Dec. 1, 1953 B. R. GARRETT 2,661,090

SORTING MACHINE

Filed Sept. 28, 1948 3 Sheets-Sheet 1

FIG. 1

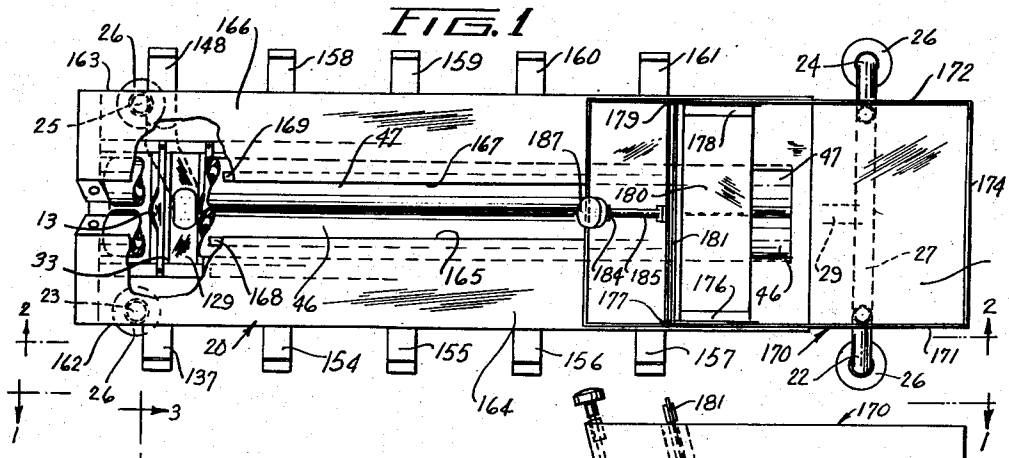
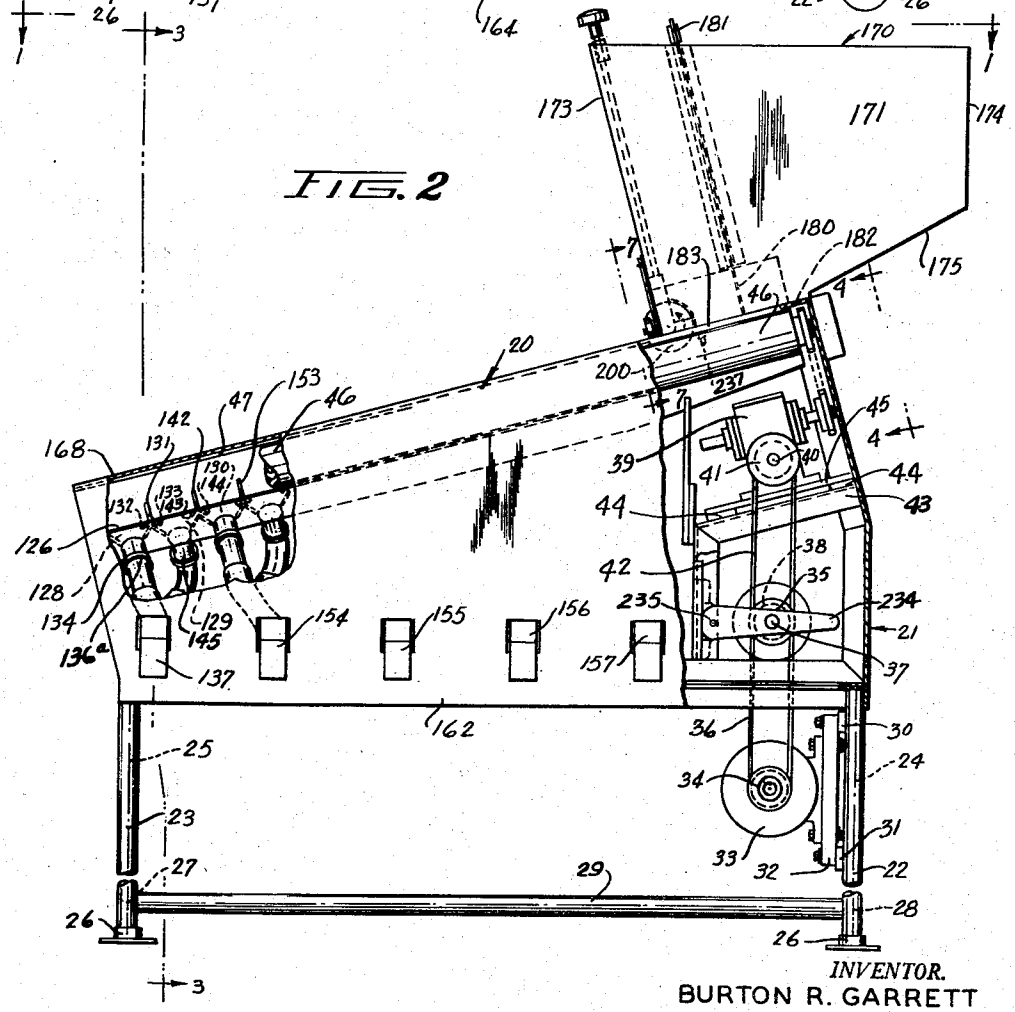


FIG. 2



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Dec. 1, 1953 B. R. GARRETT 2,661,090

SORTING MACHINE

Filed Sept. 28, 1948 3 Sheets-Sheet 2

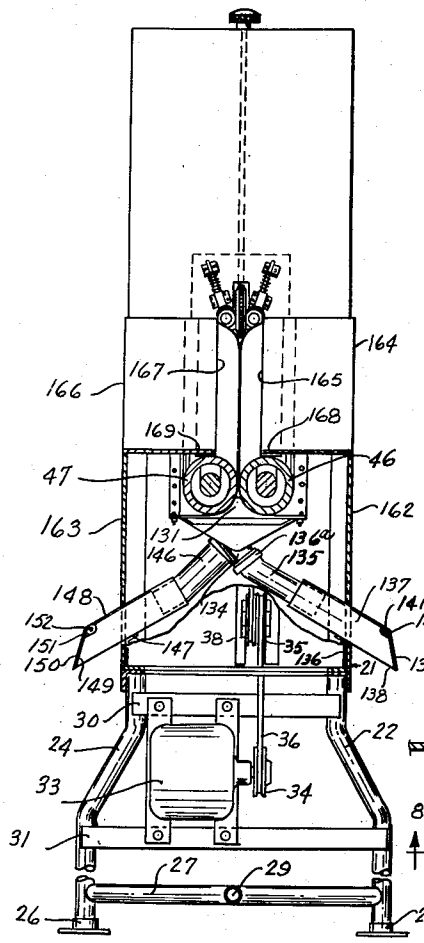


FIG. 3

FIG. 7

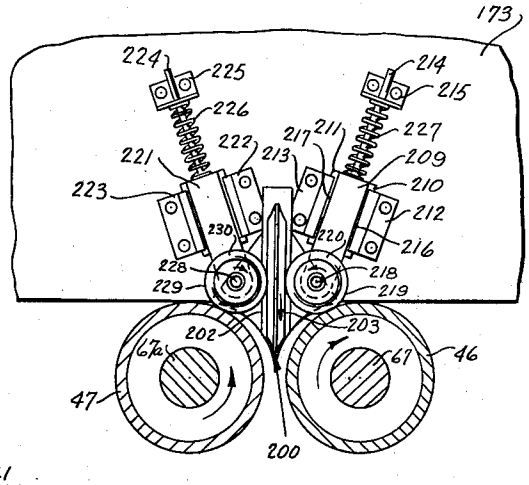


FIG. 10

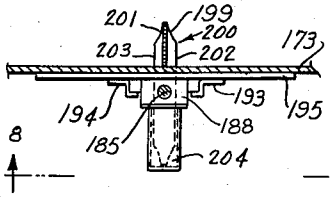


FIG. 8

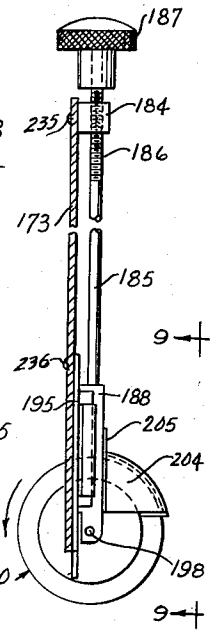
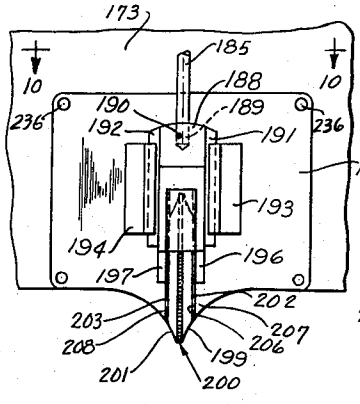


FIG. 9



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Dec. 1, 1953 B. R. GARRETT 2,661,090

SORTING MACHINE

Filed Sept. 28, 1948 3 Sheets-Sheet 3

FIG. 6

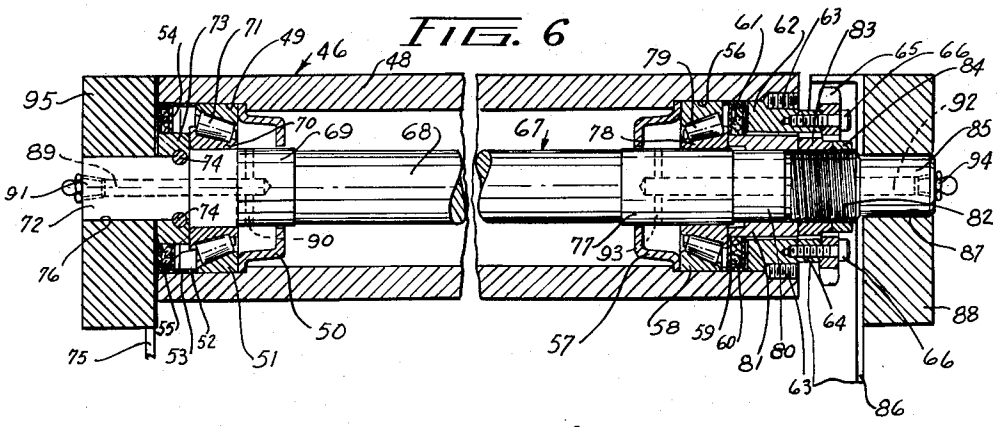


FIG. 4

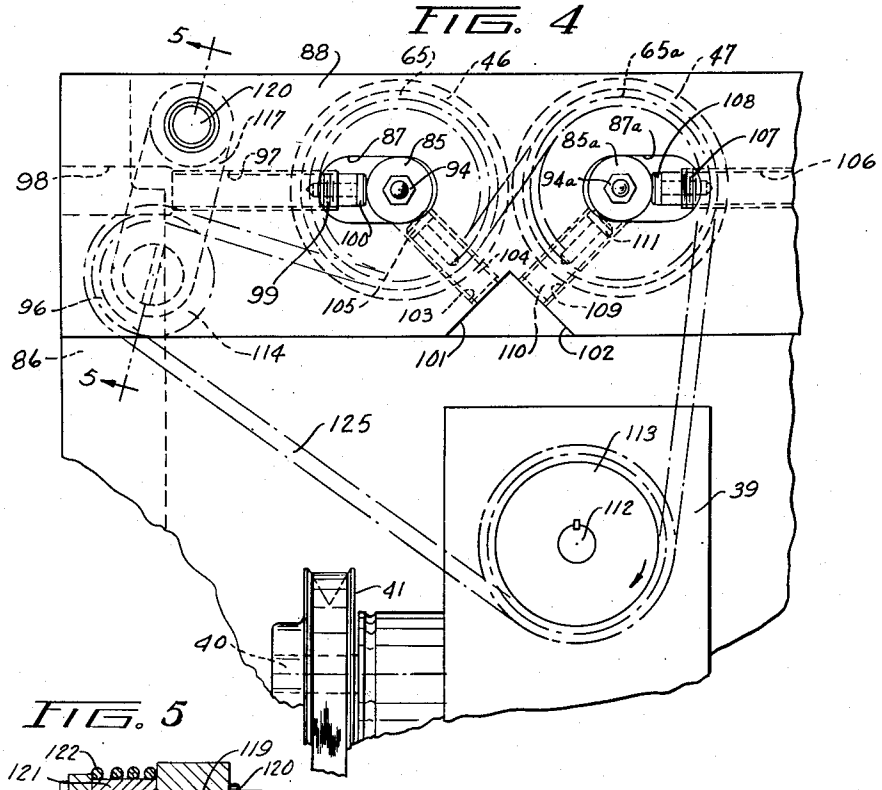
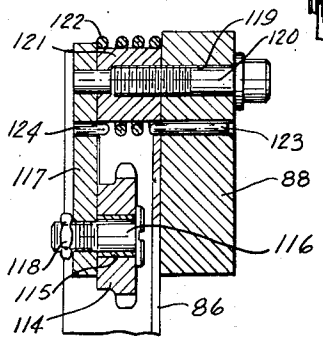


FIG. 5



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UNITED STATES PATENT OFFICE

2,661,090

SORTING MACHINE

Burton R. Garrett, Astoria, N. Y.

Application September 28, 1948, Serial No. 51,559

17 Claims. (Cl. 209—107)

1

This invention relates to improvements in sorting machines and has for an object the provision of a precision sorting machine adapted to sort articles to size plus or minus several ten-thousandths of an inch.

Another object of the invention is the provision of a precision sorter which is not only accurate to tenths of thousandths of an inch, but which also sorts with the greatest rapidity.

A further object is the provision of a precision sorter which may be quickly set for any desired range of sizes, and adapted to retain the setting until it is set for another range of sizes.

Yet another object of the invention is the provision of a precision sorter with a minimum of parts, all of which are sturdy, thereby eliminating chances for errors such as are encountered where delicate parts are employed.

A further object of the invention is the provision in a precision sorter, of a universal hopper capable of handling a large variety of objects, such as balls, pills, capsules, cylinders, false teeth, discs, screws, rivets, and many irregular shaped objects, instead of having a different hopper for each kind of article to be sorted.

Other objects and advantages of the invention will be apparent to those skilled in the art upon a study of the following specification and the accompanying drawings.

Referring to the drawings, which are given by way of example to illustrate the invention:

Figure 1 is a view of my precision sorter as seen from above;

Figure 2 is a side elevation of the sorter;

Figure 3 is an end elevation of my sorter taken along the lines 3—3 of Figure 2;

Figure 4 is an end elevation taken along the lines 4—4 of Figure 2, showing the compensating drive for the rotors and means for adjusting them relative to each other;

Figure 5 is a sectional view taken along the lines 5—5 of Figure 4 and showing means for keeping the drive chain taut;

Figure 6 is a longitudinal sectional view of one of the rotors showing its fixed supporting shaft, the roller bearings supporting the rotor, and other details of construction;

Figure 7 is an elevation partly in section, taken along the lines 7—7 of Figure 2;

Figure 8 is an elevation, partly in section, of the control wheel and its adjustments, which is mounted in the hopper;

Figure 9 is an elevation taken along the lines 9—9 of Figure 8; and

2

Figure 10 is a view as seen along the lines 10—10 of Figure 9.

Referring first to Figures 1 to 3, the sorter includes a casing 20 which is mounted on an angle iron frame 21, and this frame is secured to a subframe comprised of four offset pipes 22, 23, 24 and 25, each of which carries on its lower end, a flange fitting 26. The pipes 23 and 25 are joined by a cross pipe 27, and likewise, the pipes 22 and 24 are joined by a cross pipe 28. The cross pipes 27 and 28 are joined together by a longitudinal pipe 29 extending from the midpoint of one to the midpoint of the other. These pipes are joined by welding or by any other suitable manner.

A horizontal cross-member 30 is secured to the pipes 22 and 24 near the upper ends thereof, and a second horizontal cross-member 31 is also secured to the pipes 22 and 24 below and in spaced parallel relation to the cross-member 30. A motor base 32 is secured to the cross-members by bolts.

An electric motor 33 is adjustably mounted on the base 32 and carries a grooved pulley 34 which is connected to a second grooved pulley 35 by means of a V belt 36.

The pulley 35 is mounted on a shaft 37, and on the same shaft is mounted a grooved pulley 38 which may be the same size as the pulley 35. A lever 234, pivotally mounted on a stud 235, supports the shaft 37 and the grooved pulleys are so arranged that by movement of the lever 234 in one direction, the speed is increased, and by moving it in the opposite direction, the speed is decreased, so as to change the speed at which the articles are fed and sorted. An example of such variable speed transmission is one for sale on the open market, called "Toledo Variable Speed Transmission." A speed reducer 39 has an input shaft 40 which has mounted thereon a grooved pulley 41, and a V belt 42 connects the pulleys 38 and 41 together.

The frame 21 has angular members, one of which is shown at 43, and these carry cross-members 44, 44, which support a base 45 upon which the speed reducer 39 is mounted.

The device employs two rotors 46 and 47, and since they are identical, a detailed description of only one of them is believed necessary. Referring to Figure 6, a sectional elevation of the rotor 46 is shown. The rotor includes a tubular member 48 having a counterbore 49 in one end thereof to accommodate a cup-like grease retaining member 50 and the outer race 51 of a roller bearing. A spacer ring 52 abuts the outer

race 51 and in contact therewith is an annular flange 53 of a holder 54 for a felt oil ring 55, said elements cooperating to form a grease seal.

The other end of the rotor tubular member 48 has a counterbore 56 formed therein to accommodate a cup-like member 57, the outer race 58 of a roller bearing, and a driving element to be presently described. The outer race 58 abuts the flange of the cup-like member and abutting it is an axial flange 59 of a holder 60 for a felt oil ring 61, constituting a grease seal.

The driving element includes a hollow bushing 62 which fits into the counterbore and is secured therein by means of a plurality of screws 63 which engage threaded holes formed partly in the bushing and partly in the tubular member. The hollow bushing 62 has an extension 64 which projects beyond the end of the tubular member 48, and a sprocket 65 is secured thereto by means of filister head screws 66.

A shaft 67 has a middle portion 68 of reduced diameter. Adjoining this portion at one end thereof is a portion 69 of precision diameter upon which is mounted the inner race 70 of a roller bearing 71 which cooperates with the outer race 49. Adjoining the portion 69 of the shaft is a portion 72, also of precision diameter, upon which is mounted a collar 73 by means of dowel pins 74, and this collar abuts the inner race 70. The end of the shaft portion 72 extends into an elongated hole 76 formed in a supporting bar 95, which elongated hole will presently be described.

Adjoining the middle shaft portion 68 at the other end thereof is a portion 77 of precision diameter upon which is mounted the inner race 78 of a roller bearing 79 which cooperates with the outer race 56. Adjoining the portion 77, is a portion 80, also of precision diameter and smaller than the portion 77. A sleeve 81, which is longer than the portion 80, is mounted thereon and abuts the inner race 78.

The shaft has a threaded portion 82 which is engaged by a threaded sleeve 83. This sleeve abuts the sleeve 81 and it forces the inner race 78 towards the inner race 70, at the other end of the shaft, and thereby all radial and end play of the bearings is eliminated. The shaft portion 82 is also engaged by an internally threaded ring 84 which is screwed hard against the threaded sleeve 83 for locking it in any adjusted position. The sleeve 83 and the ring 84 may be provided with spanner holes or notches (not shown) so that they may be moved by means of spanner wrenches, for example.

The shaft has an end portion 85 beyond the threaded portion 82 and this portion extends into an elongated hole 87 formed in a supporting bar 88, which will be presently described.

The shaft 67 has an oil passage 89 extending into it from one end thereof, and a cross-hole 90 therein communicates with this passage and with the interior of the cup-like member 50. The outer end of the oil passage 89 is threaded and is engaged by a grease fitting 91.

The shaft 67 also has an oil passage 92 extending into it from the opposite end thereof to communicate with a cross-hole 93, which in turn communicates with the interior of the cup-like member 57. The outer end of the passage 92 is threaded and is engaged by a grease fitting 94.

The supporting bars 88 and 95 are substantially identical, so the description of one of them will suffice for both. Referring now to Figure 4, the supporting bar 88 is shown. One end of it is shown as secured to the frame member 86 by means of cap screws 96. Its other end and the ends of the supporting bar 95 are secured to corresponding frame members in the same manner.

Formed in the bar 88 in spaced relation to the elongated hole 87 is an elongated hole 87*a*. The axes of these holes lie on a common plane. The end 85 of the shaft supporting the rotor 46 extends into the hole 87, and the end 85*a* (which is identical with the end 85) extends into the hole 87*a*. In alignment with the long axis of the hole 87 is a threaded hole 97 having a counterbored hole 98 communicating therewith. A screw 99 engages the hole 97 and has a swiveled tip 100 adapted to be forced against the shaft portion 85.

The bar 88 has a 90° notch formed in the bottom edge thereof with its apex lying on a vertical line equidistant from the holes 87 and 87*a*. This notch has faces 101 and 102. Extending into the hole 87 from the face 101 is a threaded hole 103 which accommodates a screw 104 which has a swiveled tip 105 engaging the shaft portion 85.

Extending into the bar 88 from the other end thereof, and in alignment with the threaded hole 97, is a threaded hole 106 which communicates with the elongated hole 87*a*. The outer end of the hole 106 has a counterbore like the counterbore 98. A screw 107 is screwed into the hole 106 and is provided with a swiveled tip 108 adapted to engage the shaft extension 85*a*.

Extending from the face 102 of the 90° notch to the hole 87*a* is a threaded hole 109 which accommodates a screw 110 which has a swiveled tip 111 adapted to engage the shaft extension 85*a*.

By means of the screws 99 and 104, the rotor 46 may be adjusted toward or away from the rotor 47. Likewise, by means of the screws 107 and 110, the rotor 47 may be adjusted toward or away from the rotor 46. For example, if it is desired to widen the space between the rotors, the screw 99 would be backed up and the screw 104 would be tightened. Likewise, the screw 107 would be backed up and the screw 110 would be tightened. Now, if the rotors are to be adjusted toward each other to narrow the space between them, the screw 104 would be backed up and the screw 99 would be tightened and the screw 110 would be backed up and the screw 107 would be tightened.

The supporting bar 95 is also provided with elongated holes, one of which, as above described, was designated by the numeral 76, and these holes are also provided with screws arranged in a manner similar to those described in connection with Figure 4, so that in addition to adjusting the upper ends of the rotors, the lower ends may also be adjusted. These rotors, as may be seen in Figure 2, are inclined with the horizontal. Reference above to the upper end is taken to mean the right ends, as seen in Figure 4, and the lower ends would be the left ends.

It has been described above that the rotor 46 has a sprocket 65 secured thereto. The rotor 47 has a like sprocket 65*a* secured thereto. The speed reducer 39 has an output shaft 112 to which is keyed a sprocket 113.

An idler sprocket 114 (see Figure 5 in addition to Figure 4) has a bearing bushing 115 therein, and this bushing is journaled on a shouldered screw 116 which engages a threaded hole ad-

jacent to one end of an arm 117, and is locked therein by means of a locknut 118. The bar 88 has a hole 119 therein through which a screw 120 passes to secure a boss 121 thereto in swiveled relation. The boss 121 is secured to and moves with the arm 117. A spring 122 embraces the boss 121 and has one end 123 extending into a hole formed in the supporting bar 88, and another end 124 extending into a hole formed in the arm 117 so that the arm is urged about the axis of screw 120 in a clockwise direction as seen in Figure 4. A drive chain 125 extends from the sprocket 113 to and about the idler sprocket 114, then passes under the sprocket 65, over the sprocket 65a, and thence back to the sprocket 113. The urge of the spring 122 on the arm 117 and consequently the idler sprocket 114, keeps the chain taut. As the sprocket 113 rotates in the direction of the arrow (clockwise) the rotor 46 rotates in a counter-clockwise direction and the rotor 47 rotates in a clockwise direction, so their relative directions of movement are upwardly and hence against the direction of movement of articles tending to pass between them. Now, since the rotors are inclined to the horizontal, that is to say, from right to left, as seen in Figure 2, and are nearer together at their upper ends than they are at their lower ends. The articles move down the incline until they reach a point where the space between the rotors is sufficient for them to pass through.

As they pass through the space between the rotors, they fall into one of a series of funnel-shaped receptacles positioned below the rotors.

Referring to Figures 2 and 3, inclined strips 126 and 127 are spaced apart from each other and form supports for a series of funnel-shaped members 128, 129, 130, etc. Spanning the junction of the funnel-shaped members 128 and 129, is a parting strip 131 which has an extension 132 projecting into the member 128 and an extension 133 projecting into the member 129. The portion 131, as may be seen in Figure 3, extends upwardly between the rotors a substantial distance. The funnel-like member 128 has a conduit outlet 134 which is connected to a flexible conduit 135 which passes over its end and which is secured thereto by a circular clamp 136a. The frame 21 has an angular bracket 136 secured thereto and secured to the bracket 136 in any suitable manner is an outlet conduit 137 having a beveled end 138 which is closed by a door 139 having ears formed integral therewith, one of which is designated by the numeral 140.

A pin 141 passes through aligned holes in the ears 140 and corresponding holes formed in the outlet conduit 137, so that the door 139 may be opened when the machine is in use and closed when the machine is not in use or to prevent articles from falling to the floor when changing receptacles.

The flexible conduit 135 extends into the outlet conduit 137 so as not to present a ledge to articles moving therethrough into said outlet conduit.

A second parting strip 142 has extensions 143 and 144, the extension 143 projecting into the member 129 and the extension 144 projecting into the member 130. The funnel-like member 129 has a conduit outlet 145 to which is connected a flexible conduit 146.

An angular bracket 147 is secured to the frame 121 in any suitable manner and secured to this bracket is an outlet conduit 148 having a beveled end 149 which is closed by a door 150 having ears formed integral therewith, one of which is designated by the numeral 151. A pin 152 passes through aligned holes in the ears and also through corresponding holes formed in the outlet conduit 148.

In the embodiment herein shown and described, the outlet conduits 137 and 148 are shown in alignment. Since the funnel-like members 128 and 129 are side by side, the connection 146 between the funnel-like member 129 and the outlet conduit 148 is offset. A parting strip 153 spans the junction of the funnel-like member 130 and its neighbor in the same manner as described above for the other parting strips and the outlet of the funnel-like member 130 is connected to the outlet conduit 154. Thus, it will be seen that every other funnel-like member is connected to an outlet conduit on one side of the machine and those in between are connected to outlet conduits on the opposite side of the machine. Thus, in Figure 2, outlet conduits 137, 154, 155, 156 and 157, may be seen. These may also be seen in Figure 1, as well as outlet conduits 148, 158, 159, 160 and 161.

In sorting articles, the smallest article sorted passes to the outlet 161, while the largest passes to the outlet 137, and gradients therebetween pass into 157, 160, 156, 159, 155, 158, 154 and 148 in the order named.

The outlet conduits 137, 154, 155, 156 and 157 extend through a side plate 162 of the casing 20 and the outlet conduits 148, 158, 159, 160 and 161 extend through the opposite side plate 163. An extension 164 of the side plate 162 forms a portion of the upper surface of the machine and terminates with an edge 165 which is substantially above the center line of the rotor 46. Likewise, an extension 166 of the side plate 163 forms a portion of the top of the machine and terminates with an edge 167 which is substantially in line with the center line of the rotor 47. Secured to the under-surface of the extension 164 and bordering the edge 165 is a felt strip 168. Also secured to the under-surface of the extension 166 and bordering the edge 167 thereof is a like felt strip 169.

Mounted on the casing 20 at the right end thereof, as seen in Figure 2, is a hopper 170 which has side walls 171 and 172, a front end wall 173, and a rear end wall which is comprised of sections 174 and 175 which are angular with respect to each other.

Within the hopper 170 and spaced apart from the end wall 173 thereof are opposed angle members 176 and 177 arranged in one set on the interior of the wall 171, and 178 and 179 arranged in a set on the interior of the wall 172. Slidably mounted in the hopper 170 with one edge between the angle members 176 and 177 and with the opposite edge between the angle members 178 and 179 is a partition member 180 which has on its upper edge, a handle 181, by means of which it may be set so that its bottom edge may be positioned at various heights within the hopper 170.

The hopper 170 has a portion between the left end (as seen in Figure 2) of the wall 175 in contact with a wall portion 182, thereby leaving an opening 183 communicating with the upper ends of the rotors 46 and 47.

The front end wall 173 has a boss 184 secured thereto adjacent the upper end thereof by screws 235, and this boss has a threaded hole therein which is parallel to the wall 173. The threaded portion 186 of a rod 185 threadedly engages the hole in the boss 184 and carries

on the upper end thereof a knurled knob 187. The lower end of the rod 185 is swiveled in a slidable frame 188, as seen in Figures 8, 9 and 10, in the following manner.

A hole extends into the slidable frame and the lower end of the rod 185 forms a working fit in this hole. Adjacent to the lower end of the rod 185 is formed an annular groove 189 which is engaged by a pin 190 in the frame member 188. The frame member 188 has its opposite edges 191 and 192 engaged by Z-shaped brackets 193 and 194, respectively, which may be spot welded or otherwise secured to a plate 195 which is secured on the inner face of the wall 173 in centralized relation to the rotors 46 and 47 by means of screws 236. From this, it will be seen that by rotating the knob 187 in one direction, the frame is slidably moved upwardly and by rotating the knob in the opposite direction, the frame is slidably moved downwardly. The lower portion of the frame 188 is bifurcated, thereby leaving spaced solid portions 196 and 197 therein to accommodate a shaft 198. Journaled on the shaft 198 is a gate wheel 200, which has beveled edges 199 and 201 which respectively join the flat sides 202 and 203 thereof. The edges 199 and 201 are beveled to conform to the contours of the rotors in its average working position.

A guard 204 embraces a portion of the gate wheel 200 and is provided with a flange 205 which may be spot welded or otherwise secured to the frame 188. Thus, it will be seen that by rotating the knob 187 in one direction, the gate wheel is lowered and by rotating it in the opposite direction, the gate wheel is raised. The plate 195 has a slot 206 formed therein to clear the gate wheel and it also has downward extensions 207 and 208, the outer surfaces of which are curved and which approach parallelism with the rotors 46 and 47.

Referring now to Figure 7, which is a view taken on the outer face of the wall 173 opposite the portion of the wall 173 shown in Figure 9, a slidable member 209 has edge portions 210 and 211 which are engaged respectively by Z-shaped bracket members 212 and 213 secured to the wall 173. A rod 214 fixed to the slidable member extends through a hole formed in L-shaped bracket 215 which is secured to the wall 173. The slidable member 209 has clearance spaces 216 and 217 between itself and the brackets 212 and 213 so that in addition to being slidable, the member 209 may move laterally within the limits of said clearances.

Journaled on the lower end of the slidable member 209 on shaft 218 is a roller 219 which has a rubber rim 220. A helical spring 227 positioned on the rod 214 between the upper end of the slidable member 209 and the bracket 215, urges the slidable member downwardly and consequently maintains the roller 219 in frictional engagement with the rotor 46 and the flat side 203 of the gate wheel 200.

A second slidable member 221 is slidably mounted in Z-shaped brackets 222 and 223 secured to the end wall 173. This slidable member is also provided with clearances similar to those described for the slidable member 209 and in addition to being slidable endwise, it also may be displaced laterally within the limits of said clearances.

The slidable member 221 has fixed thereto a rod 224 which extends through a clearance hole formed in a bracket 225 secured to the end wall 173. Between the upper end of the slidable member 221 and the bracket 225, the rod 224 is embraced by a helical spring 226. The lower end of the slidable member 221 carries a shaft 228 on which is journaled a roller 229 which is provided with a rubber-like rim 230. The spring 226 urges the roller 229 into frictional engagement with the rotor 47 and the flat side 202 of the gate wheel 200.

Due to the fact that both the roller 219 and the roller 229 oppositely engage the flat faces of the gate wheel 200, and due to the fact that these rollers are in frictional engagement with the rotors 46 and 47, the gate wheel 200 is rotated as long as the rotors are in motion. The rotor 46 rotates in a clockwise direction (as seen in Figure 7) and this causes the roller 219 to rotate in a counter-clockwise direction, and this, in turn, tends to move the front edge of the gate wheel 200 downwardly.

The rotor 47 rotates in a counter-clockwise direction and consequently the roller 229 is rotated in a clockwise direction and this roller, acting against the flat surface 202 of the gate wheel, also tends to move it in a direction wherein the outer end, as seen in Figure 7, is downwardly.

Due to the fact that the rotors 46 and 47 rotate in the opposite directions described, the pieces being sorted are urged upwardly within the space between the end wall 173 and the slidable partition 180, and due to the counter-clockwise movement in the gate wheel 200, as seen in Figure 2, the pieces being sorted are urged backwardly within said space and the combination of these motions, together with the spacing of the bottom of the slide 180, ensures separation of the articles or pieces being sorted, because they are prevented from piling up on each other. It will be understood that the smaller the articles being sorted, the closer the bottom edge of the partition 180 is adjusted or positioned with respect to the bottom of the hopper.

The gate wheel assembly may be easily removed and replaced by another one having a different contour, for example, by removing the screws 235 and 236.

Each rotor carries one or more filister head screws 237 which are rotated a predetermined distance from the hopper wall 173 inside the hopper and near the disc 200. These screws can be regulated so that their heads are flush with the surface of the rotor or they may be set so that they project any desired distance beyond the surface of the rotors and they function as agitators to facilitate the even flow of certain odd-shaped articles.

Although I have herein shown and described by way of example one embodiment of the invention, it is obvious that many changes may be made in the arrangements herein shown and described within the scope of the following claims.

What is claimed is:

1. In a machine having inclined rotors adjacent to each other and driven in opposite directions with their adjacent peripheries moving upwardly, an article hopper spanning and having a bottom opening communicating with portions of the upper ends of said rotors for containing articles to be delivered to portions of said rotors beyond said hopper, a slot formed in the wall of said hopper in alignment with a vertical plane extending between and equidistant from the axes

of said rotors, a gate wheel adjustably supported on said last wall of said hopper and extending through said slot and at least partially between said rotors on said plane, and means to rotate said gate wheel to move the lower portion of its periphery counter to the direction of the movement of articles down said rotors, thereby spacing said articles therealong.

2. In a machine having inclined rotors adjacent to each other and driven in opposite directions with their adjacent peripheries moving upwardly, an article hopper spanning and having a bottom opening communicating with portions of the upper ends of said rotors for containing articles to be delivered to portions of said rotors beyond said hopper, a slot formed in the wall of said hopper in alignment with a vertical plane extending between and equidistant from the axes of said rotors, a support spanning said slot and slidably supported on said last wall of said hopper, a gate wheel having an axis journalled in said support and extending through said slot, the lower portion of the periphery of said wheel being at least partially between said rotors on said vertical plane, a frictional roller engaging one of said rotors and one side face of said wheel, a second frictional roller engaging the other of said rotors and the opposite face of said wheel, said frictional rollers being adapted to rotate said wheel in a direction whereby the lower portion of its periphery is moved counter to the direction of the movement of articles down said rotors, thereby spacing said articles therealong.

3. A machine according to claim 2 in which an upwardly extending wall is slidably carried within said hopper in predetermined spaced relation to said last wall of said hopper thereby dividing said hopper into a larger rear compartment and a smaller front compartment adjacent to said last mentioned wall, both said compartments having open bottoms communicating with said portions of the upper ends of said rotors, said partition being settable to position its lower end a predetermined distance from said portions of said upper ends in accordance with the size of the articles being handled.

4. In a sorting machine, a pair of inclined rotors having their axes on a common plane, means for adjusting said axes along said plane for varying the distance between said rotors at each end thereof, means to rotate said rotors in opposite directions so that their adjacent surfaces are constantly moved upwardly, an article hopper positioned above and at least sufficient to clear the upper end of said rotors, said hopper having a bottom opening communicating with the upper ends of said rotors, whereby articles placed in said hopper will be agitated by the upper ends of said rotors, a rotary gate wheel on said hopper for releasing articles onto said rotors outside of and adjacent to said hopper, said means lying on a central plane extending between and equidistant from the axes of said rotors, and article receiving means disposed beneath said rotors.

5. In a sorting machine, a pair of inclined rotors having their axes on a common plane, means for adjusting said axes along said plane for varying the distance between said rotors at each end thereof, means to rotate said rotors in opposite directions so that their adjacent surfaces are constantly moved upwardly, an open bottomed article hopper at and cooperating with the upper end portions of said rotors to receive articles to be sorted, whereby articles placed therein are agitated, a rotary gate wheel on said hopper moved in definite timed relation with the movement of said rotors for regulating the delivery of articles from the upper end portions of said rotors to portions thereof outside said hopper, said rotary gate wheel extending at least partially between said rotors and being equidistant from the axes of both said rotors, and article receiving means disposed beneath said last mentioned portions of said rotors.

6. In a sorting machine, a pair of inclined rotors having their axes on a common plane, means for adjusting said axes along said plane for varying the distance between said rotors at each end thereof, means to rotate said rotors in opposite directions so that their adjacent surfaces are constantly moved upwardly, an article hopper to receive articles to be sorted, said hopper being comprised in part of stationary walls and in part of a bottom formed by upper end portions of said rotors, a gate wheel on said hopper moved by at least one of said rotors for regulating the delivery of articles from the portion of said rotors inside said hopper to portions of said rotors external to said hopper, said gate wheel having a periphery extending between said rotors below a plane tangent to the upper peripheries of the latter, and article receiving means disposed at least beneath said last mentioned portions of said rotors.

7. In a sorting machine, a pair of inclined rotors having their axes on a common plane, means for adjusting said axes along said plane for varying the distance between said rotors at each end thereof, means to rotate said rotors in opposite directions so that their adjacent surfaces are constantly moved upwardly, an article hopper spanning and having a bottom opening communicating with portions of the upper ends of said rotors to receive articles to be sorted, said bottom opening having the same inclination as said rotors and of such width that articles in said hopper are in contact with and are agitated by said rotors within an area the width of which is limited by the distance from center to center of said rotors, and article regulating means in said hopper including disc means journaled in said hopper and having a central plane therethrough equidistant from the axes of said rotors and cutting said common plane, said disc means being driven in a direction to cause its lower portion to move opposite to the direction in which said articles tend to move from said upper portions of said rotors within said hopper to portions outside of said hopper under the force of gravity.

8. In a sorting machine, a pair of inclined rotors having their axes on a common plane, means for adjusting said axes along said plane for varying the distance between said rotors at each end thereof, means to rotate said rotors in opposite directions so that their adjacent surfaces are constantly moved upwardly, an article hopper spanning and having a bottom opening communicating with portions of the upper ends of said rotors to receive articles to be sorted, said bottom opening having substantially the same inclination as said rotors and being of such width that articles in said hopper are in contact with and agitated by said rotors within an area the width of which is limited by the distance from center to center of said rotors, and article regulating means in said hopper including a disc journaled in said hopper and having its periphery lying on a vertical plane extending

between said rotors, and means driven by at least one of said rotors and arranged to drive said disc in a direction to cause its lower portion to move against the flow of articles tending to move down the inclined surfaces of said rotors.

9. In a sorting machine, a pair of inclined rotors having their axes on a common plane, means for adjusting said axes along said plane for varying the distance between said rotors at each end thereof, means to rotate said rotors in opposite directions so that their adjacent surfaces are constantly moved upwardly, an article hopper spanning and having a bottom opening communicating with portions of the upper ends of said rotors to receive articles to be sorted, said bottom opening having substantially the same inclination as said rotors and being of such width that articles in said hopper are in contact with and agitated by said rotors within an area the width of which is limited by the distance from center to center of said rotors, and article regulating means in said hopper including a disc journaled in said hopper and having peripheral portions adjacent to the surfaces of said rotors, and means frictionally driven by at least one of said rotors and frictionally driving said disc in a direction to cause its lower portion to move in a direction opposite to the direction in which said articles tend to move along said rotors under the force of gravity.

10. In a sorting machine, a pair of inclined rotors having their axes on a common plane, means for adjusting said axes along said plane for varying the distance between said rotors at each end thereof, means to rotate said rotors in opposite directions so that their adjacent surfaces are constantly moved upwardly, an article hopper spanning and having a bottom opening communicating with portions of the upper ends of said rotors to receive articles to be sorted, said bottom opening having substantially the same inclination as said rotors and being of such width that articles in said hopper are in contact with and agitated by said rotors within an area the width of which is limited by the distance from center to center of said rotors, and article regulating means at least partially within said hopper including a disc journaled on said hopper and having a central plane which extends between both said rotors, frictional rollers for rotating said disc, means urging one of said rollers into contact with one of said rotors and one side of said disc, and other means urging said roller into contact with the other of said rotors and the opposite side of said disc.

11. In a sorting machine, a pair of rotors having their axes on a common plane inclined with respect to the horizontal, means for adjusting said axes along said plane for varying the distance between said rotors at each end thereof, means to rotate said rotors in opposite directions so that their adjacent surfaces are constantly moved upwardly, an article hopper spanning and having a bottom opening communicating with portions of the upper ends of said rotors to receive articles to be sorted, said bottom opening having substantially the same inclination as said rotors, and side portions adjacent to said openings also inclined towards said rotors, said opening being of such width that articles in said hopper are in contact with and are agitated by said rotors within an area the width of which is limited by the distance from the center of said rotors and the length of which extends along said rotors from the upper ends thereof to a point where the articles exit from said hopper, adjustable partition means extending upwardly in said hopper for dividing the interior into a series of compartments the open bottom ends of which are adjacent to said portions of the upper ends of said rotors and the open top ends of which are adjacent to the upper end of said hopper, and a gate wheel in the last compartment of said series and means to rotate the same for regulating the spacing of the articles passing out of said hopper onto and down the incline of said rotors, said gate wheel having its lower periphery extending below and between the upper peripheries of said rotors.

12. In a sorting machine, a pair of inclined rotors having their axes on a common plane, means for adjusting said axes along said plane for varying the distance between said rotors at each end thereof, means to rotate said rotors in opposite directions so that their adjacent surfaces are constantly moved upwardly, an article hopper spanning and having a bottom opening communicating with portions of the upper ends of said rotors to receive articles to be sorted, said bottom opening having substantially the same inclination as said rotors, and side portions adjacent to said opening also inclined towards said rotors, said opening being of such width that articles in said hopper are in contact with and are agitated by said rotors within an area the width of which is limited by the distance from the center of said rotors and the length of which extends along said rotors from the upper ends thereof to the point where the articles exit from said hopper, an adjustable partition extending upwardly in said hopper for dividing the interior into two compartments common to said portions of the upper ends of said rotors and arranged to be adjusted for metering the quantity of articles passing from one compartment to the other along said rotors, and a gate wheel at the exit of said last mentioned compartment and extending at least partially between said rotors for regulating the spacing of the articles passing through said exit and lengthwise of the rotors.

13. In a sorting machine, a pair of inclined rotors having their axes on a common plane, means for adjusting said axes along said plane for varying the distance between said rotors at each end thereof, means to rotate said rotors in opposite directions so that their adjacent surfaces are constantly moved upwardly, an article hopper spanning and having a bottom opening communicating therewith portions of the upper ends of said rotors to receive articles to be sorted, said bottom opening having substantially the same inclination as said rotors, side portions adjacent to said opening also inclined towards said rotors, said opening being of such width that articles in said hopper are in contact with and are agitated by said rotors within an area the width of which is limited by the distance from the center of said rotors and the length of which extends along said rotors from the upper ends thereof to the point where the articles exit from said hopper, an upright partition slidably mounted in said hopper for dividing the interior of said hopper into two compartments one of which has a greater part of said upper portion of said rotors for its bottom than the other, said partition being adapted to be adjusted for meting a quantity of articles passing from one compartment to the other, and a regulating disc

in said last mentioned compartment and means for rotating the same in a direction wherein the lower portion of its periphery is between and below the upper portions of the peripheries of said rotors and moves in a direction opposite to the direction of movement of the articles down the incline of said rotors toward the portions thereof outside said hopper.

14. The invention according to claim 10, in which the periphery of said disc has opposed concave surfaces formed thereon to conform to the contours of the rotors to prevent articles from sliding out of the hopper between the surfaces of the rotors and the disc other than centrally between said rotors.

15. The invention according to claim 10, in which said rollers are journaled on supports slidably mounted on said hopper and having their axes angular with respect to a vertical plane extending between said rotors, and in which said disc is carried on a movable support on said hopper so that the space between the periphery and said rotors may be varied.

16. A sorting machine according to claim 10, in which said rollers is each comprised of an inseparable ball bearing having a non-metallic ring thereon.

17. A sorting machine according to claim 13, in which said disc is adjustable toward and away from said rotors and is rotated by rollers frictionally engaging the sides thereof and each engaging one of said rotors.

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