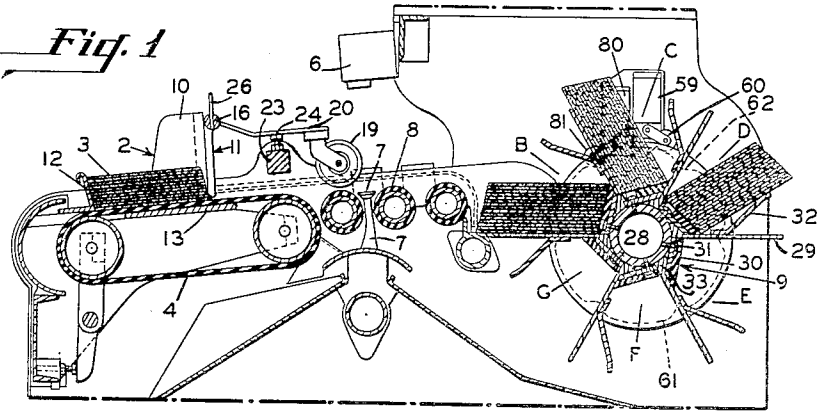
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COUNTING DEVICE

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Fig. 1



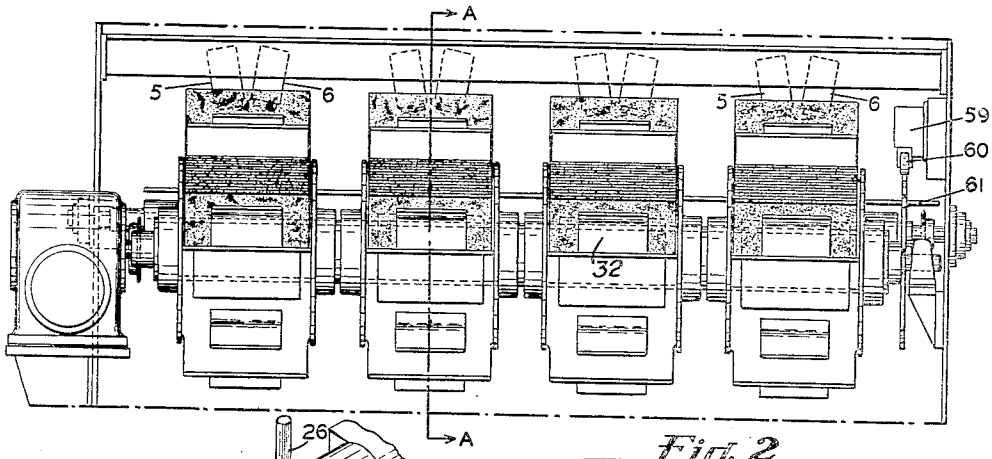


Fig. 2

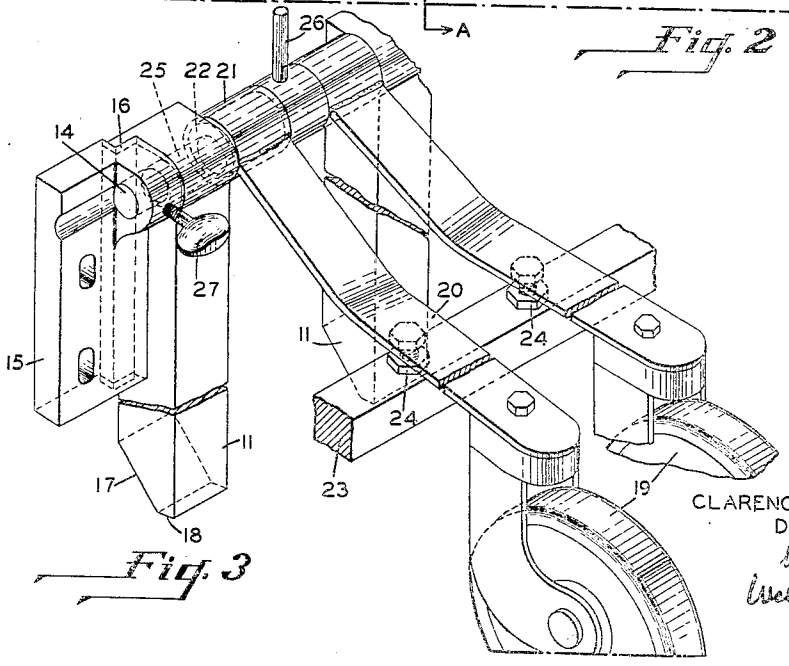


Fig. 3

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COUNTING DEVICE

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Fig. 4

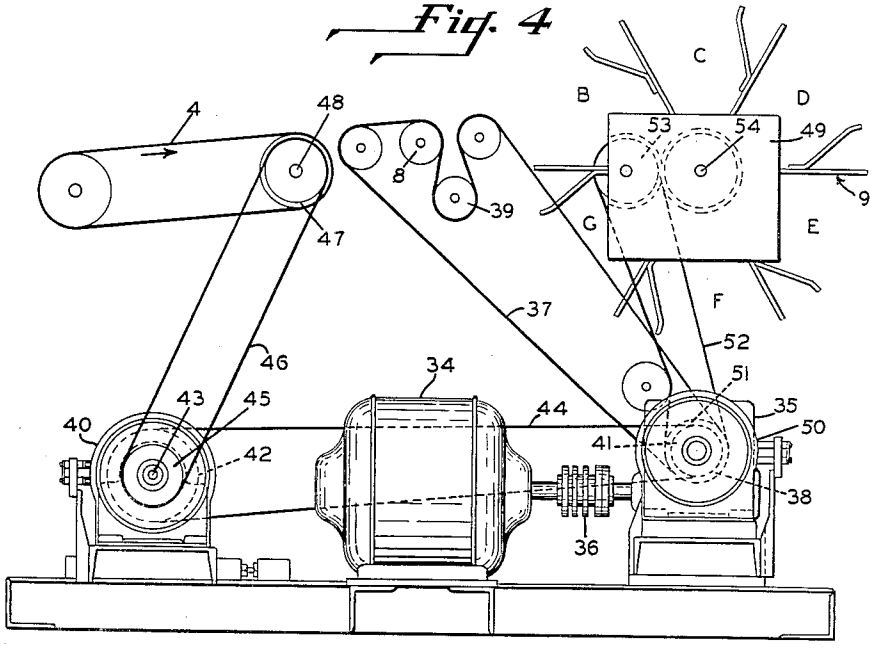
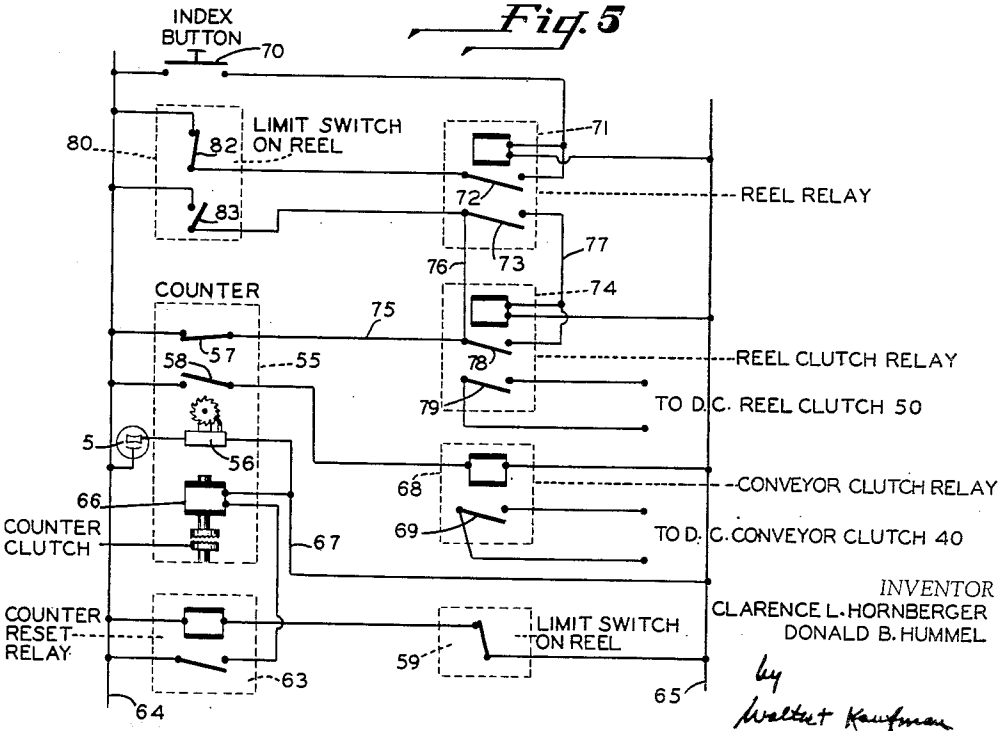


Fig. 5



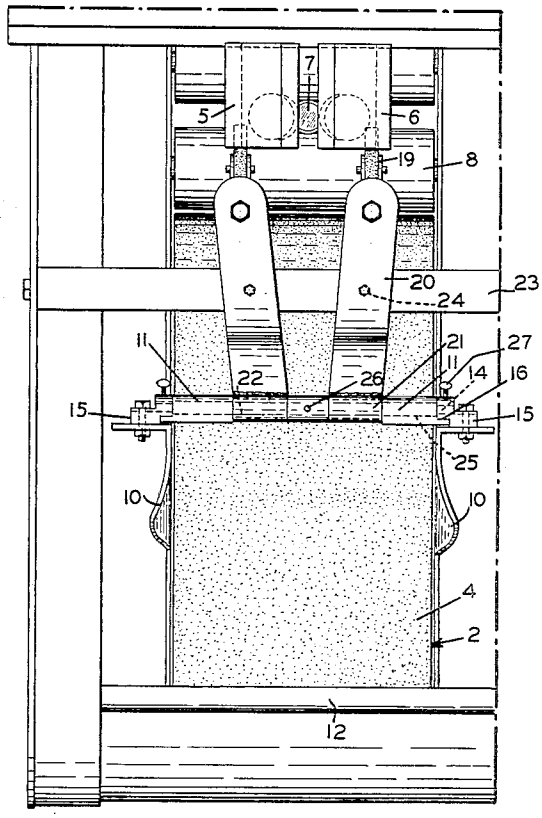
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Fig. 6



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COUNTING DEVICE

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Application June 10, 1952, Serial No. 292,754

4 Claims. (Cl. 93—93)

This invention relates to a counting device and is concerned more particularly with a device for counting resilient tiles or similar flat articles.

Resilient tiles such as so-called asphalt tiles, rubber tiles, cork tiles, and the like are customarily packaged for shipment in corrugated paperboard cartons with a predetermined number of pieces placed in each box. The counting of individual pieces by workmen who fill the boxes is not commercially feasible because of the time involved in making an actual count. Usually packaging is accomplished at the end of the production line after final inspection, and many thousands of pieces are delivered along the line each hour. One practice in the industry has been to determine the number of pieces required to fill a carton, assuming a standard thickness, and to fill each carton. The tiles may vary somewhat in thickness, however, or a piece or two may be slightly bowed when inserted in the box. As a result, the estimated count is not always contained in each package. For the large merchant who is installing tiles from day to day, this is of no real consequence, for the total number will average out satisfactorily, one box in the large number consumed over a period of time will have an extra tile to compensate for a box which is short of tile. With the widespread practice of the home mechanic installing his own tile and purchasing precisely the number of tiles he has calculated will cover the floor to be treated, a short count of a tile or two in those necessary to complete the job may cause considerable delay for the mechanic and embarrassment for the dealer. As a consequence it is desirable to provide for the accurate automatic counting of the tiles for delivery to each carton.

Tiles of different thickness are made; heavier tiles are generally used where heavy traffic is encountered and lighter weight tiles in other areas. Both thicknesses are made on the same equipment, the necessary changes in setting of the forming rolls and dieing equipment being made when changing from one thickness to another.

An object of the invention is to provide a counting device which will accurately count articles delivered thereto and position them in groups of predetermined number for packaging.

Another object of the invention is to provide a counting device which will be readily adjustable to count tiles or other articles of different thicknesses.

Another object of the invention is to provide a counting device which will orient the counted articles in a position where the group of counted articles may be conveniently grasped, with the articles disposed in the form of a parallelepiped, facilitating their insertion into a packing carton.

A further object of the invention is to provide a counting device which will deliver its counted articles to a compartmented reel with suitable controls provided for the delivery of a predetermined number of counted articles to each bin or compartment after the same is rotated to article-receiving position, permitting each bin to be filled sequentially while another bin is being manually or otherwise emptied and the articles delivered to a carton or packaging station, for example.

Other objects of the invention will become apparent from consideration of the following description of an embodiment of the invention which is illustrated in the attached drawings, in which:

Figure 1 is a sectional view taken along the line A—A of Figure 2 showing a portion of a counting machine embodying the invention;

Figure 2 is a rear elevational view of a counting machine showing principally the compartmented reel and some of its control equipment;

Figure 3 is a perspective view, partially broken away, showing the details of an adjusting mechanism useful in converting the counter from operation on one thickness of article to another;

Figure 4 is a diagrammatic view of the driving and clutching arrangement for one of the counting units of Figures 1 and 2;

Figure 5 is a wiring diagram of the counting and control equipment for one of the counting units; and

Figure 6 is a top plan view of a portion of one of the units of Figure 1, illustrating the pressure arrangement of Figure 3 in position on the machine.

The counting unit shown in the drawings is of the multiple counting line type; and, since each line is essentially the same, one will be described. There is a holder 2 (Figure 1) for the reception of a stack of articles 3 to be counted. In the embodiment illustrated, tiles such as asphalt tiles are being counted. An escapement belt 4 delivers the articles, one at a time, to a counting zone where a counter is located, including photocell 5 (Figure 2), a light source 6, and a reflector 7 (Figure 1) for directing the beam of light from the source into the photocell. Driven advancing rolls 8, operating at a surface speed greater than that of the escapement conveyor 4, separate the articles as they pass through the counting zone, and thus the reflected beam of light is intermittently directed into the photocell during the interval between the passage of one article over the reflector 7 and the entrance of the next article into the counting zone. The articles after passage through the counting zone are delivered to an indexed rotatable compartmental bin or cell 9 which receives groups of counted articles and orients them for convenient grasp and insertion into packing cartons.

The holder 2 (Figure 6) comprises a pair of edge guides 10 mounted above the escapement belt 4, a pair of adjustable escape gates 11, a rear guide 12, and a supporting plate 13 (Figure 1) over which the escapement belt 4 is trained. These elements form a pocket which supports a stack of articles in a slightly inclined position as shown in Figure 1, with the lowermost article in the stack lying on the surface of the escapement belt 4. These pockets may be filled by an operator, or the articles to be counted may be delivered thereto automatically from an inspection belt, for example.

One of the escape gates 11 is of right-hand pattern (Figure 3) and the other of left-hand pattern, and they are mounted upon an eccentric cross shaft 14 journalled in bearings in bearing blocks 15. The gates 11 are mounted for sliding motion in a generally vertical direction in ways 16 providing in the bearing blocks. The lower edges of the gates which face the stacked articles 3 are inclined downwardly as indicated at 17 to facilitate the movement of the lowermost article in the stack under the gates upon movement of the escapement belt. The lower edge 18 of each of the gates 11 is disposed in an adjusted position above the escapement belt 4 to permit passage of only a single article therebelow. The arrangement is such that when the lowermost article passes out from below the gates, the next article above

drops into position on the escapement belt and is delivered immediately behind the first article. This action continues so long as the escapement belt is in motion, one article following the other in closely spaced relationship.

The advancing rolls 8, as mentioned previously, serve to separate the articles for effective counting and also to deliver the counted articles to the reel 9. Positive driving of the articles through the counting zone is effected by pressing the articles into engagement with the first of the advancing rolls 8. This is accomplished by a pair of presser rollers 19 (Figures 3 and 6) which are mounted on arms 20, the one end 21 of each of which is received over an eccentric lobe 22 of eccentric shaft 14. A rest bar 23 extends transversely of the machine and is provided with adjustable stops 24 which engage the lower surfaces of arms 20 and space the presser rollers 19 above the advancing roll 8 a distance to permit entrance of an article therebetween, the article lifting the rollers and arms by pivoting the arms about lobes 22, the weight of the assembly holding the article in engagement with driven advancing roll 8 therebelow and insuring positive driving of the article at a speed greater than the surface speed of the escapement belt and thus separating advancing articles moving into and through the counting zone.

The gates 11 and the rollers 19 are arranged for simultaneous adjustment to accommodate articles of different thicknesses such, for example, as resilient tiles ⅛" and 3/16" in thickness. This is effected through eccentric shaft 14 which, as previously mentioned, has lobes 22 which receive the hollow cylindrical ends 21 of the presser roller arms 20. Similar lobes 25, of different throw than lobes 22 because of different angular position and length of the arms 20, are provided for the gates 11 which are bored to receive the lobes 25. An operating handle 26 is secured to the eccentric shaft 14; and upon rotation of this shaft by movement of handle 26 through an arc of 180°, gates 11 are raised or lowered and rollers 19 are comparably raised or lowered, the presser roller arms 20 pivoting over adjustable stops 24. Specifically assuming the machine has been running articles ⅛" thick and it is desired to adjust it for articles 3/16" thick, operating handle 26 will be rotated in a counterclockwise direction as viewed in Figure 3 through 180°, and this will elevate the gates 11 to permit an article 3/16" thick to pass therebelow and will raise presser rollers 19 a comparable amount so that they will properly engage articles 3/16" thick without damage or impediment to proper movement through the machine. Clamping members such as thumb screws 27 are provided for locking the unit in adjusted position. The eccentric shaft 14 is preferably provided with flats on diametrically opposite surfaces to receive the ends of the thumb screws.

Each of the four sections of reel 9 is provided with six bins—B, C, D, E, F, and G as shown in Figure 1. The number of bins is not critical, but six provide for filling with a bin disposed in a substantially horizontal plane, such as bin B of Figure 1, while an advanced bin, bin D of Figure 1, is in a position where the stacked articles are disposed for convenient grasp by an operator for delivery into a packing carton or for positioning in a packaging device.

There is a hollow shaft 28 which is common for all of the reel sections. Compartment dividers 29 project radially from the shaft 28 and are secured in position thereon by clamping plates 30 secured to the shaft 28 by bolts 31. Each compartment divider 29 is provided with an orienting plate 32 which, as shown in Figure 1, holds the stack of articles to be discharged from bin D in an inclined position. The orienting plate 32 is of a width less than the width of the articles as shown in Figure 2, permitting the operator to grasp the outside edges of the stack of articles with both hands. The clamping plate 30 is preferably covered with rubber or other yielding material against which the articles are delivered by the feed rolls 8, the yielding material preventing damage to the edges of the articles which may be delivered to the compartments at considerable velocity. The compartment dividers 29 are provided with flanges 33 which are inclined to provide for firm locking of the dividers by clamping plates 30 and also to incline the plates 30 in such manner that the stack of articles in bin D to be discharged lie in a position with the projecting edges disposed in an inclined position. This facilitates feeding of the articles into a carton, the length and width of which is but very slightly greater than the length and width of the articles.

The arrangement for driving each of the escapement belts 4, the sets of advancing rolls 8, and the reel 9 is shown diagrammatically in Figure 4. There are individual drive arrangements for each escapement belt, but the advancing rolls are driven continuously with a common drive, and the reel is arranged for rotation as a unit. The driving arrangement includes a main drive motor 34 which is connected to a speed reducer 35 by a flexible coupling 36. A chain 37 is trained over a sprocket 38 on the output shaft of reducer 35 and over sprockets secured to the shafts of advancing rolls 8 and an idler tension-adjusting sprocket 39. The arrangement may be such that the surface speed of the advancing rolls 8 may be about 178 feet per minute. As previously mentioned, these rolls are driven continuously during operation of the counter.

Each of the escapement belts 4 is driven intermittently through a clutch and brake unit 40, such as a Stearns Magnetic Clutch and Brake Combination manufactured by Stearns Magnetic Manufacturing Company of Milwaukee, Wisconsin, one such unit being provided for each escapement belt. Driving is effected through a sprocket 41 connected to the output shaft of reducer 35 and a sprocket 42 connected to a common clutch shaft 43 for the clutch and brake units 40. A driving chain 44 is trained about the sprockets 41 and 42. The clutch sleeve of each unit 40 carries a sprocket 45, about which is trained a chain 46 encircling a sprocket 47 on the drive pulley shaft 48 of the escapement belt. The arrangement is such that, when the clutch of a unit 40 is engaged, the escapement belt for that unit will be moved in the direction of the arrow at a speed of about 120.5 feet per minute, for example, and will continue to operate until a predetermined number of articles, say twenty-five, has passed through the counting zone and been counted; whereupon, the counter will initiate a control which will disengage the clutch of the particular unit 40 and simultaneously apply the brake of the unit, halting motion of escapement belt 4. The control arrangement will be more fully described later.

Upon delivery of the counted articles to bin B of reel 9, the bin will be rotated through one-sixth of a revolution to bring bin G into position to receive the next group of counted articles. Where there are a plurality of reel sections 9, as in the illustrated embodiment, the reel sections preferably will be rotated in unison and such rotation will be controlled to prevent rotation unless all operating sections have received their complement of articles. For purposes of illustration and to simplify description, it will be assumed that only one section is in operation.

Rotation of reel 9 is effected through a gear reducer 49 which is also driven by motor 34 through reducer 35. A clutch and brake control unit 50 similar to unit 40 is connected to an output shaft of reducer 35. A sprocket 51 is secured to the clutch sleeve of unit 50 and drives a chain 52 which is trained over a sprocket 53 on the input shaft of speed reducer 49. The output shaft 54 of reducer 49 is connected to hollow shaft 28 of reel 9. When the clutch of unit 50 is engaged, rotation of reel 9 is effected, and when the clutch is disengaged the brake of unit 50 is engaged and rotation is arrested.

Control of movement of the various units described above may be effected electrically as indicated by the simplified wiring diagram of Figure 5.

In the electrical control arrangement shown in Figure 5, provision has been made for rotation of the reel 9 upon delivery of a predetermined number of articles to a single bin B. Those skilled in the art will have no difficulty in incorporating a circuit which will actuate the reel when all or any number of the bins B of the reel sections have been filled (there are four sections in tandem shown in Figure 2), thus presenting the next series of bins G for filling.

There is a photocell counter 55 which includes a ratchet counter-switch 56 with a normally closed contact 57 and a normally open contact 58. Contact 57 is open during counting, however, and contact 58 is closed; the positions of the contacts reverse at count-out as will be more fully hereinafter described. In Figure 5 the equipment is shown in the position assumed by the various elements when all electrical power has been removed from the system. A limit switch 59 is mounted as shown in Figures 1 and 2 and includes a contact actuating arm and roller controller arrangement 60 which rides on a cam 61, the cam normally holding the switch 59 closed. The cam 61 rotates with the reel 9 and is provided with six lobes with separating recesses 62, corresponding in number with the compartments or bins B–G of the reel 9, and controlling the reel upon each one-sixth of a revolution to bring the bins, one at a time, into article-receiving position. When controller 60 of limit switch enters a recess, switch 59 is momentarily opened. Limit switch 59 is shown in the lower right-hand portion of Figure 5 and is connected to control the operation of a counter reset relay 63.

Assuming the limit switch 59 to be closed and power to be applied to the system through lines 64 and 65, counter reset relay 63 will be energized, closing its contact and completing a circuit from line 64 to a solenoid-controlled clutch 66 for the counting unit 55. The solenoid is normally connected to the line 65 by a lead 67. Upon engagement of the clutch 66, contact 58 is closed and contact 57 is opened, such contacts being mechanically connected with the solenoid 66. Upon closing of contact 58 a conveyor clutch relay 68 is energized. This closes contact 69 and supplies direct current to the conveyor clutch unit 40 shown in Figure 4. Thereupon the escapement belt 4 moves to deliver articles 3 from the stack to the bin B as shown in Figure 1. As each article passes through the counting zone it interrupts the light from source 6 being directed into the photocell 5 by the reflector 7, and the ratchet counter-switch 56 is moved stepwise as each article interrupts the light directed to the photocell 5. Upon the passage of a predetermined number of articles through the counting zone, the counter 56 will complete its count and open contact 58 and close contact 57. When this occurs, relay 68 will be de-energized and the escapement belt 4 will be stopped by application of the brake of unit 40.

When a count has been completed and contact 57 is closed, the reel 9 may be rotated to bring a new compartment or bin into position to receive counted articles. When the operator is ready to receive a new group of counted articles for packaging, he presses an index button 70. This completes a circuit for reel relay 71, and its contacts 72 and 73 close. When contact 73 closes, it completes the circuit for a reel clutch relay 74 through contact 57 and leads 75, 76, and 77. Energization of relay 74 closes contacts 78 and 79. Contact 78 serves to interlock the relay 74. Contact 79 completes a circuit for the direct current clutch and brake unit 50 which controls rotation of the reel 9. A second limit switch 80 is mounted on the machine as shown in Figure 1 and has an arm and roller controller arrangement 81 which follows cam 61. This limit switch has two contacts 82 and 83, the contact 82 being normally closed and contact 83 being normally open when the controller

81 is in one of the recess 62 of the cam as shown in Figure 1. Since contact 82 is closed, relay 71 is interlocked by contact 72 and the operator need not hold index button 70. Immediately after the reel 9 starts its rotation, controller 81 leaves the recess 62 and the contacts 82 and 83 are reversed, reel relay 71 then being de-energized by opening of contact 82. Reel clutch relay 74 will remain energized, however, by interlock contact 78 through contact 83 of the limit switch 80 and lead 76. When reel 9 moves to a point where controller 60 of limit switch 59 enters the next recess 62, the contact of switch 59 will be momentarily opened, de-energizing reset relay 63 and solenoid clutch 66. Spring action returns the counter to a zero setting, and contacts 57 and 58 are momentarily reversed as controller 60 falls into the recess 62 and is again elevated by the oncoming lobe of the cam 61. This does not affect reel clutch relay 74, however, because of its interlock contact through contact 83 of limit switch 80 as mentioned above. Movement of the reel 9, therefore, continues until controller 81 of limit switch 80 enters the next recess 62 of cam 61; whereupon, contact 83 opens and contact 82 closes. Opening of contact 83 interrupts the supply of energizing voltage to reel clutch relay 74, and it falls open, breaking the circuit for the reel clutch 50 and applying the brake of that unit to stop the reel with bin G in position to receive counted tiles.

It will be noted by reference to Figure 1 that the limit switches 59 and 80 are so positioned on the machine that controller 60 of switch 59 is lowered and raised by movement of the cam 61 immediately prior to movement of the controller 81 of switch 80 into a recess 62 to interrupt the rotation of the reel. This permits the delivery of articles by the escapement belt 4 to commence just as soon as the counter has been reset by the momentary interruption of the current supply to the reset relay 63 which occurs when the controller 60 of limit switch 59 moves into a recess 62 of cam 61. By the time the first article is delivered through the counting zone, the reel 9 will have come to rest.

We claim:

1. In a device for counting articles and segregating the same into groups of a predetermined number of articles, the combination of a rotatable reel, a plurality of bins on said reel and movable therewith to bring said bins, one at a time, into article-receiving position, means for delivering articles seriatim through a counting zone to a bin of said reel, counting means responsive to passage of said articles through said counting zone to said bin, means responsive to said counting means for stopping said delivering means upon delivery of a predetermined number of articles through said counting zone, and means responsive to rotation of said reel which brings another bin into article-receiving position for starting said delivering means to deliver articles to said other bin of said reel.

2. In a device for counting articles and segregating the same into groups of a predetermined number of articles, the combination of a rotatable compartmentalized reel, a plurality of bins on said reel and movable therewith to bring said bins, one at a time, into article-receiving position, means for delivering articles seriatim through a counting zone to a bin of said reel, counting means responsive to passage of said articles through said counting zone to said bin, means responsive to said counting means for stopping said delivering means when a predetermined number of articles have passed through said counting zone into said bin, means for rotating said reel to another position when said predetermined number of articles has been received in said bin to bring another bin into position to receive articles from said counting zone, means controlled by said counting means for preventing rotation of said reel until the bin being filled has received its predetermined number of counted articles, and means controlled by rotation of said reel to said other position for

starting said delivering means to deliver articles to said other bin of said reel.

3. In a device for counting articles and segregating the same into groups of a predetermined number, the combination of a rotatable reel and a plurality of bins on said reel and movable therewith to bring said bins, one at a time, into article-receiving position, one wall of each of said bins being essentially plane and unobstructed for the reception of articles delivered to said bin, with said bin disposed in article-receiving position, and the opposite side of said wall having an orienting guide fixed thereto and projecting laterally therefrom to space said articles from the wall of the bin in an inclined position for convenient grasp upon rotation of said bin through an angle of 180° from said article-receiving position to an article-discharge position.

4. In a counting device, the combination of claim 1 in which said means for delivering the articles comprises a travelling conveyor, a driven roll disposed adjacent to said conveyor for positively moving said articles seriatim through said counting zone, a support for holding a stack of articles to be counted disposed on said conveyor with the lowermost article of the stack engaging said conveyor,

an adjustable gate mounted above said conveyor and limiting movement of said articles therebelow to a single article at a time, a pressure member for urging the articles passing below the gate on said conveyor into engagement with said driven roll to be positively moved thereby, and means for simultaneously adjusting said gate and pressure member to accommodate articles of different thicknesses.

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