Feb. 23, 1965 W. G. PEARSON ETAL 3,170,627

ARTICLE COUNTING DEVICE

Filed July 8, 1963 2 Sheets-Sheet 1

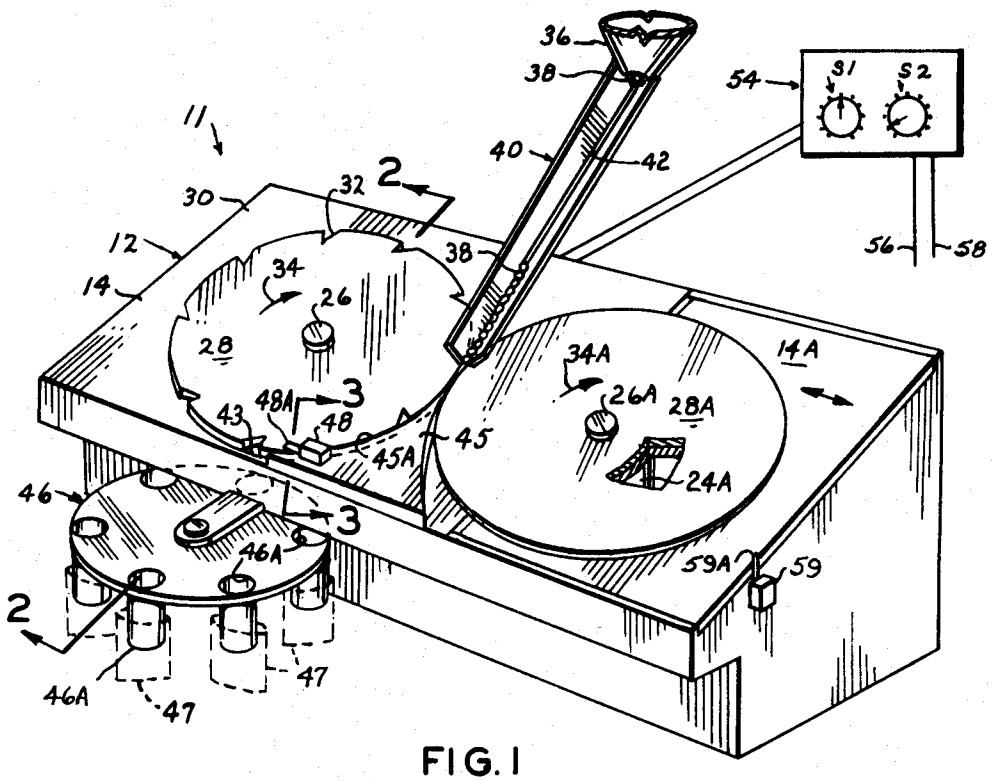



FIG. 1

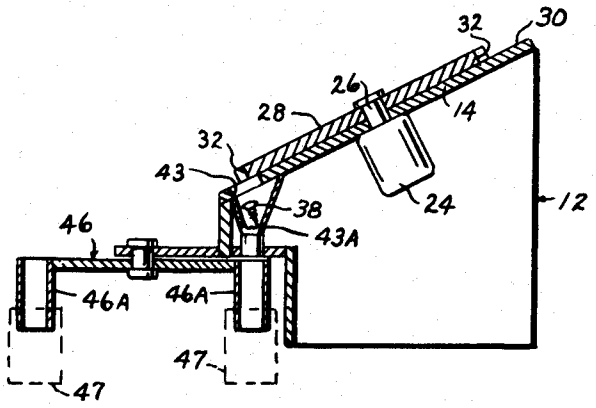



FIG. 2

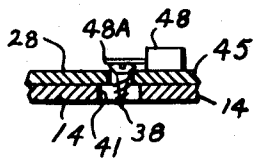



FIG. 3

WALTER G. PEARSON
KERNEY J. HURST
INVENTORS

BY
Robert K. Rhea
AGENT

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ARTICLE COUNTING DEVICE

Filed July 8, 1963 2 Sheets-Sheet 2

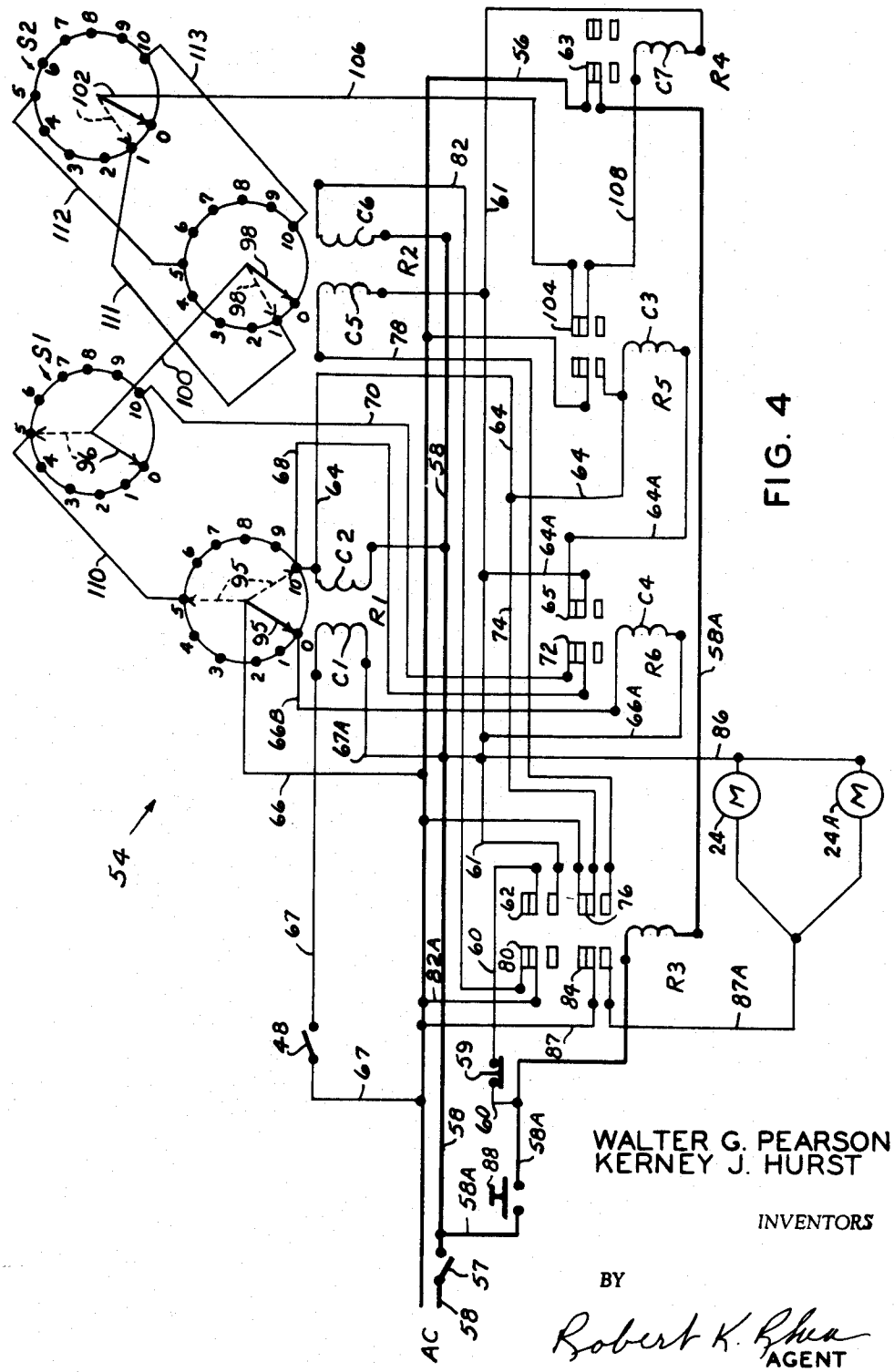



FIG. 4

WALTER G. PEARSON
KERNEY J. HURST

INVENTORS

BY

Robert K. Rhea
AGENT

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3,170,627

# ARTICLE COUNTING DEVICE

Walter G. Pearson, 1615 Military Highway, Pineville, La., and Kerney J. Hurst, 25 Rockledge Road, Hartsdale, N.Y.

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10 Claims. (Cl. 235—98)

The present invention relates to machines for counting small articles such as screws, bolts, nails and other small articles of a similar nature.

The present invention is a continuation-in-part of an application filed by us in the United States Patent Office on July 3, 1962, Ser. No. 207,305 for Article Counting Device.

Considerable time is consumed in the tedious hand operation of group counting such small articles, particularly screws and bolts, especially when prepackaging small individual group amounts.

The prior art reveals a number of counting machines adapted to count a predetermined number of pills or tablets and deposit them in separate containers, some of which are progressively conveyed past the counting device. Some of these counting devices are designed for use by the manufacturer of pills or tablets, rather than by the individual pharmacist, wherein each successive prescription filled has a number of pills or tablets which is different from the previously filled prescription. These machines, as shown by the prior art, so far as we have been able to determine, do not provide a device capable of being actuated for counting a selected number of articles for individual orders. It is highly important in the handling of pharmaceutical tablets, which are to be internally consumed, that the tablets be undamaged and be kept clean to present a perfect appearance to the consumer. Article counting machines, as shown by the prior art, so far as we have been able to determine, do not provide a device capable of rapid counting, a minimum of ten thousand or more per hour in groups of a predetermined number, screws, nails or bolts and depositing the groups in separate containers. A common method of packaging a selected number of screws or the like is to count the first group, weigh this group and thereafter approximate the group count by scale weights. This frequently results in the inclusion of one or two more screws than is necessary to complete the desired count. It is, therefore, important, from an economic standpoint, to provide a low cost prepackaging method of accurately counting screws, bolts and articles of similar nature.

It is, therefore, the principal object of the instant invention to provide a device which will actually count or separate a selected number of such small articles from a hopper containing a reserve supply.

Another object is to provide a device which will count a selected number of articles without any damage thereto.

Another object is to provide a counting machine which is controlled by a preset electrical means for counting out the predetermined number of articles.

A further object is to provide a device which is fully automatic in the counting operation and does not require manual supervision when the machine has been placed in operation.

Another object is to provide a device which will rapidly count a selected number of screws, bolts and articles of similar nature.

Another object is to provide a device or machine adaptable for handling small articles of various shapes and sizes.

Still another object is to provide a machine of this class which is relatively simple in construction, positive in operation, and which can easily withstand continuous usage with a minimum of service or repair.



A further object is to provide a device of this class which may be readily used by manufacturers, or the like, in counting out large volumes of small articles.

Yet another object is to provide a device of this class which may comprise a single article handling unit, or a multiplicity of such units, all controlled by a single electrical counter.

The present invention accomplishes these and other objects by providing a frame having an inclined upper support. Motor driven disk means, mounted on the inclined support, is provided with article receiving openings. Electrical counting means operates the motor driven disk means and stops the latter at a predetermined setting when the counting means has been actuated by the passage of the selected number of articles being counted.

Other objects will be apparent from the following description when taken in conjunction with the accompanying two sheets of drawings, wherein:

FIGURE 1 is a perspective view of the device;

FIGURES 2 and 3 are vertical cross-sectional views taken substantially along the respective line 2—2 and 3—3 of FIG. 1; and,

FIGURE 4 is a wiring diagram of the counting control means.

Like characters of reference designate like parts in those figures of the drawings in which they occur.

In the drawings:

Referring more particularly to FIGS. 1 to 3, the reference numeral 11 indicates the device, as a whole, which is rectangular in general configuration. The device 11 includes a frame 12 having upper inclined supports 14 and 14A. A motor 24 is mounted within one end portion of the frame 12 and is supported by the support 14. The motor 24 has a drive shaft 26 which projects upward through the support 14. A disk 28 is axially connected to the upwardly disposed end of the drive shaft 26 in flat face to face contact with the surface 30 of the upwardly inclined support 14. The peripheral edge portion of the disk 28 is provided with a plurality of equally spaced-apart radial notches, slots or recesses 32. A second motor 24A is similarly mounted within the other end portion of the frame 12 and is supported by the support 14A. This second motor 24A has a drive shaft 26A which projects upwardly through the support 14A. Another disk or plate 28A, diametrically substantially equal with respect to the disk 28, is similarly axially connected to the drive shaft 26A so that an arc or periphery portion of the plate 28A lies in closely spaced relation with respect to a similar arc or peripheral edge portion of the disk 28. The disk 28 and plate 28A both revolve in a clockwise direction as shown by the respective arrows 34 and 34A.

A hopper or bin 36, containing a reserve supply of articles to be counted, such as screws or nails 38, is positioned in spaced relation above and outwardly of the frame 12. An inclined V-shaped trough 40, connected at one end with an outlet of the hopper 36, conveys the screws 38 for discharge on the upper surface 30 of the support 14 at a point adjacent the juncture of the meeting point of the disk 28 and plate 28A. The depending end of the trough 40 overlies a peripheral edge portion of the disk 28 and plate 28A adjacent their juncture. The trough 40 is V-shaped in cross section and the walls forming the V-shape are spaced-apart at their lowermost edges to define an opening or space 42 therebetween through which the stem portion of the respective screw 38 depends so that the head portion of each screw is supported by the opposing walls of the trough as the screws travel by gravity toward the lower end thereof. An arcuate slot 41 (FIG. 3) is preferably formed through the support 14 in underlying relation with respect to a peripheral portion of the disk 28 so that the depending

free end portion of the screws or nails, being counted, may project downwardly thereinto or therethrough. As the disk 28 rotates, one of the recesses 32 engages the stem portion of one of the screws 38 and carries the latter toward a discharge point adjacent the depending forward edge of the inclined surface 30 where an aperture 43, formed in the inclined support 14 in communication with the slot 41, permits the screw 38 to fall by gravity into a funnel-like chute 43A. During its travel with the disk 28, the screw 38 is maintained in position within the recess 32 by a guide member 45 having an arcuate edge 45A adjacent a peripheral portion of the disk 28. The head of the respective screw, carried by the disk 28, projects upwardly of the upper surface of the disk 28 so that the head portion of the screw passes under the arm 48A of a microswitch 48, mounted on the guide 45, to actuate a counting and control means 54 as is more fully described hereinbelow.

Since the screws are fed by gravity to the pick-up point of the disk 28, they tend to pile up or become bunched at the discharge end of the trough 40. To prevent such irregularity of the sequence of their engagement by the recesses 32 the rotating disk 28A frictionally contacts the stem portion of the screws tending to impart a counter-clockwise rotation of the screws which prevents such piling up or congestion at the point of pick-up for counting. As a safety feature in preventing malfunction of the counting operation, the righthand portion as viewed in FIG. 1, of the inclined support 14 upon which the disk 28A is mounted and indicated by the numeral 14A, is separately mounted on the frame 12 for sliding movement toward and away from that end of the frame opposite the disk 28. The section 14A is spring urged toward the disk 28. If, for example, two screws 38 are picked up or become positioned within one of the recesses 32, the combined thickness of the screws forces the disk 28A and panel portion 14A to be moved laterally of the frame 12 away from the disk 28. This movement of the panel 14A positions its righthand free edge portion, as viewed in FIG. 1, against the switch arm 59A of a microswitch 59, mounted on the frame 12, which interrupts the circuit to the counter means 54 and stops operation of the device 11 until the malfunction has been corrected.

A horizontal turret plate of table 46 is supported by the forward side of the frame 12 and is provided with a plurality of circumferentially spaced tubes 46A depending from cooperating openings formed in the table 46. A sack or receptacle 47 surrounds the depending end portion of each tube 46A and receives individual group counts of the screws. As seen in FIGS. 1 and 2, the tubes 46A are positioned in turn below the funnel-like tube 43A, by rotating the table 46, so that the articles 38 fall by gravity through the respective tube 46A and into the sack 47 as the device counts out a series of grouped quantities of the articles as is more fully described hereinbelow.

Referring more particularly to FIG. 4, the counting control or selector mechanism and its wiring is indicated generally by the numeral 54 which operates the counting mechanism 11. The counting control 54 may be housed within the frame or within a separate unit, as shown, and connected with the device 11 by wiring. The counter 54 includes a pair of selector switches S1 and S2 which are manually set by moving the respective indicator 96 and 102 thereof to a preselected number representing the number of articles to be counted as more fully explained hereinbelow.

An alternating current A.C., connected with a source of electrical energy, not shown, applies current to the counter 54 over conductors 56 and 58 through an "off-on" control switch 57. The coil of a first relay R3 is interposed in a wire 58A, connected at one end with the wire 58, which is connected at its other end to the wire 56 through a set of contacts 63 controlled by a second relay R4. The de-energizing safety switch 59, is interposed in a wire 60 connected with the wire 58A and connected, at its other end, with a current source wire 61 through a set of contacts 62 controlled by relay R3 to interrupt the counting action when desired.

A single pole ratchet counting relay R1, having multiple contacts or points, each having a value of one, numbered 0 to 10, has each of these contacts interconnected with corresponding contacts of the indicator dial of the switch S1. A second single pole ratchet counting relay R2, having contacts or points, each having a value of ten and numbered 0 through 10, is similarly interconnected with the indicator dial of the switch S2. A wire 67, connected with the wire 56, is connected with one end of an inductor coil C1 of relay R1 and the other end of the coil C1 is connected by a wire 67A to the wires 58 and 61. At least one microswitch 48 is interposed in the wire 67.

The inductor coil C2 of relay R1 is connected at one end to the wire 58 and at its other end to the indicator point or contact 10 of relay R1 and with one end of the winding of the coil C3 of a fifth relay R5 by a wire 64. The other end of the coil C3 is connected to the wire 61 by a wire 64A through a set of contacts 65 associated with a sixth relay R6. The coil C4 of relay R6 is connected to the wire 61 and to the 0 contact of relay R1 by wires 66A and 66B. The contact 10 of relay R1 is connected with the point 10 of the dial of selector switch S1 by wires 68 and 70 through a set of contacts 72 associated with the relay R6. A wire 74, connected to wire 64, connects one end of the coil C2 of relay R1 with the coil C5 of relay R2 through a set of contacts 76 associated with relay R3 over a wire 78. The other end of coil C5 is connected to the wire 61. The other coil C6 of relay R2 is connected at one end to the wire 58 and at its other end to the wire 56 through a set of contacts 80, controlled by the relay R3, by wires 82 and 82A.

The motors 24 and 24A are connected to the wires 56 and 61 through another set of contacts 84, controlled by relay R3, by wires 86, 87 and 87A.

A push button switch 88 is interposed in the wire 58A before its connection with the relay R3 for energizing the relay R3, starting the motors 24 and 24A and starting the counting operation.

The indicator 96 of the switch S1 is interconnected with the indicator 98 of relay R2 by a wire 100 and the indicator 102 of switch S2 is connected to the coil C7 of relay R4 through a set of contacts 104 associated with the relay R5 by wires 106 and 108. Wire 110, connecting the contact 5 of the relay R1 with the indicator contact 5 of the switch S1, illustrates the manner in which the respective contacts are interconnected. Wires 111, 112 and 113 similarly illustrate the manner of interconnecting contacts of relay R2 with the respective indicator contacts of the switch S2.

*Operation*

In operation a reserve supply of the articles 38 to be counted are placed in the hopper 36. All relay contacts are shown, by solid lines (FIG. 4), in a deenergized position. Closing switch 57 energizes the counter 54. Coil C2 of relay R1 and coil C6 of relay R2 are energized through contacts 76 and 80 of relay R3. The counting selector switches S1 and S2 are positioned for a count of 15. For example, the indicator 96 of selector switch S1 is positioned at the point 5 while the indicator 102 of selector switch S2 is positioned at 1. The starting switch 88 is closed, which energizes relay R3 and operates its associated contacts. Opening contacts 76 and 80 of relay R3 interrupts the circuit and de-energizes the coil C2 of relay R1 and the coil C6 of relay R2. While the indicator of relay R1 is at point 0 a circuit is completed from the wire 56 through the coil C4 of relay R6 to the wire 61 over wires 66, 66B and 66A which opens relay R6 contacts 65 and 72 and de-energizes the contact 10 of of relay R1. As the articles being counted, carried by the disk 28, successively close the microswitch 48, coil

C1 of relay R1 is energized over wires 67 and 67A which progressively moves the indicator 95 of relay R1 from 0 to point 10. When the indicator 95 reaches point 10, a circuit is completed through the coil C2 of relay R1 to release the indicator 95 and reset the latter to 0 position. Simultaneously a circuit is completed to energize the coil C5 of relay R2 over wires 64, 74 and 78, through the contacts 76 of relay R3 which moves the indicator 98 of relay R2 to point 1 for the count of 10. During its return sweep to 0 position, the indicator 95 of relay R1 is prevented from causing an unwanted count or trip-out by contact with the interconnected points, such as point 5, by the circuit over wires 64 and 64A through contacts 65 of relay R6 wherein the coil C3 of relay R5 is energized and opens the points 104 associated with relay R5 which prevents energizing the coil C7 of relay R4. When the indicator 95 of relay R1 returns to 0 position on the coil C4 of relay R6 is again energized to open contacts 65 and 72 which de-energizes relay R5. Subsequent articles 38 closing the switch 48 progressively moves the indicator 95 to the point 5 of relay R1 to complete the count of 15. When the indicator 95 reaches the point 5, a circuit is completed to the indicator 96 of switch S1 over wire 110 and to the indicator 98 of relay R2 over wire 100 and to the indicator 102 of selector switch S2 which is in turn connected to coil C7 of relay R4 over wire 106 through the points 104 of relay R5 and wire 108 which energizes the coil C7 thus opening the points 63 de-energizing relay R3 and returning its associated contacts to de-energizing position to complete the cycle. In this position the coils, C2 of relay R1 and C6 of relay R2, bias the respective indicator 95 and 98 to 0 position.

Obviously the invention is susceptible to some change or alteration without defeating its practicability, and we therefore do not wish to be confined to the preferred embodiment shown in the drawings and described herein, further than we are limited by the scope of the appended claims.

We claim:

1. An article counting device, comprising: a frame; a support connected to said frame, said support having an inclined upper surface; a motor mounted within said frame, said motor having a shaft projecting upwardly through said support; a disc axially connected with said shaft in face to face contact with the upper surface of said support for rotation with said shaft, said disk having a series of equally spaced-apart article receiving recesses formed in its periphery; hopper means connected with said disk, said hopper means adapted to receive and hold a plurality of small articles to be counted, said support having a discharge aperture disposed below the path of travel of the recesses; normally open switch means mounted on said support adjacent the path of travel of the recesses in said disk so that articles carried by the recesses in said disk successively close said switch means as the disk is rotated; and electrical circuit means connected with a source of electrical energy for operating said motor, and rotating said disk, said electrical circuit means including, a single pole multiple contact selector switch having a manually positioned indicator, a single pole multiple contact ratchet relay having an indicator biased to starting position, wiring interconnecting the contacts of said ratchet relay with the respective contacts of said selector switch, a first relay and a second relay, make and break contacts controlled by said first and second relays, and other wiring interconnecting a source of electrical energy with said first and second relays and said ratchet relay through the indicators of said ratchet relay and said selector switch so that each time an article carried by a recess in said disk closes said normally open switch means, said ratchet relay is energized to advance the indicator of the latter and said motor is de-energized by the breaking of said make and break contacts when the indicator of said ratchet relay is advanced to the predetermined setting of the indicator of said selector switch energizing said second relay and de-energizing said first relay.

2. Structure as specified in claim 1 in which said hopper means is positioned in spaced relation above said disk and includes a delivery trough extending between said hopper and an arc of the periphery of said disk for positioning articles carried by said hopper for reception by the recesses in said disk.

3. Structure as specified in claim 2 and a second motor mounted within said frame, said motor having a drive shaft projecting upwardly through said support; a plate connected with and driven by the drive shaft of said second motor, a peripheral portion of said plate being closely spaced with respect to a peripheral portion of said disk for contacting articles delivered by said delivery trough to regulate movement of the articles out of the discharge end of said trough.

4. An apparatus for counting small articles, including: an inclined platform; a disk flatly contacting the upper surface of said platform, said disk having equally spaced-apart article receiving recesses formed in its periphery; means adjacent said platform and cooperating with said disk to position only one article to be counted in each article receiving recess; motor means for rotating said disk, said platform having an aperture disposed below the path of the recesses as the disk is rotated permitting articles to be counted, deposited in the recesses, to fall therethrough by gravity; normally open switch means supported by said platform so that articles carried by the recesses successively contact and close said switch means; and electrical circuit means connecting a source of electrical energy with said motor and said switch means for stopping said motor after the passage of a predetermined number of articles through the aperture in said support, said electrical circuit means including, at least one single pole multiple contact selector switch having an indicator selectively positioned manually, at least one single pole multiple contact ratchet relay having an indicator biased to a starting position and progressively movable between the contacts, a first relay connected with said ratchet relay for stopping the motor, a second relay connected with said first relay, and other electrical wiring interconnecting the contacts of said selector switch with the indicator of said ratchet relay and interconnecting said normally open switch means with said ratchet relay and connecting the indicator of said selector switch with said second relay, whereby the indicator of said ratchet relay is advanced from one contact to the next toward a predetermined setting of said selector switch indicator each time an article carried by the recesses in said disk closes said normally open switch means and said motor is de-energized when the indicator of said ratchet relay is advanced to the predetermined setting of the indicator of said selector switch energizing said second relay and de-energizing said first relay.

5. Structure as specified in claim 4 in which the first said means is a hopper positioned in spaced relation above said disk and includes a delivery trough extending between said hopper and an arc of the periphery of said disk for positioning articles carried by said hopper for reception by the recesses in said disk.

6. Structure as specified in claim 5 and a second motor mounted within said frame, said motor having a drive shaft projecting upwardly through said support; a plate connected with and driven by the drive shaft of said second motor, a peripheral portion of said plate being closely spaced with respect to a peripheral portion of said disk for contacting articles delivered by said delivery trough to regulate movement of the articles out of the discharge end of said trough.

7. Structure as specified in claim 6 in which said normally open switch means comprises a microswitch having an arm disposed above said disk in the path of

travel of the recesses; and a guide connected with said support and having an arcuate surface positioned in closely spaced relation to an arc of the periphery of said disk for holding articles to be counted within the recesses of said disk as the latter rotates the articles toward a discharge position.

8. An article counting device, including: a frame; a support connected to said frame, said support having an inclined upper surface; a motor mounted within said frame, said motor having a drive shaft projecting upwardly through said support; a disk axially connected with said drive shaft in face to face contact with the upper surfaces of said support for rotation with said drive shaft; hopper means associated with said disk, said hopper means adapted to receive and hold a quantity of relatively small articles to be counted, said disk having spaced-apart recesses formed in its periphery, each said recess being adapted to receive only one of the articles therein as the disk is rotated, said support having a discharge aperture disposed below the path of travel of the recesses; a chute connected at one end with the lower surface of said support around the discharge aperture therein for removing articles carried by the recesses to a point outwardly of the frame as said disk is progressively rotated; and electrical counting means, said electrical counting means including, a normally open switch positioned adjacent the path of travel and successively closed by the passage of the articles in the recesses in said disk as the disk rotates, at least two multiple contact selector switches each having an indicator, at least two multiple contact ratchet relays each having an indicator biased to starting position, wiring



interconnecting the contacts of said selector switches with the contacts of said ratchet relays, a relay and relay operated switches, and other electrical wiring connected with a source of electrical energy and interconnecting said motor, said normally open switch, said relay and said relay operated switches with said ratchet relays and said selector switches, whereby the indicators of said ratchet relays are progressively advanced toward a predetermined setting of the indicators of said selector switches by the passage of articles closing said normally open switch and said motor is de-energized to stop the counting action when either or both indicators of said ratchet relays are advanced to a predetermined setting of said selector switches completing a circuit through said relay and operating said relay operated switches.

9. Structure as specified in claim 8 in which said hopper means is positioned above and in spaced relation with respect to said disk and includes a delivery trough extending between said hopper and an arc of the periphery of said disk for positioning articles carried by said hopper for reception by the recesses in said disk.

10. Structure as specified in claim 9 and a second motor mounted within said frame, said motor having a drive shaft projecting upwardly through said support; a plate connected with and driven by the drive shaft of said second motor, a peripheral portion of said plate being closely spaced with respect to a peripheral portion of said disk for contacting articles delivered by said delivery trough to regulate movement of the articles out of the discharge end of said trough.

No references cited.