft 80 such that movement of the adjusting lever 176 will rotate the shaft 80 and thereby move the switch arm supporting beam 86 either in a clockwise or a counterclockwise direction. Such movement will reflect itself in the spacing between the switch actuating arms 100 and the peripheral surface of the delivery drum 10, it being noted particularly

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that the relationship of the switch operating arms 100 and their related microswitches is not in the least altered in the adjustment, since the switch operating arms and their related microswitches will be adjusted as a unit about the shaft 80. The free end of the adjusting lever 176 has a screw 178 extending therethrough at a point where it engages in an arcuate slot 180 thus providing means for securing the assembly in any desired position of adjustment.

The microswitches 70, 71 and 73 are carried as a unit on a bracket 182 so that adjustment of the bracket 182 will serve to simultaneously adjust the microswitch group in respect to the face of the timing drum flange 66. As best seen in FIG. 3, the microswitch bracket 182 is pivoted on a stud 184 and has formed in the free end thereof an arcuate slot 186; the position of the bracket 182 being maintained by a screw 188. Thus, if the screw 188 is relieved, such that the bracket 182 can move about its pivot 184, an accurate adjustment of the switch assembly can be achieved, such that the operating blade 72 of the switches will be properly spaced in respect to the timing flange of the drum.

The initial relationship between the switch operating cams 68 and the pockets 20 of the delivery drum 10 is made by relatively adjusting the strap 58 in respect to the adjusting arm 60. As stated hereinabove, the strap 58 is fixed to the end of the inner drum 30 while adjusting arm 60 is fixed to the flange 62 of the flanged hub 38. By reference to FIG. 6, it can be seen that the adjusting arm 60 has a slotted head 190 through which extends a screw 192 by means of which the strap 58 and the adjusting arm 60 are connected to operate in unison. An adjustment between the timing drum and the delivery drum can be secured easily by relieving the screw 192 and then rotating the delivery drum 10, as may be required to align the article-receiving pockets 20 thereof with their related switch operating cams 68. When such adjustment has been achieved, the screw 192 is tightened so that the timing drum and the delivery drum will operate in synchronism.

In the operation of the machine herein described, the count selecting knob 200 of the reset counter 74 is set to the count of articles selected for delivery to the receptacle 64. The line switch 118 is closed and the motor 56 will, therefore, be energized. Simultaneously, the drum clutch solenoid 130 will be energized thereby engaging the clutch faces for transmitting power through the clutch 42 to the delivery drum 10. At this time the brake solenoid 128 will be de-energized with the result that the brake shoe 154 will be ineffective. As the count of articles proceeds, the switch combinations, as described above, will impulse the counting coil 122 of the reset counter and this operation will continue until the mechanism of the reset counter indicates that the preset count of articles has been reached. Thereupon, the switch 123 will be closed and the switch 126 will be opened; this, in turn, will result in release of the driving clutch since its control solenoid 130 is now de-energized, while at the same time the brake solenoid 128 is energized thus bringing the brake shoe 154 into contact with the timing drum thereby stopping rotation of the delivery drum without overrun thereof. The reset switch 124 of the reset counter will be operated to reset the counting mechanism, although it is apparent that the reset switch 124 may be operated manually as well, or automatically in conjunction with conveyor means, not shown, with which the counter may be employed.

In the illustrative embodiment of the invention herein, there has been shown a delivery drum having three sets of circumferential article-receiving and delivering pockets 20. This specific illustration has been used merely for purpose of explanation, it being obvious that the sets of pockets and the pockets in any one of the sets may be either greater or less in number than that illustrated.

While the fundamentally novel features of the inven-

tion have been illustrated and described in connection with a specific embodiment of the invention, it is believed that this embodiment will enable others skilled in the art to apply the principles of the invention in forms departing from the exemplary embodiment herein, and such departures are contemplated by the claims.

I claim:

1. In an article counting and transferring machine, a cyclically operating rotary transfer drum having a plurality of circumferentially spaced object-receiving pockets in the face thereof for transferring objects individually in timed sequence from a source of objects to a container, an electrical control circuit, normally open first switch means in said control circuit associated with said object-receiving pockets of said rotary transfer drum, object operated means overlying the path of said object-receiving pockets of said drum operable by objects in said object-receiving pockets during the rotation of said drum for closing said first switch means for varying intervals by the presence of an object in said object-receiving pockets at the discharge point thereof during cyclic operation, normally open second switch means in said control circuit in series with said first switch means located at a fixed point adjacent said cyclically operating rotary drum, switch operating means mounted for rotation with said drum, said switch operating means having a switch closing element in axial alignment with each of said circumferentially spaced object-receiving pockets each adapted to successively contact and close said second switch means at a fixed point and for a predetermined interval during the rotation of said cyclically operating drum and within the period of closure of said first switch means, the predetermined interval of closure of said second switch means being short compared to the varying intervals of closure of said first switch means, counting means in said control circuit operated by the simultaneous closure of said first and second switch means adapted to register one count for each such simultaneous closure, third switch means associated with said counting means adapted to be operated when a predetermined number of counts is reached, and means responsive to said counting means when a predetermined number of counts is reached for operating said third switch means.

2. In an article counting and transferring machine, a cyclically operating rotary transfer drum having a plurality of circumferentially spaced object-receiving pockets in the face thereof for transferring objects individually in timed sequence from a source of objects to a container, an electrical control circuit, normally open first switch means in said control circuit associated with said object-receiving pockets of said rotary transfer drum, object operated means overlying the path of said object-receiving pockets of said drum operable by objects in said object-receiving pockets during the rotation of said drum for closing said first switch means for varying intervals by the presence of an object in said object-receiving pockets at the discharge point thereof during cyclic operation, means for selectively spacing said objects operated means from the face of said drum, normally open second switch means in said control circuit in series with said first switch means located at a fixed point adjacent said cyclically operating rotary drum, switch operating means mounted for rotation with said drum, said switch operating means having a switch closing element in axial alignment with each of said circumferentially spaced object-receiving pockets each adapted to successively contact and close said second switch means at a fixed point and for a predetermined in-

terval during the rotation of said cyclically operating drum and within the period of closure of said first switch means, the predetermined interval of closure of said second switch means being short compared to the varying intervals of closure of said first switch means, means for selectively aligning said switch closing elements with said object-receiving pockets, counting means in said control circuit operated by the simultaneous closure of said first and second switch means adapted to register one count for each such simultaneous closure, third switch means associated with said counting means adapted to be operated when a predetermined number of counts is reached, and means responsive to said counting means when a predetermined number of counts is reached for operating said third switch means.

3. In an article counting and transferring machine, a cyclically operating rotary transfer drum having a plurality of circumferentially spaced object-receiving pockets in the face thereof for transferring objects individually in timed sequence from a source of objects to a container, means including an electro-mechanical clutch device for rotating said drum, means including an electro-mechanical brake device for holding said drum against rotation, an electrical control circuit, normally open first switch means in said control circuit associated with said object-receiving pockets of said rotary transfer drum, object operated means overlying the path of said object-receiving pockets of said drum operable by objects in said object-receiving pockets during the rotation of said drum for closing said first switch means for varying intervals by the presence of an object in said object-receiving pockets at the discharge point thereof during cyclic operation, normally open second switch means in said control circuit in series with said first switch means located at a fixed point adjacent said cyclically operating rotary drum, switch operating means mounted for rotation with said drum, said switch operating means having a switch closing element in axial alignment with each of said circumferentially spaced object-receiving pockets each adapted to successively contact and close said second switch means at a fixed point and for a predetermined interval during the rotation of said cyclically operating drum and within the period of closure of said first switch means, the predetermined interval of closure of said second switch means being short compared to the varying intervals of closure of said first switch means, counting means in said control circuit operated by the simultaneous closure of said first and second switch means adapted to register one count for each such simultaneous closure, third switch means associated with said counting means adapted to be operated when a predetermined number of counts is reached, means responsive to said counting means when a predetermined number of counts is reached for operating said third switch, and means responsive to the operation of said third switch for operating said clutch device and said brake device.

References Cited in the file of this patent

UNITED STATES PATENTS

1,795,511	Scheu et al. -----	Mar. 10, 1931
1,823,960	Troutman -----	Sept. 22, 1931
1,916,531	Robb -----	July 4, 1933
2,318,372	Caldwell -----	May 4, 1943
2,337,813	Grossenbacher -----	Dec. 28, 1943
2,352,622	Gaumer -----	July 4, 1944
2,605,967	Stone -----	Aug. 5, 1952
2,812,137	Curtis et al. -----	Nov. 5, 1957