June 23, 1959 W. W. KOTTAS 2,891,698

PARTS COUNTING DEVICE

Filed March 5, 1956 5 Sheets-Sheet 1

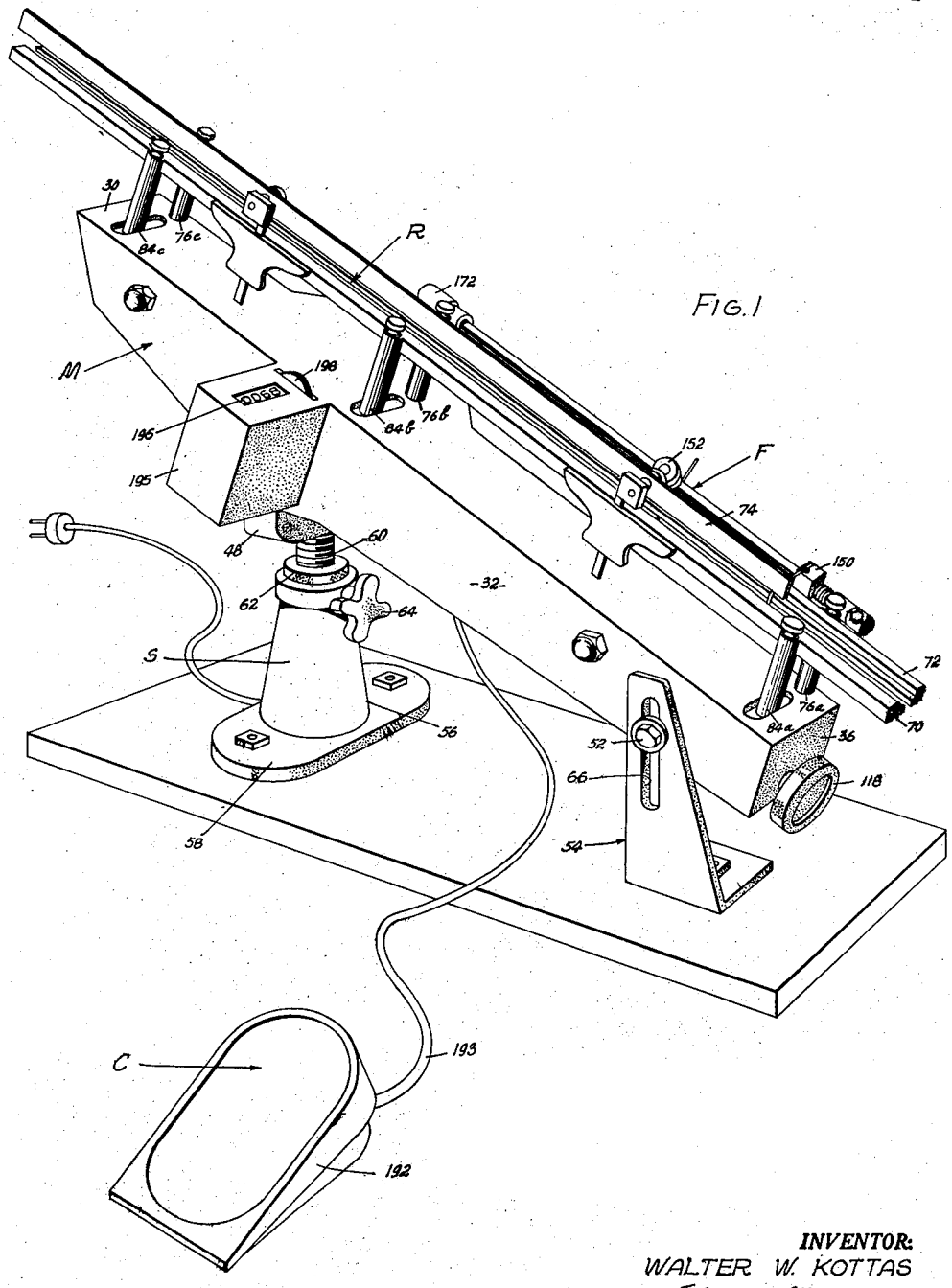


FIG. 1

INVENTOR:
WALTER W. KOTTAS
BY Fulwider, Mattingly and Huntley
ATTORNEYS.

June 23, 1959 W. W. KOTTAS 2,891,698

PARTS COUNTING DEVICE

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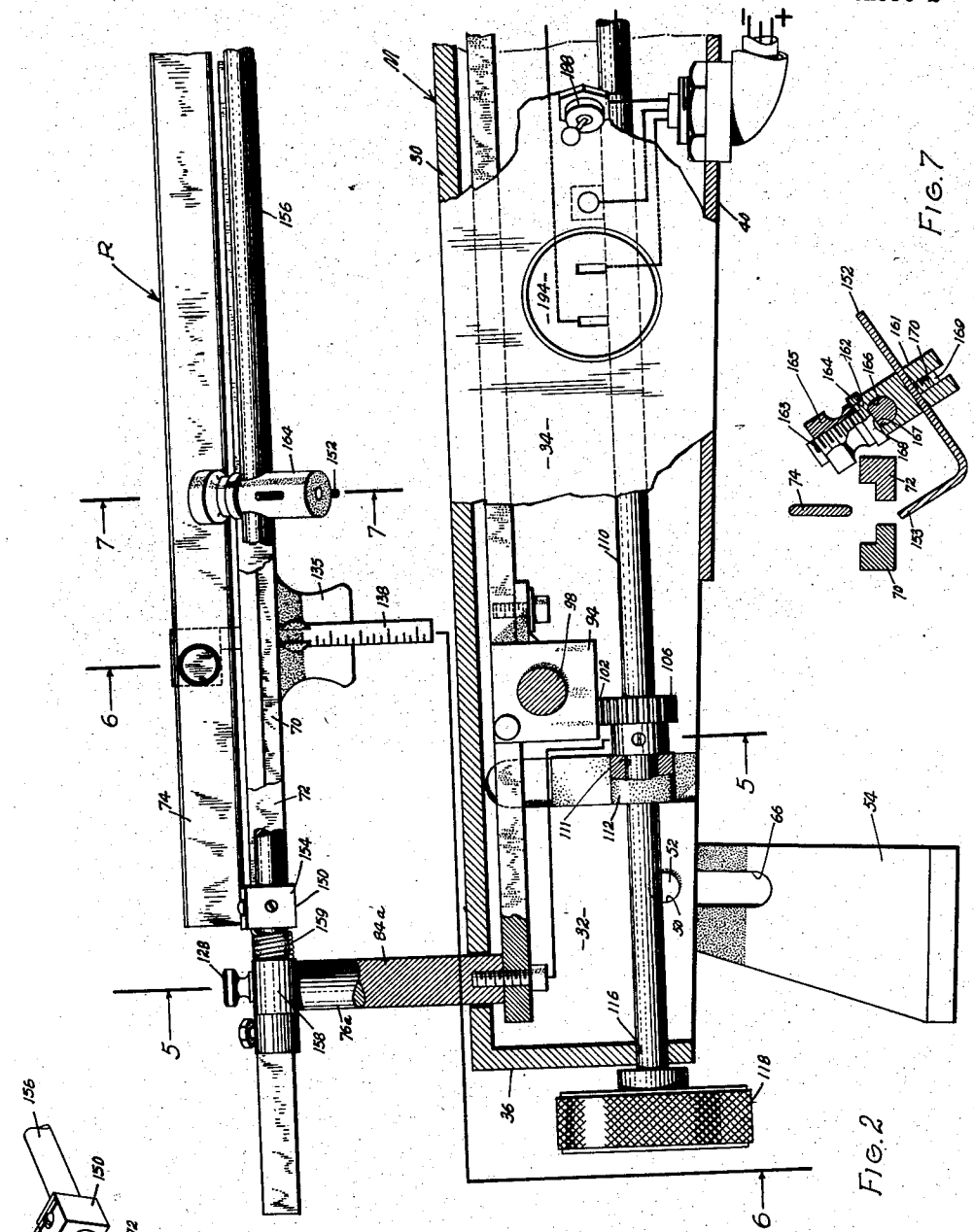


FIG. 2

FIG. 7

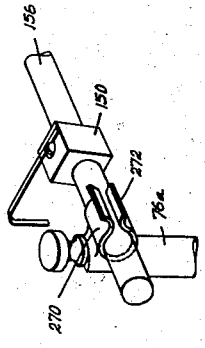


FIG. 24

INVENTOR:
WALTER W. KOTTAS
BY Fulwider, Mattingly and Huntley
ATTORNEYS.

June 23, 1959 W. W. KOTTAS 2,891,698

PARTS COUNTING DEVICE

Filed March 5. 1956 5 Sheets-Sheet 3

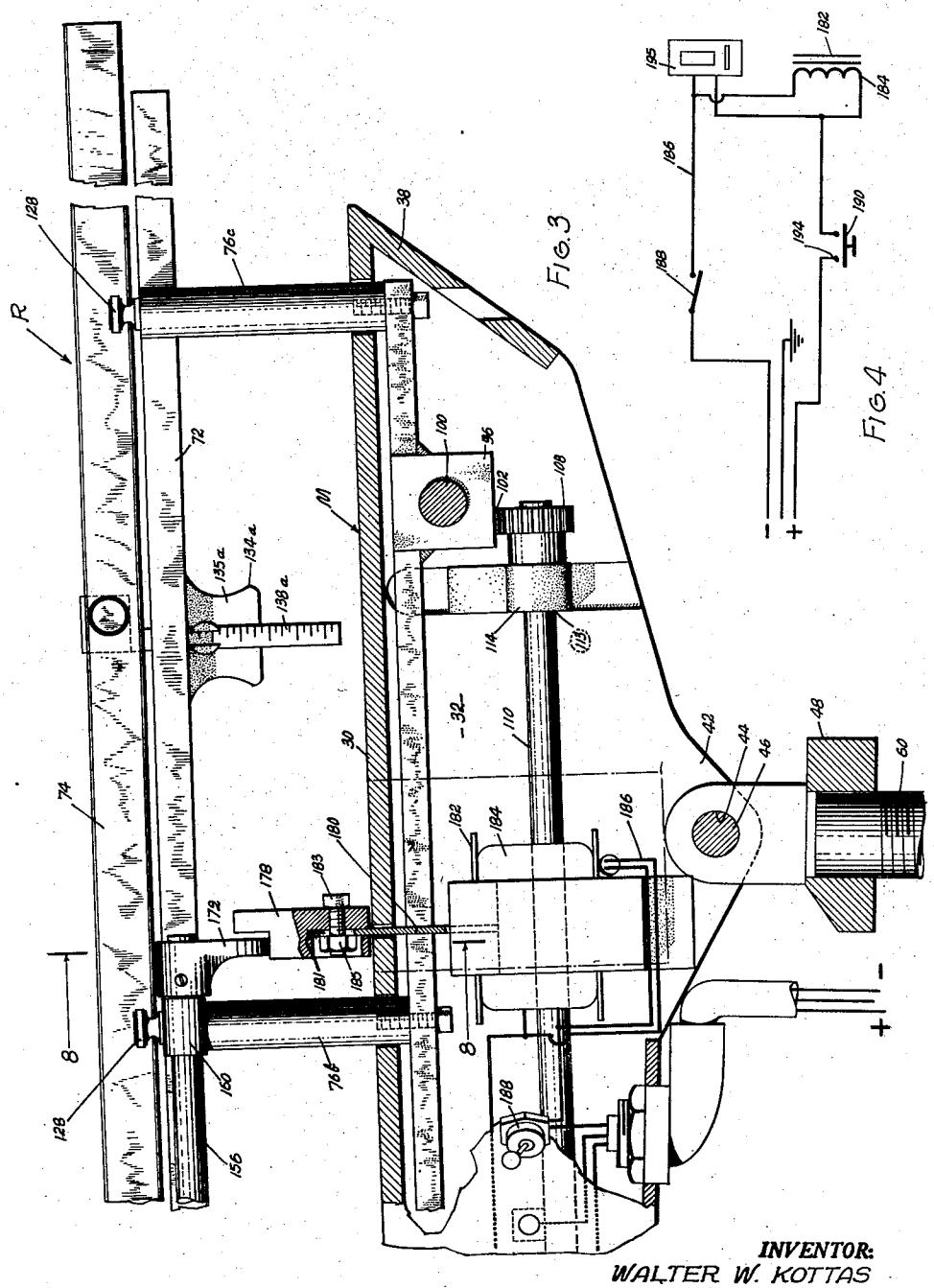


FIG. 3

FIG. 4

INVENTOR:
WALTER W. KOTTAS
BY Fulwider, Mattingly and Huntley
ATTORNEYS.

June 23, 1959 W. W. KOTTAS 2,891,698

PARTS COUNTING DEVICE

Filed March 5. 1956 5 Sheets-Sheet 4

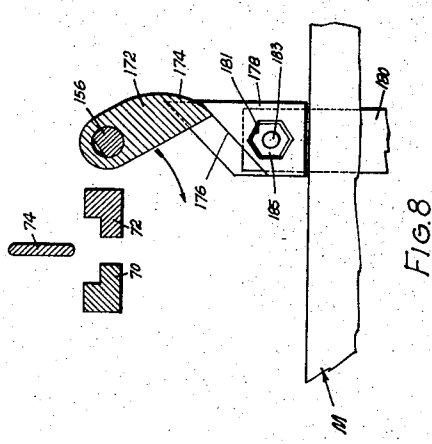


FIG. 8

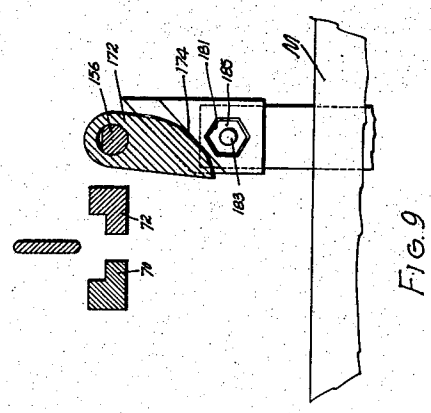


FIG. 9

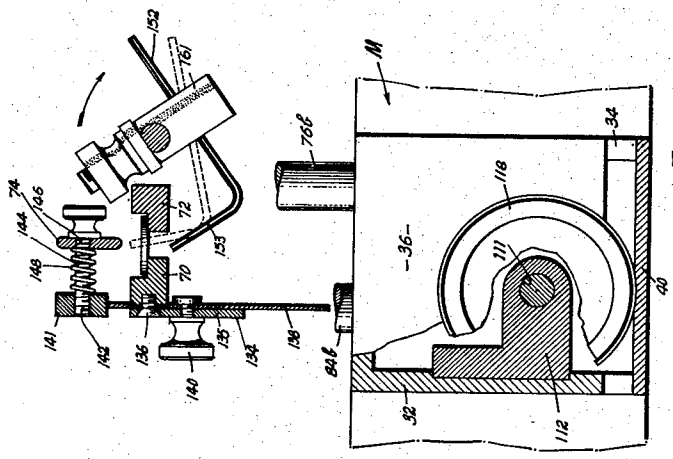


FIG. 6

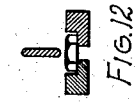


FIG. 12

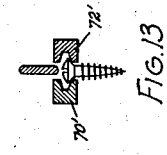


FIG. 13

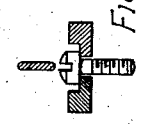


FIG. 11

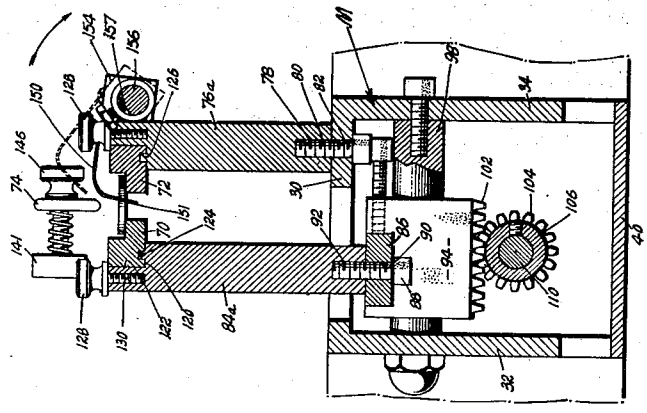


FIG. 5

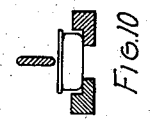


FIG. 10

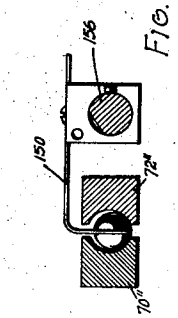


FIG. 14

INVENTOR:
WALTER W. KOTTAS
BY Fulwider, Mattingly and Huntley
ATTORNEYS.

June 23, 1959 W. W. KOTTAS 2,891,698

PARTS COUNTING DEVICE

Filed March 5. 1956 5 Sheets-Sheet 5

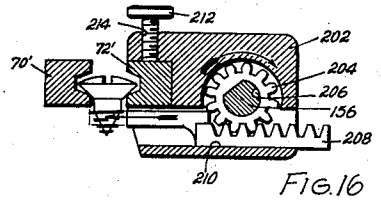


FIG. 16

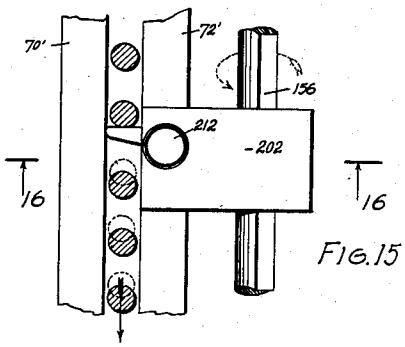


FIG. 15

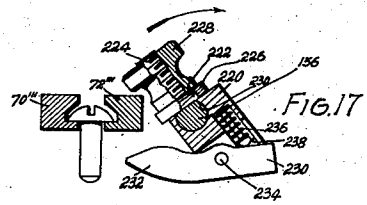


FIG. 17

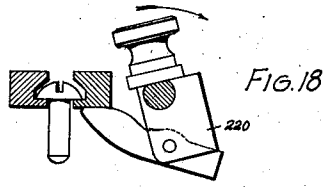


FIG. 18

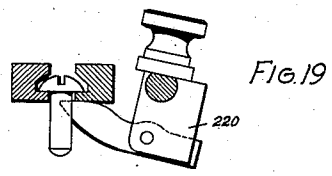


FIG. 19

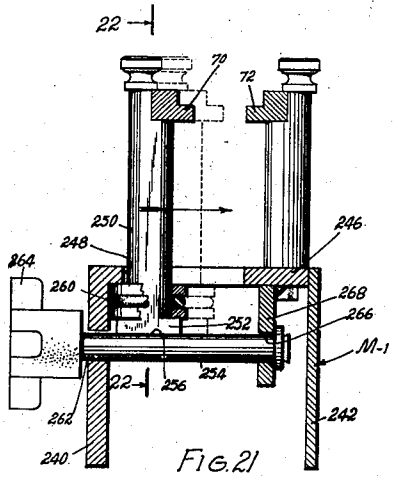


FIG. 21

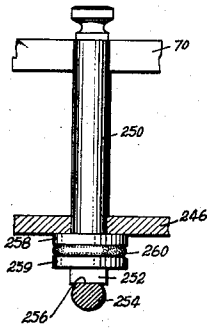


FIG. 22

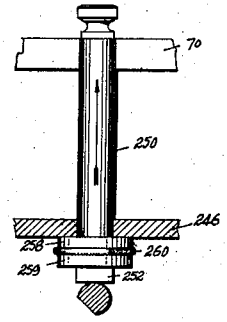


FIG. 23

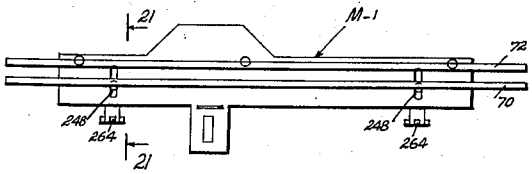


FIG. 20

INVENTOR:
WALTER W. KOTTAS
BY Fulwider, Mattingly and Huntley
ATTORNEYS.

United States Patent Office

2,891,698

Patented June 23, 1959

2,891,698

PARTS COUNTING DEVICE

Walter W. Kottas, Paramount, Calif.

Application March 5, 1956, Serial No. 569,444

20 Claims. (Cl. 221—207)

The present invention relates generally to counting devices and more particularly to a novel and improved device for automatically counting and sorting a desired number of small parts.

It is a major object of the present invention to provide a device which automatically and accurately counts a desired number of small parts and thereby eliminates the need for manually counting and sorting such parts.

Another object is to provide an automatic parts counting device which is extremely simple in design and inexpensive to manufacture whereby it may be sold at a comparatively low price to a maximum number of users.

A further object of the invention is to provide a parts counting device which offers greater flexibility with regard to the types and sizes of parts handled than is possible with existing automatic parts counters.

Yet another object is to provide a parts counting device which is foolproof and positive in operation, even when utilized by unskilled workmen.

A more particular object of the invention is to provide a parts counting device utilizing a novel parts-supporting rail structure that permits maximum flexibility of operation.

An additional object is to provide a counting device wherein the flow rate of the counted parts may be readily and quickly adjusted for optimum conditions.

It is another object to provide a parts counting device that is light in weight and compact in size.

Yet another object of the invention is to provide a parts counting device that utilizes a simple yet effective jam clearing arrangement.

An important object of the invention is to provide a parts counting device of the aforedescribed nature which is especially adapted for use with one or more similar parts counting devices for simultaneously counting a number of different types of parts for packaging in a single container.

Another object is to provide a parts counting device requiring a minimum amount of servicing over a long and useful service life.

These and other objects and advantages of the present invention will become apparent from the following detailed description, when taken in conjunction with the appended drawings, wherein:

Figure 1 is a general perspective view showing a preferred form of parts counting device embodying the present invention;

Figure 2 is an enlarged side elevational view, taken partly in vertical section, showing the left-hand portion of the parts counting device of Figure 1;

Figure 3 is a right-hand continuation of Figure 2;

Figure 4 is an electrical wiring diagram which may be used with said parts counting device;

Figure 5 is a vertical sectional view taken on line 5—5 of Figure 2;

Figure 6 is a vertical sectional view taken on line 6—6 of Figure 2;

Figure 7 is a vertical sectional view taken on line 7—7 of Figure 2;

Figure 8 is a vertical sectional view taken on line 8—8 of Figure 3;

Figure 9 is a view similar to Figure 8 but showing certain parts thereof disposed in a different position;

Figures 10 through 14 disclose various parts-supporting rail arrangements usable with said parts counting device;

Figure 15 is a top plan view of a second form of counting finger arrangement usable with said device;

Figure 16 is a vertical sectional view taken on line 16—16 of Figure 15;

Figures 17 through 19 disclose a third form of counting finger arrangement which may be utilized with said counting device;

Figure 20 is a plan view in reduced scale showing a second form of parts counting device embodying the present invention;

Figure 21 is an enlarged vertical sectional view taken on line 21—21 of Figure 20;

Figure 22 is a vertical sectional view taken on line 22—22 of Figure 21;

Figure 23 is a view similar to Figure 22 but showing certain parts therein disposed in a different working position; and

Figure 24 is a fragmentary perspective view showing an alternate manner of mounting the counting finger assembly of said parts counting device.

General arrangement

Referring to the drawings and particularly Figure 1 thereof, the preferred form of counting device embodying the present invention broadly comprises a main frame M; support means S for maintaining the main frame in a vertically inclined position; a rail assembly R carried by the main frame M along which the parts to be counted continuously slide downwardly under the influence of gravity; a finger assembly F disposed adjacent the rail assembly R for segregating the desired number of parts from those passing along the rail assembly; and a control member C for effecting successive operation of the finger assembly F so as to permit the desired number of parts to pass out through the lower right-hand end of the rail assembly R. The parts to be counted are continuously transported to the upper rear end of the rail assembly R by suitable feeding means, the latter forming no part of the present invention.

The main frame M

More particularly, the main frame M is of elongated, hollow configuration and includes a top wall 30, side walls 32 and 34, a front wall 36 and an inclined rear wall 38. The intermediate portion of the side walls 32 and 34 are integrally interconnected by a bottom wall 40. As shown in Figure 3, the rear portion of the side walls 32 and 34 define a pair of downwardly extending ears 42 formed with aligned horizontal bores 44. These bores 44 each receive a horizontal pivot pin 46 for pivotally connecting the frame to the bifurcations of a generally U-shaped bracket 48 constituting a portion of the support means S. Referring to Figure 2, the front portion of one of the side walls 32 is formed with a bore 50 that receives an adjustment bolt 52. This adjustment bolt 52 serves to connect the front portion of the frame to a generally L-shaped bracket 54 which constitutes another portion of the support means S.

The support means S

Referring again to Figure 1, the support means S includes a pedestal 56 for supporting the rear portion of the main frame M and the generally L-shaped bracket 54. The lower end of the pedestal is formed with a horizontal

flange 58 permitting it to be rigidly affixed to a structural member upon which the device is supported. A threaded column 60 is vertically adjustably carried by the pedestal 56. The relative vertical position of the column 60 with respect to the pedestal 56 may be controlled by rotation of a collar element 62. A thumb screw 64 is provided for temporarily locking the column 60 in any desired position. The upper end of the column 60 is rotatably journaled within the mid-portion of the U-shaped bracket 48. The vertical leg of the L-shaped bracket 54 is formed with a vertically extending slot 66 which slidably receives the adjustment bolt 52. The horizontal leg of this bracket is adapted to be rigidly affixed to the supporting structure. With this arrangement, the vertical inclination of the main frame may be readily adjusted for a purpose to be fully set forth hereinafter.

The rail assembly R

The rail assembly R includes a pair of parallel side rails 70 and 72 together with a center rail 74 disposed thereabove. Referring to Figure 5, the right-hand side rail 72 is rigidly secured to the top wall 30 of the main frame M by a plurality of vertically extending posts 76*a*, 76*b* and 76*c*. The lower end of each of these posts are formed with a vertically extending threaded bore 78 for receiving a bolt 80 extending upwardly from the interior of the main housing M through a bore 82 formed in the top wall 30. The left-hand side rails 70 are supported by a second set of three upstanding posts 84*a*, 84*b* and 84*c*. These latter posts are aligned with the posts 76*a*, 76*b* and 76*c*, however, they are movable horizontally relative thereto. The lower ends of the posts 84*a*, 84*b* and 84*c* are rigidly secured to an elongated, longitudinal, flat rod 86 by bolts 88. These bolts extend upwardly through aligned vertical bores 90 and 92 formed in the rod 86 and the lower end of the columns 84*a*, 84*b* and 84*c*, respectively. The latter bores are internally threaded. As indicated in Figures 2, 3 and 5, the front and rear portions of the rod 86 are rigidly affixed to a front rack 94 and a rear rack 96. The front rack 94 is slidably carried by a transverse dowel pin 98 interposed between the side walls 32 and 34 of the main frame M. Similarly, the rear rack 96 is slidably supported upon a transverse rear dowel pin 100. The lower ends of the racks are formed with teeth 102. The latter are engaged with complementary teeth 104 formed on a pair of front and rear pinions 106 and 108, respectively. These pinions are keyed to a longitudinally extending shaft 110. The front portion of the shaft 110 is journaled within the bore 111 of a bearing 112 secured to the front portion of the side wall 32, as indicated in Figures 2 and 6. The rear portion of the rod 110 is journaled within a bore 113 of a similar bearing 114 supported by the rear portion of the side wall 32. The front end of the shaft 110 extends through a bore 116 formed in the front wall 36 of the main housing M and it is keyed to a knurled control knob 118 disposed exteriorly of the front wall. With this arrangement, rotation of the control knob 118 will effect concurrent transverse movement of the left-hand side rail 70 relative to the fixed right-hand side rail 72.

Referring again to Figure 5, each of the side rails 70 and 72 are generally L-shaped in configuration. The proximate sides of the upper end of each of the columns 76*a*, 76*b*, 76*c*, 84*a*, 84*b* and 84*c* are cut away so as to define a horizontal surface 120 and a vertical surface 122 which receive the underside and the outer edge, respectively, of the two side rails 70 and 72. The horizontal surfaces 120 are each formed with a vertically extending tongue 124 that receives a complementary groove 126 formed in the lower portion of each of the side rails. In this manner, the side rails are positively restrained against downward and sideward movement. The side rails are positively restrained against upward movement by a plurality of knurled thumb screws 128 which are removably received by threaded bores 130 formed in the upper portion of each of the rail supporting posts. With this arrangement, the side rails may be made readily interchangeable with other side rails having different configurations for use with various types of parts to be counted.

The center rail 74 is supported by the movable left-hand side rail 70. Thus, referring to Figure 6 it will be observed that a mounting member 134 is provided for this purpose. The mounting member 134 includes a plate 135 that is rigidly secured to the front portion of the side rail 70 by rivets 136. The mounting member 134 also includes a scale element 138 which is vertically slidably carried by the plate 135. The scale element 138 bears printed measurement indicia. A set screw 140 is provided for locking the scale element 138 relative to the plate 135 of the mounting member 134. The upper end of the scale element 138 is affixed to a block 141 of enlarged cross-section and which includes a threaded transverse bore 142. A transversely extending adjustment bolt 144 is carried by this bore 142. The center rail 74 is formed with a bore 146 which receives the adjustment bolt 144. A coil compression spring 148 is interposed between the center rail 74 and the upper end of the block 140. With this arrangement, rotation of the adjustment bolt 144 will effect concurrent transverse movement of the center rail 74 relative to the two side rails 70 and 72 for a purpose to be fully set forth hereinafter. Referring to Figures 1 and 3, it will be observed that a second mounting member 134*a* is provided for the rear portion of the center rail 74. This rear mounting member 134*a* may be identical to the aforedescribed rail mounting member 134.

The finger assembly F

The finger assembly F includes a front or blocking finger 150 shown in detail in Figure 5 and a rear or counting finger 152 shown in detail in Figure 6. Referring first to Figure 5, the blocking finger 150 is of generally L-shaped configuration and includes a generally vertically extending portion 151 which is normally disposed within the transverse space existing between the inner edges of the side rails 70 and 72. The outer end of the horizontal portion of the blocking finger is rigidly affixed to a support block 154. This support block 154 is keyed to a longitudinally extending trip shaft 156. This shaft 156 is formed with a flattened portion 157. As shown in Figure 2, the front portion of the trip shaft 156 is journaled within a sleeve bearing 158 which is rigidly affixed to one side of the side rail support post 76*a*. A torsion spring 159 is interposed between the support block 154 and the underside of the rail 72, as shown in Figure 2. This spring 159 constantly biases the trip shaft 156 in a counter-clockwise direction, relative to Figures 5 through 9. As indicated in Figures 3 and 7, the rear end of the trip shaft 156 is journaled by a similar sleeve bearing 160 which is rigidly affixed to the post 76*b*. Referring now to Figures 6 and 7, the rear or counting finger 152 is also generally L-shaped in configuration and is affixed to a slider member 161. The slider member 161 is generally cylindrical and is formed at its upper portion with a boss 162 of reduced diameter. A coaxial threaded post 163 extends upwardly from this boss 162. A washer 164 is removably retained upon the boss by a knurled nut 165 carried by the post 163. A passage 166 is formed through the slider member 161 for slidably receiving the trip shaft 156. This passage 166 includes a flat upper wall 167 disposed in the same plane as the shoulder 168 defined by the lower end of the boss 162 and corresponding in width to the flattened portion 157 of the trip bar 156. The lower portion of the passage 166 is of annular configuration and being slightly larger in dimension than the trip shaft 156. With this arrangement, the washer 164 will be urged against the flattened portion of the trip shaft 156 when the nut 165 is tightened upon the

post 163 so as to thereby lock the slider member 161 against movement relative to the trip bar. If the nut 165 is loosened, however, the slider member may undergo longitudinal movement along the trip bar. The lower end of the slider member 161 is formed with a bore 170 wherein the horizontal leg of the counting finger 152 is retained by a set screw 169 for a purpose to be fully set forth hereinafter.

The rear end of the trip shaft 156 is keyed to a cam finger 172. As indicated in Figures 8 and 9, the cam finger 172 is formed with a curved cam surface 174. This latter surface 174 is in engagement with a slanted surface 176 formed on the upper end of a cam element 178. Referring now to Figure 3, the cam element 178 is secured to the upper end of the plunger 180 of an electric solenoid 182 mounted within the confines of the main housing M. It will be observed that the plunger 180 is formed with a vertical slot 181 for receiving a bolt 183, the latter being held in place by a nut 185. With this arrangement, upon energization of the windings of the electric solenoid 182 the solenoid plunger 180 and hence the cam 178 will be raised from their normal position of Figure 8 to their position of Figure 9. Such upward vertical movement of the cam 178 will cause the cam finger 172 to be rotated in a clockwise direction from its position of Figure 8 to that of Figure 9. In this manner the trip shaft 156 and hence the blocking finger 150 and the counting finger 152 will also be caused to undergo clockwise rotation through a predetermined angle, the blocking finger and the counting finger moving from their solid outline position of Figures 5 and 6 to their dotted outline position therein. The angle through which these fingers are rotated may be controlled by adjustment of the cam 178 relative to the solenoid plunger 180, the bolt 183 being loosened so as to carry out such adjustment.

The Control Means C

As indicated in Figures 2, 3 and 4, the windings 184 of the electric solenoid 182 are connected by suitable wiring 186 to a source of electric current. Preferably, a master switch 188 will be mounted on one side of the main housing M. A second switch 190 which is shown as being controlled by a foot pedal 192 is provided for completing the circuit between the source of electric current and the solenoid windings 184. The lead 193 from the foot pedal 192 is attached to a plug (not shown) that is removably insertable within a complementary socket 194 secured to the side wall 34 of the main frame M. The circuit may also include an electric counter 195 shown mounted on side wall 32 of the main frame M. This counter 195 is formed with a viewing window 196. It may also include a manual re-set dial 198. With this arrangement, when the foot pedal 192 is depressed the switch 190 will be closed so as to momentarily complete the electrical circuit through the windings 184 of the solenoid 182. Simultaneously, the electric counter 195 will be actuated through one counting cycle.

Operation of the device shown in Figures 1 through 14

It is essential to the proper operation of the preferred form of parts counting device embodying the present invention that the rails 70, 72 and 74 be arranged with the proper vertical inclination. This is necessary in order to insure optimum flow of the parts to be counted along these rails. If the inclination is too steep, the parts may cluster and jam within the rails. On the other hand, if the inclination is too shallow, the flow will be impeded. The proper angle of inclination may readily be obtained by vertically adjusting the column 60 with respect to the pedestal 56. It may also be necessary to loosen the adjustment bolt 52 so as to permit it to slide within the slot 66 of the bracket 54 and adjust the elevation of the front portion of the main frame M. Once the proper vertical inclination has been obtained, the support means S will positively retain this setting.

It is also necessary in order to insure proper gravity flow of the parts to be counted, that the rails 70, 72 and 74 be properly adjusted with respect to the configuration of these parts. This adjustment involves rotation of the control knob 118 so as to move the side rail 70 towards or away from the fixed side rail 72. Additionally, the vertical spacing between the center rail 74 and the two side rails must be properly adjusted. This vertical adjustment is obtained by manipulation of the scale elements 138 relative to the plates 135 of the mounting members 134. Finally, the transverse spacing of the center rail 74 must be obtained. This operation is carried out by rotation of the adjustment bolts 144. In this manner, the rails 70, 72 and 74 may be adjusted to the requirements of most of the parts that may be handled by the device. Referring to Figures 10, 11 and 12, there are shown three examples of the many types of parts which may be satisfactorily handled by the aforedescribed rail mounting assembly.

In Figure 13 there is shown a modified pair of side rails 70′ and 72′ which may be substituted for the rails 70 and 72. Such substitution may be easily affected by loosening the locating pins 128. In Figure 14 there is disclosed a third pair of side rails 70″ and 72″ that may be susbtituted for rails 70 and 72. Rails 70″ and 72″ are especially adapted for handling ball elements. This type of side rail does not require a center rail. It should be observed that where long production runs are anticipated, specially machined rails such as those shown in Figure 14 will be provided. Where the user anticipates shorter production runs, however, the rail supporting arrangement disclosed in Figures 1 through 12 will be employed.

Once the proper inclination of the main frame M and the adjustment of the rails has been obtained, the counting finger 152 will be adjusted longitudinally relative to the trip shaft 156 so as to provide the desired number of parts per operating cycle. This adjustment is obtained by first loosening the lock nut 165 of the slider member 161 whereby the latter may be moved longitudinally along the trip shaft 156. With the aforedescribed arrangement, it is possible to obtain a count of one up to several parts per operating cycle.

After this adjustment has been carried out, the parts may be fed into the upper end of the rails, 70, 72 and 74 from which point they will flow downwardly through the rails under the influence of gravity. Thereafter, whenever the foot pedal 192 is depressed, the solenoid windings 184 will be momentarily energized. Such momentary energization of the solenoid windings will lift the solenoid plunger 180 and hence the cam 178. This upward vertical movement of the cam 178 will rotate the finger 172 and the trip shaft 156 in a clockwise direction relative to Figures 5 through 9. As indicated in Figure 5, such rotation of the trip shaft 156 will lift the vertical portion 151 of the blocking finger 150 from its normal position forwardly of the lowermost part to be counted. Referring to Figure 6, simultaneously the vertical portion 153 of the counting finger 152 will be raised from its normal position. Accordingly, all of the parts disposed between the two fingers 150 and 152 will slide out of the lower end of the rails.

The parts disposed above and rearwardly of the counting finger 152 will be restrained against forward movement by the vertical portion 153 of this finger. Thereafter, the solenoid plunger 180 and the cam 178 will drop back into their normal positions of Figure 8 under the influence of gravity. If necessary, this downward movement can be aided by suitable spring means (not shown). As the cam element 178 drops, the trip shaft 156 will be rotated in a counter-clockwise direction relative to its original position under the influence of the torsion spring 159. When the fingers 150 and 152 have returned to their original positions, the parts disposed in the rails upwardly of the counting finger 152 will slide

downwardly until the lowermost part abuts the rear of the vertical portion **151** of the blocking finger **150**. The depression of the foot pedal **192** will, in addition to momentarily energizing the solenoid windings **184**, effect a counting cycle of the electric counter **195**.

Should the parts flowing down the rails become jammed due to the existence of foreign, bent or defective units, this jam may be quickly cleared by rotation of the control knob **118**. Such rotation will effect transverse movement of the side rail **70** and the center rail **74** away from the fixed rail **72**. Once the jam has been cleared, the control knob **118** may be employed to return the rails **70** and **74** to their original position. It should be particularly observed that the rails **70** and **74** will always be maintained in exact parallelism with the rail **72** by virtue of the aforedescribed rack and pinion arrangement. It is essential that such parallelism be maintained in order to insure optimum flow conditions for the parts being counted.

At this point it should be noted that the aforedescribed device is especially adapted for use with a packaging machine and one or more similar parts counting devices in simultaneously counting a number of different types of parts for packaging in a single container. Where this arrangement is employed, the part counting devices are arranged in a semi-circular pattern, so as to converge at a single funneling point. Under such circumstances, the foot pedal **192** is generally replaced with an electric limit switch that is operatively connected to the packaging machine and timed to synchronize with the feeding and packaging pace of this machine.

Description of Figures 15 and 16

In Figures 15 and 16 there is shown a second form of counting finger arrangement usable with the aforedescribed parts counting device. This particular form of counting finger arrangement is especially adapted for use with parts which require a comparatively wide transverse spacing between the two side rails **70** and **72**, as for example parts having a wide head but a short shank. This finger arrangement includes a slider member **202** which journals a pinion element **204**. This pinion element **204** is coaxially formed with a bore **206** that is keyed to the aforedescribed trip shaft **156**. The pinion **204** is engaged with the teeth of a rack **208**, the latter constituting the actual parts-engaging counting finger. This rack **208** is slidably mounted within a transverse passage **210** formed in the lower portion of the slider member **202**. With this arrangement, rotation of the trip shaft **156** will effect concurrent rotation of the pinion **204** so as to cause the rack **208** to undergo transverse movement relative to the rails **70'** and **72'**, the rack element **208** moving from its solid outline position of Figures 15 and 16 to its dotted outline position therein. The longitudinal position of the slider member **202** relative to the rails **70** and **72** may be adjusted by means of a set screw **212** which is disposed within a vertically extended threaded bore **214** formed in the inner portion of the slider member **202**. The lower end of this bore **214** intersects the upper surface of the side rail **72**.

Description of Figures 17, 18 and 19

In Figures 17, 18 and 19 there is shown a third form of counting finger arrangement which may be utilized with the aforedescribed parts counting device. This form of counting finger arrangement is also especially adapted for use with parts which require a comparatively wide transverse spacing between the two side rails **70'''** and **72'''**. It includes a slider member **220** having an upper portion which is similar to that of the slider member **164** described hereinbefore. Thus, the upper portion of this slider member **220** is formed with a boss **222** from which extends a threaded post **224**. A washer **226** is retained upon the boss **222** by a knurled lock nut **228**. Below the boss **222**, the slider member **220** is formed with a bore **230** that slidably receives the trip shaft **156**. This arrangement makes it possible to effect longitudinal adjustment of the slider member **220** relative to the trip shaft **156**. An elongated rigid finger **232** is pivotally secured to the lower portion of the slider member **220** by a pivot pin **234**. The inner or left-hand end of this finger is pointed and is constantly biased in a clockwise direction by means of a compression spring **236** disposed in a cavity **238** formed in the slider member **220**.

In Figure 17, the parts are shown disposed in their normal position. In Figure 18, the solenoid windings have been energized whereby the trip shaft **156** has started its clockwise rotation. At this time, the inner end of the finger **232** will have engaged the underside of the rail **72**. Referring now to Figure 19, continued clockwise rotation of the trip shaft **156** will cause the free end of the finger **232** to move transversely inwardly along the underside of the two rails **70** and **72** whereby it will block the flow of parts therealong. As the trip shaft and slider member **220** return to their original positions, the spring **236** will likewise return the finger **231** to its original position of Figure 17.

Description of Figures 20 through 23

In Figures 20 through 23, there is shown a modified form of parts counting device embodying the present invention. In this modified form the rack and pinion connection between the main housing M and the movable rail **70** is replaced by a simpler and less expensive construction. In this form of the device, the main housing M–1 is similar to the aforedescribed main housing M and includes a pair of side walls **240** and **242** which are integrally connected at their upper ends by an upper wall **246**. The upper wall is formed with a pair of transversely extended elongated slots **248** for receiving a pair of identical rail supporting posts **250**. The upper portion of these rail supporting posts **250** are similar to the rail supporting posts **84** described hereinbefore. The lower ends of these posts, however, are each integrally formed with a flange **252**. The underside of this flange **252** slidingly abuts a transverse cam shaft **254** having a flattened portion **256**. A pair of collars **258** and **259** are slidably interposed between the upper surface of the flange **252** and the underside of the top wall **246**. A rubber O-ring **260** is interposed between the two collars **258** and **259**. One end of the cam shaft **254** protrudes through a bore **262** formed in the side wall **240** and is keyed to a control knob **264** exteriorly of the main housing M–1. The opposite end of the cam shaft is journaled within a bore **266** formed in a flange **268** depending from the underside of the top wall **246**. With this arrangement, when the flattend portions **256** of the cam shafts **254** are disposed in abutment with the underside of the flanges **252**, the posts **250** will be free to undergo transverse movement within the two slots **248**. When each cam shaft **254** is rotated from its position of Figure 22 to that of Figure 23, it will cam its post **250** upwardly. Accordingly, the upper surface of each top washer **258** will frictionally engage the underside of the top wall **246** with appreciable pressure. The posts **250** will then be frictionally restrained against transverse movement relative to the main housing M–1. It will be noted that this upward movement of the post **250** will serve to compress each of the rubber O-rings **260**. Accordingly, when the cam shafts **254** are again rotated to dispose their flattened portion **256** in abutment with the underside of the flanges **252**, the O-rings will expand to their normal size and thereby force the columns **250** downwardly to their original positions. The operator may effect movement of the side rail **70** towards and away from the other side rail **72** by first rotating the control knobs **264** so as to align the flattened portion **256** of each cam shaft **254** with the underside of its column flange **252**. Thereafter,

the posts 250 may be grasped manually so as to carry out their transverse movement.

Description of Figure 24

In Figure 24 there is shown an alternate arrangement for mounting the ends of the trip shaft **156**. This arrangement makes it possible to readily disengage the trip shaft from the remainder of the assembly. Thus, it is possible to substitute a new trip shaft equipped with a different counting finger arrangement in a minimum amount of time. In this arrangement, the front and rear sleeve bearings **158** and **160** are each replaced by an identical clip element **270**. Each clip element **270** is formed of spring steel and is rigidly affixed to the upper portion of one of the columns **76***a* and **76***b*. Its outer portion is formed with lips **272** which may be forced apart so as to permit the ends of the trip shaft **164** to be inserted and removed therefrom.

From the foregoing description it will be seen that the present invention contemplates a parts counting device offering maximum versatility with regard to the types of parts being counted at a minimum cost. Additionally, the parts counting device of the present invention is completely foolproof and positive in operation. It moreover permits a jam to be cleared and the parts supporting rails thereafter re-set in a minimum amount of time.

It will be apparent that various modifications and changes may be made with respect to the foregoing detailed description without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. A parts counting device, comprising: a frame; a rail assembly supported by said frame at a vertical inclination whereby parts to be counted may flow therealong under the influence of gravity; a trip shaft mounted parallel to said rail; a blocking finger secured to said trip shaft at the front portion of said rail assembly, said blocking finger normally being disposed in the path of said parts for blocking the flow thereof along said rail assembly; a counting finger longitudinally adjustably secured to said trip shaft at a point spaced rearwardly from said blocking finger, said counting finger normally being disposed out of the path of said parts; a cam finger keyed to said trip shaft; a cam engageable with said finger so as to effect the partial rotation of said trip shaft whereby said blocking finger will be moved out of the path of said parts and said counting finger will be concurrently urged into said path thereby permitting the parts originally positioned between said fingers to slide off the front portion of said rail assembly; electric solenoid means on said frame and having a reciprocal plunger; adjustment means interposed between said plunger and said cam for controlling the angle through which said trip shaft is rotated; and control means for effecting momentary energization of said solenoid.

2. A parts counting device, comprising: a frame; a rail assembly for carrying parts to be counted mounted on said frame; a trip shaft mounted parallel to said rail; support means for said frame, said support means having elevation control means for adjusting the vertical inclination of said rail assembly whereby parts to be counted will tend to flow smoothly therealong under the influence of gravity; a blocking finger secured to said trip shaft at the front portion of said rail assembly, said blocking finger normally being disposed in the path of said parts for blocking the flow thereof along said rail assembly; a counting finger longitudinally adjustably secured to said trip shaft at a point spaced rearwardly from said blocking finger, said counting finger normally being disposed out of the path of said parts; a cam finger keyed to said trip shaft; a cam engageable with said finger so as to effect the partial rotation of said trip shaft whereby said blocking finger will be moved out of the path of said parts and said counting finger will be concurrently urged into said path thereby permitting the parts originally positioned between said fingers to slide off the front portion of said rail assembly; electric solenoid means on said frame and having a reciprocal plunger; adjustment means interposed between said plunger and said cam for controlling the angle through which said trip shaft is rotated; and control means for effecting momentary energization of said solenoid.

3. A parts counting device, comprising: a frame; a rail assembly supported by said frame at a vertical inclination with its rear end above its front end whereby parts to be counted may flow therealong under the influence of gravity; a trip shaft mounted parallel to said rail assembly; a blocking finger secured to said trip shaft at the front portion of said rail assembly, said blocking finger normally being disposed in the path of said parts for blocking the flow thereof along said rail assembly; a counting finger assembly spaced rearwardly from said blocking finger, said assembly including a slider member longitudinally adjustably carried by said rail assembly, said slider member journalling a pinion element that is keyed to said trip shaft, and a rack slidably mounted within said slider member for generally horizontal transverse movement relative to the path of said parts, said rack normally being disposed out of the path of said parts; electric solenoid means operatively connected to said trip shaft for effecting partial rotation thereof whereby said blocking finger will be moved out of the path of said parts and the rack of said counting finger will be concurrently urged into said path below said rail assembly to thereby permit the parts originally positioned between said fingers to slide off the front portion of said rail assembly; and control means for effecting momentary energization of said solenoid.

4. A parts counting device, comprising: a frame; a rail assembly supported by said frame at a vertical inclination with its rear end above its front end whereby parts to be counted may flow therealong under the influence of gravity; a trip shaft mounted parallel to said rail assembly; a blocking finger secured to said trip shaft at the front portion of said rail assembly, said blocking finger normally being disposed in the path of said parts for normally blocking the flow thereof along said rail assembly; a counting finger assembly supported by said trip shaft at a point spaced rearwardly of said blocking finger, said counting finger assembly including a slider element that is longitudinally adjustably carried by said trip shaft, a transversely extending lever having its intermediate portion pivotally secured to said slider element and spring means biasing the end of said lever proximate said path upwardly; and power means operatively connected to said shaft for effecting partial rotation thereof whereby said blocking finger will be momentarily moved out of the path of said parts and the free end of the lever of said counting finger assembly will be momentarily urged upwardly into said path below said rail assembly thereby permitting the parts originally positioned between said fingers to slide off the front of said rail assembly.

5. A parts counting device, comprising: a frame; a rail assembly supported by said frame at a vertical inclination with its rear end above its front end whereby parts to be counted may flow therealong under the influence of gravity; a trip shaft mounted parallel to said rail; a blocking finger secured to said trip shaft at the front portion of said rail assembly, said blocking finger normally being disposed in the path of said parts for normally blocking the flow thereof along said rail assembly; a counting finger assembly supported by said trip shaft at a point spaced rearwardly of said blocking finger, said counting finger assembly including a slider element that is longitudinally slidably adjustable relative to said trip shaft, a transversely extending lever having its intermediate portion pivotally secured to said slider element and spring means biasing the end of said lever proximate said path upwardly; electric solenoid means operatively

connected to said trip shaft for effecting partial rotation thereof whereby said blocking finger will be moved out of the path of said parts and the free end of the lever of the counting finger assembly will be concurrently urged into said path below said rail assembly thereby permitting the parts originally positioned between said fingers to slide off the front portion of said rail assembly; and control means for effecting momentary energization of said solenoid.

6. A parts counting device, comprising: a frame; a vertically inclined rail assembly supported by said frame and including a pair of side rails for carrying parts to be counted and a center rail disposed between said side rails; means rigidly securing one of said side rails to said frame; supporting means connecting the second of said rails to said frame and permitting transverse adjustment of said second rail relative to said fixed rail; means interconnecting said center rail and said second side rail and permitting the vertical and transverse adjustment of said center rail relative thereto; a blocking finger mounted at the front portion of said rail assembly normally disposed in the path of said parts for blocking the flow of said parts along said rail assembly; a counting finger spaced rearwardly of said blocking finger and normally being displaced from said path so as to permit said parts to flow along said rail assembly; and power means operatively connected to said fingers for concurrently moving them to a second position wherein said blocking finger is disposed out of the path of said parts and said counting finger is disposed in said path to thereby permit the parts originally positioned between said fingers to slide off the front portion of said rail assembly.

7. A parts counting device as set forth in claim 6 wherein said supporting means includes a transverse rack slidably carried by said frame and a complementary pinion rotatably carried by said frame.

8. A parts counting device as set forth in claim 6 wherein said supporting means includes a transverse cam shaft having a flattened portion rotatably carried by said frame, a post secured to said second side rail and transversely and vertically movably carried by said frame, and resilient means interposed between said post and said frame for constantly urging the lower end of said post against said cam shaft.

9. A parts counting device, comprising: a frame; a vertically inclined rail assembly supported by said frame and including a pair of side rails for carrying parts to be counted and a center rail disposed between said side rails; means rigidly securing one of said side rails to said frame; support means connecting the second of said rails to said frame and permitting transverse adjustment of said second side rail relative to said fixed side rail; means interconnecting said center rail and said second side rail and permitting the vertical and transverse adjustment of said center rail relative thereto; a trip shaft mounted parallel to said rail assembly; a blocking finger secured to said trip shaft at the front portion of said rail assembly, said blocking finger normally being disposed in the path of said parts for blocking the flow thereof along said rail assembly; a counting finger connected to said trip shaft from a point spaced rearwardly from said blocking finger, said counting finger normally being disposed out of the path of said parts, said fingers being longitudinally adjustable relative to said trip shaft; and power means operatively connected to said trip shaft for effecting partial rotation thereof whereby said blocking finger will be momentarily moved out of the path of said parts and said counting finger will be momentarily moved into said path to thereby permit the parts originally positioned between said fingers to slide off the front portion of said rail assembly.

10. A parts counting device, comprising: a frame; a vertically inclined rail assembly supported by said frame and including a pair of side rails for carrying parts to be counted and a center rail disposed between said side rails; means rigidly securing one of said side rails to said frame; supporting means connecting the second of said side rails to said frame and permitting transverse adjustment of said second side rail relative to said fixed side rail; means interconnecting said center rail and said second side rail and permitting the vertical and transverse adjustment of said center rail relative thereto; support means for said frame, said support means having elevation control means for adjusting the vertical inclination of said frame whereby parts to be counted will tend to flow smoothly therealong under the influence of gravity; a trip shaft mounted parallel to said rail assembly; a blocking finger secured to said shaft at the front portion of said rail assembly, said blocking finger normally being disposed in the path of said parts for blocking the flow thereof along said rail assembly; a counting finger connected to said trip shaft at a point spaced rearwardly from said blocking finger and normally being disposed out of the path of said parts, said fingers being longitudinally adjustable relative to said trip shaft; electric solenoid means operatively connected to said trip shaft for effecting partial rotation thereof whereby said blocking finger will be moved out of the path of said parts and said counting finger will be concurrently urged into said path to thereby permit the parts originally positioned between said fingers to slide off the front portion of said rail assembly; and control means for effecting momentary energization of said solenoid.

11. A parts counting device as set forth in claim 10 wherein said side rail supporting means includes a transverse rack slidably carried by said frame and a complementary pinion rotatably carried by said frame.

12. A parts counting device as set forth in claim 10 wherein said side rail supporting means includes a transverse cam shaft having a flattened portion rotatably carried by said frame, a post secured to said second side rail and transversely and vertically movably carried by said frame, and resilient means interposed between said post and said frame for constantly urging the lower end of said post against said cam shaft.

13. A parts counting device, comprising: a frame; a vertically inclined rail assembly supported by said frame and including a pair of side rails for carrying parts to be counted and a center rail disposed between and above said side rails; means rigidly securing one of said side rails to said frame; supporting means connecting the second of said side rails to said frame and permitting horizontal transverse adjustment of said second side rail relative to said fixed rail; means interconnecting said center rail and said second side rail and permitting the vertical and transverse adjustment of said center rail relative thereto; a blocking finger mounted at the front portion of said rail assembly normally disposed in the path followed by said parts along said rails so as to block the movement of said parts along said rail assembly, said blocking finger being movable to a second position disposed to one side of said path; a counting finger spaced rearwardly of said blocking finger and normally being displaced to one side of said rail assembly so as to permit said parts to flow along said rail assembly, said counting finger being movable in a generally horizontal direction to a second position immediately below said side rails wherein it restrains the movement of said parts supported by said rail assembly rearwardly of said counting finger; and means interposed between said frame and said fingers for concurrently moving said fingers between their normal and second positions.

14. A parts counting device as set forth in claim 13 wherein said supporting means includes a transverse rack slidably carried by said frame and a complementary pinion rotatably carried by said frame.

15. A parts counting device as set forth in claim 13 wherein said supporting means includes a transverse cam shaft having a flattened portion rotatably carried by said frame, a post secured to said second side rail and trans-

versely and vertically movably carried by said frame, and resilient means interposed between said post and said frame for constantly urging the lower end of said post against said cam shaft.

16. A parts counting device as set forth in claim 13 wherein the vertical inclination of said rail assembly may be adjusted.

17. A parts counting device, comprising: a frame; a vertically inclined rail assembly supported by said frame and including a pair of side rails for carrying parts to be counted and a center rail disposed between and above said side rails; means rigidly securing one of said side rails to said frame; support means connecting the second of said side rails to said frame and permitting transverse adjustment of said second side rail relative to said fixed side rail; means interconnecting said center rail and said second side rail and permitting the vertical and transverse adjustment of said center rail relative thereto; a trip shaft mounted parallel to said rail assembly; a blocking finger operatively connected to said trip shaft and disposed at the front portion of said rail assembly, said blocking finger normally being arranged in the path of said parts for blocking the flow thereof along said rail assembly with said blocking finger being movable to a second position disposed to one side of said path; a counting finger operatively connected to said trip shaft and arranged to a point spaced rearwardly from said blocking finger, said counting finger normally being disposed to one side of the path of said parts, said counting finger being movable in a generally horizontal direction to a second position immediately below said side rails wherein it restrains the movement of said parts supported by said rail assembly rearwardly of said counting finger, said fingers being longitudinally adjustable relative to said trip shaft; and power means operatively connected to said trip shaft for effecting partial rotation thereof whereby said fingers will be concurrently moved from their normal to their second positions to thereby permit the parts originally positioned between said fingers to slide off the front portion of said rail assembly.

18. A parts counting device as set forth in claim 17 wherein said supporting means includes a transverse rack slidably carried by said frame and a complementary pinion rotatably carried by said frame.

19. A parts counting device as set forth in claim 17 wherein said supporting means includes a transverse cam shaft having a flattened portion rotatably carried by said frame, a post secured to said second side rail and transversely and vertically movably carried by said frame, and resilient means interposed between said post and said frame for constantly urging the lower end of said post against said cam shaft.

20. A parts counting device as set forth in claim 17 wherein the vertical inclination of said rail assembly may be adjusted.

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