

April 20, 1948.

C. A. BROWN ET AL

2,439,883

ARTICLE TRAYING MACHINE

Filed Feb. 22, 1943

7 Sheets-Sheet 1

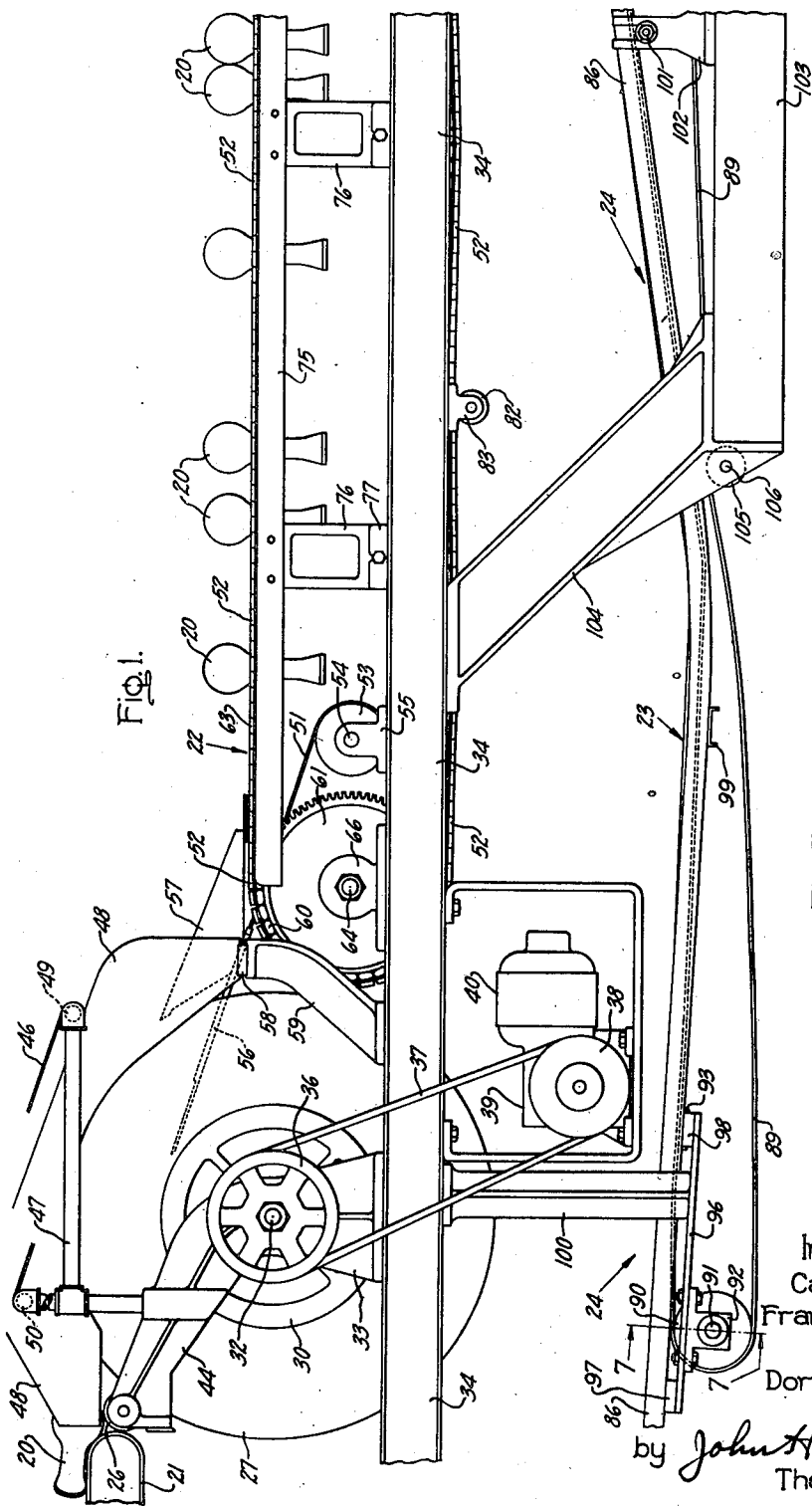


FIG. 1.

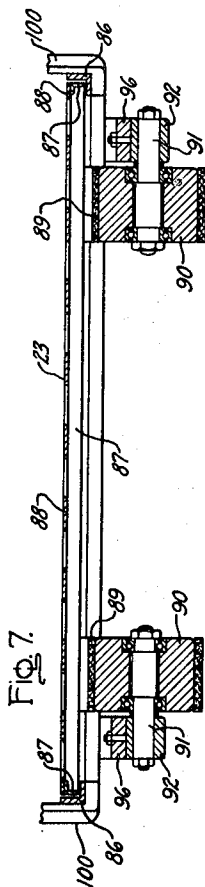


FIG. 7.

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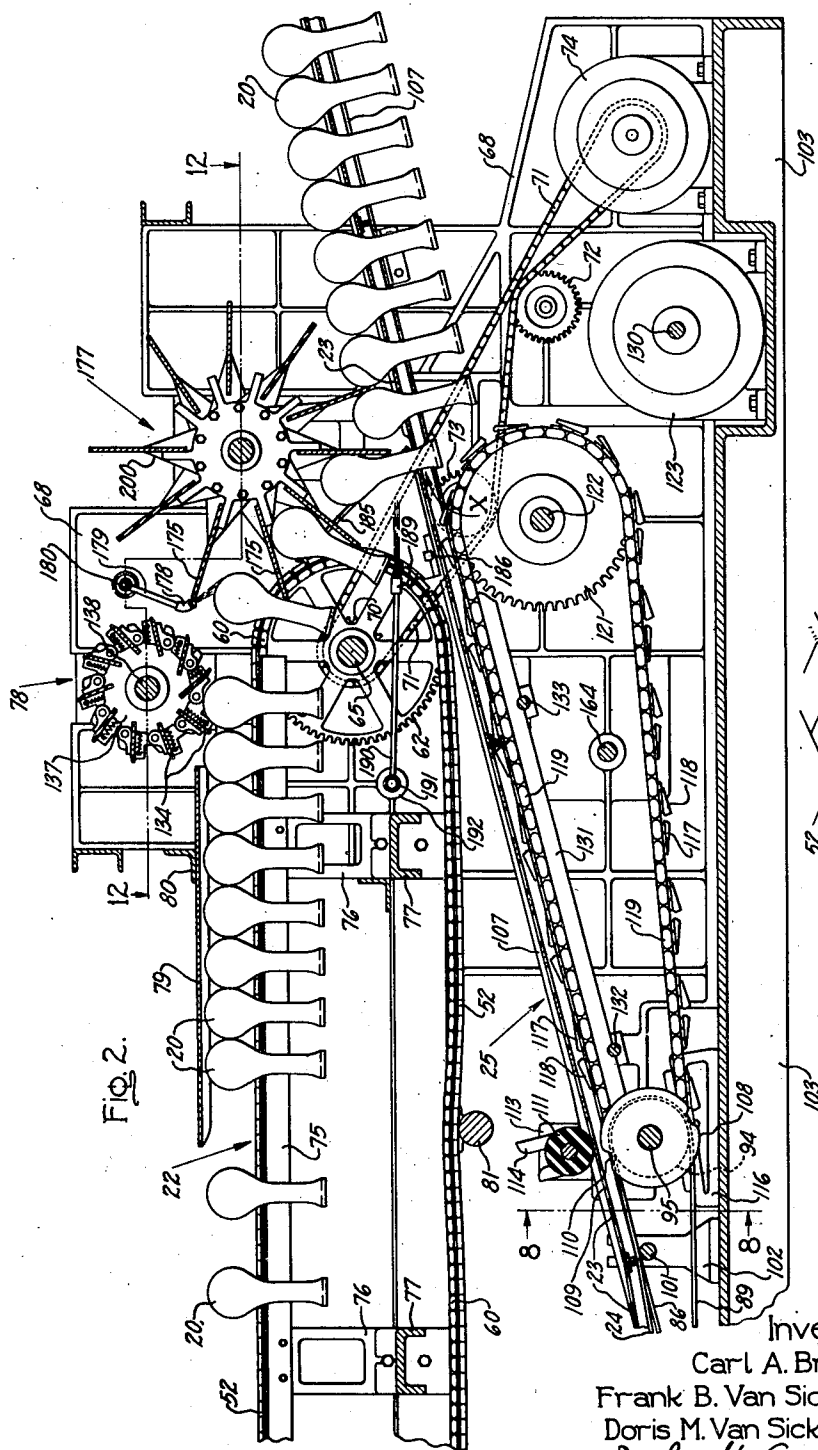


Fig. 2.

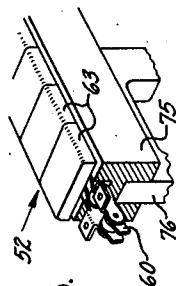


Fig. 5.

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Fig. 3.

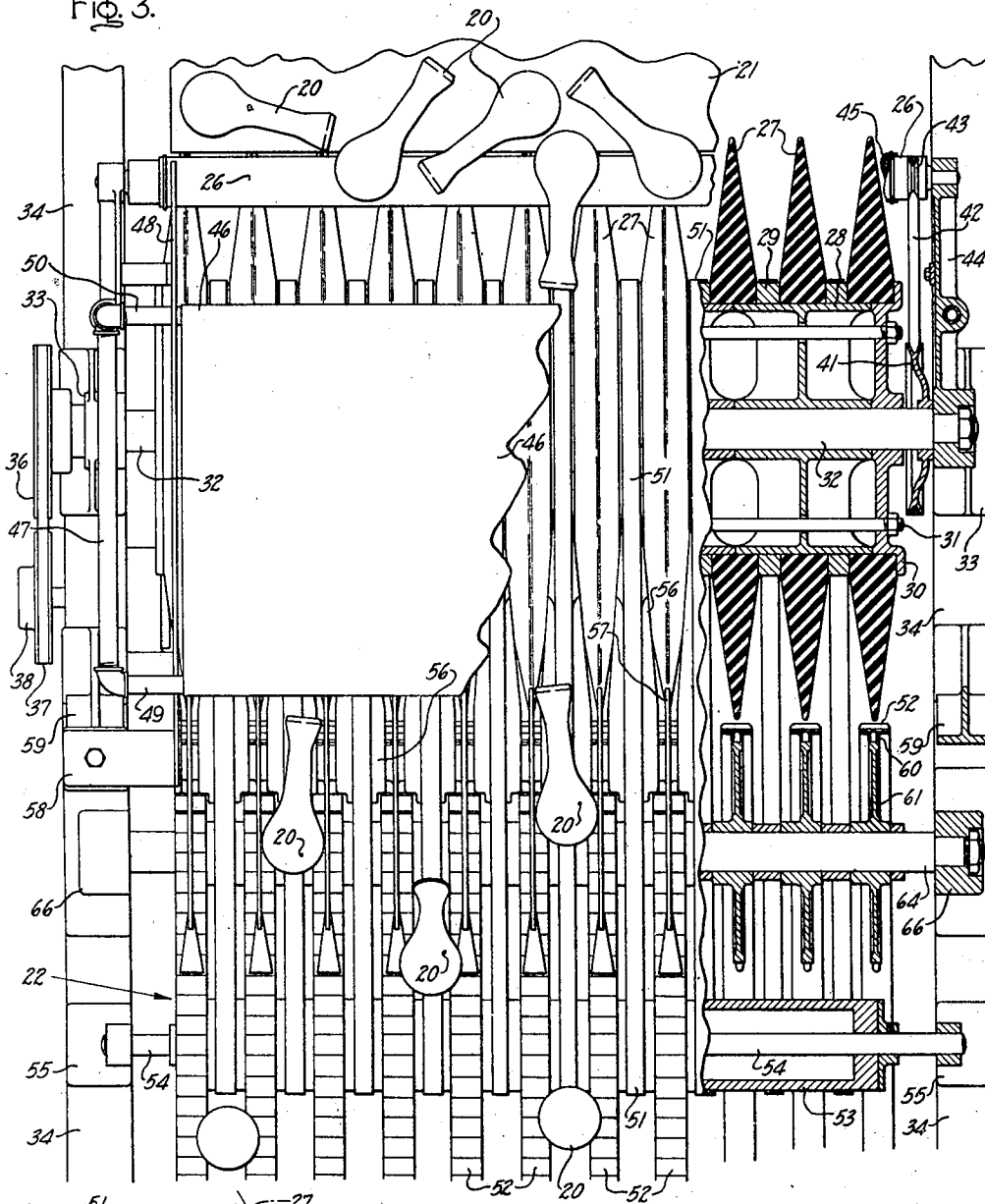
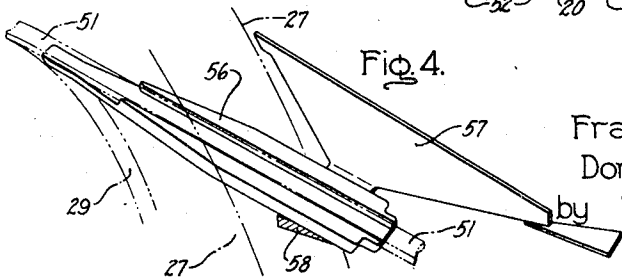


Fig. 4.



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Fig. 11.

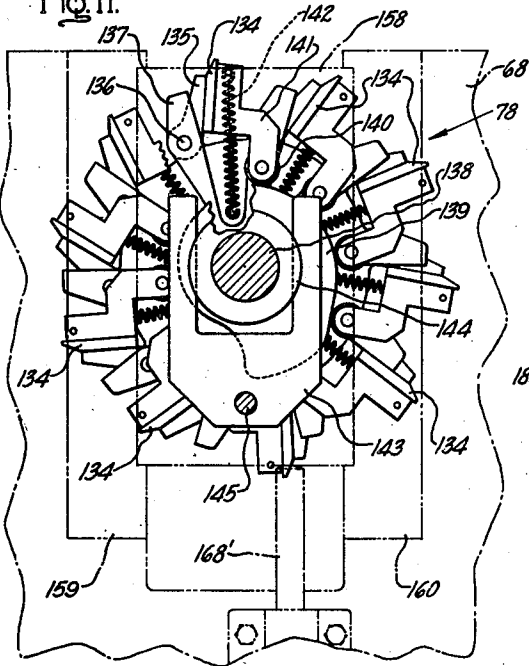


Fig. 6.

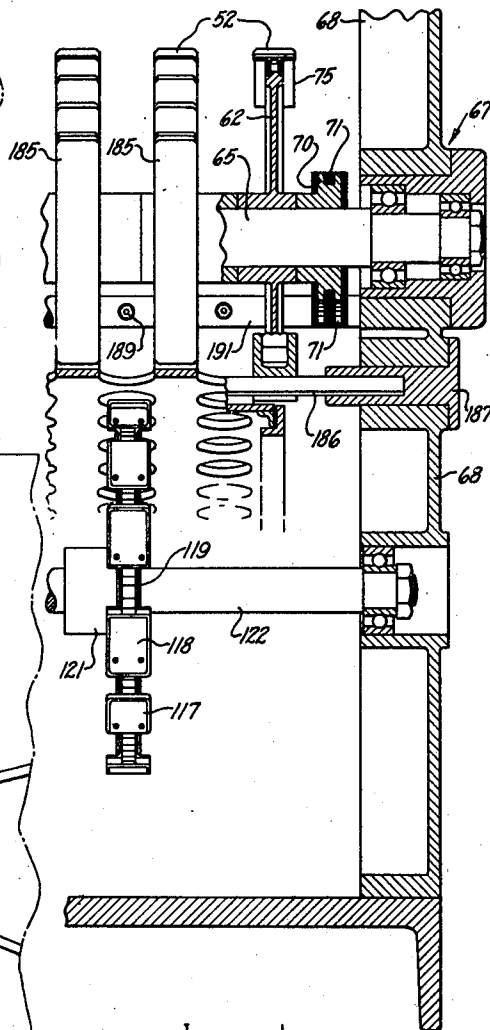
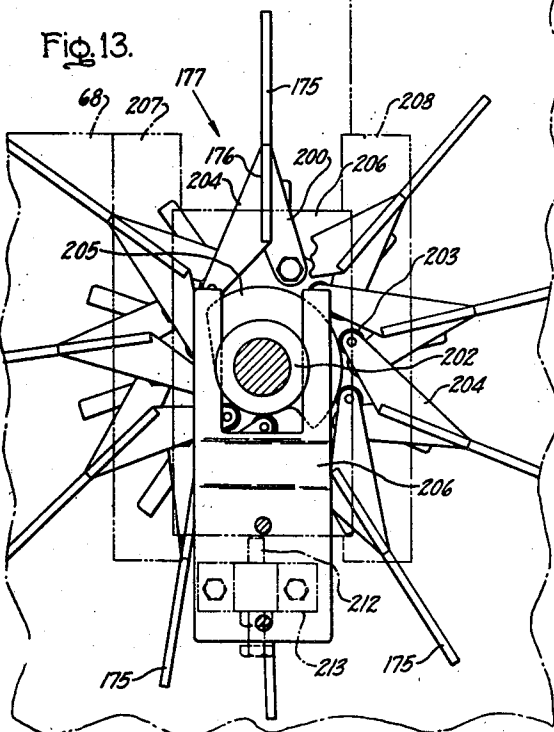


Fig. 13.



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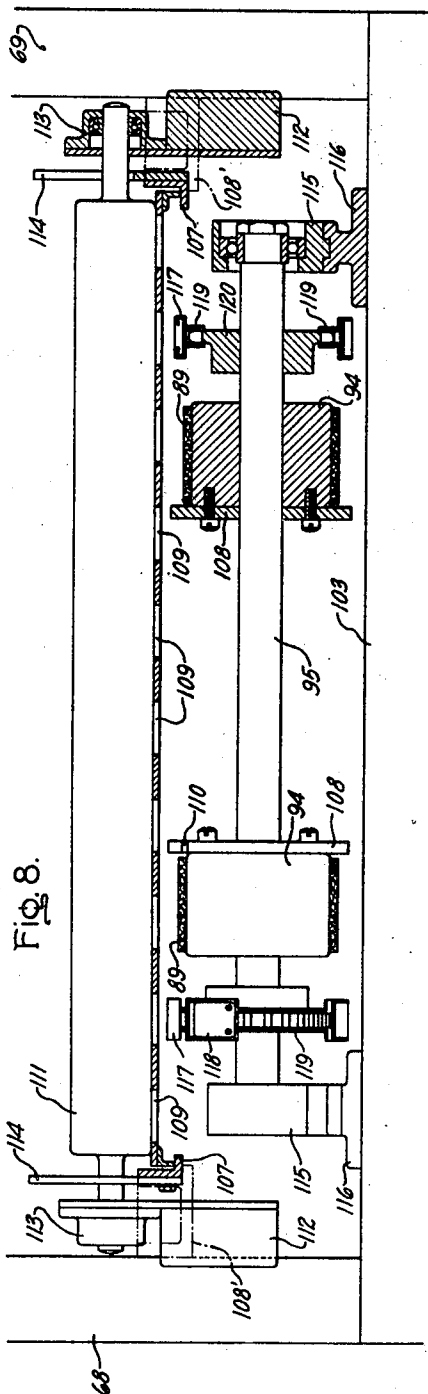
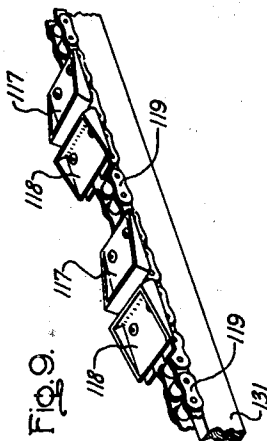
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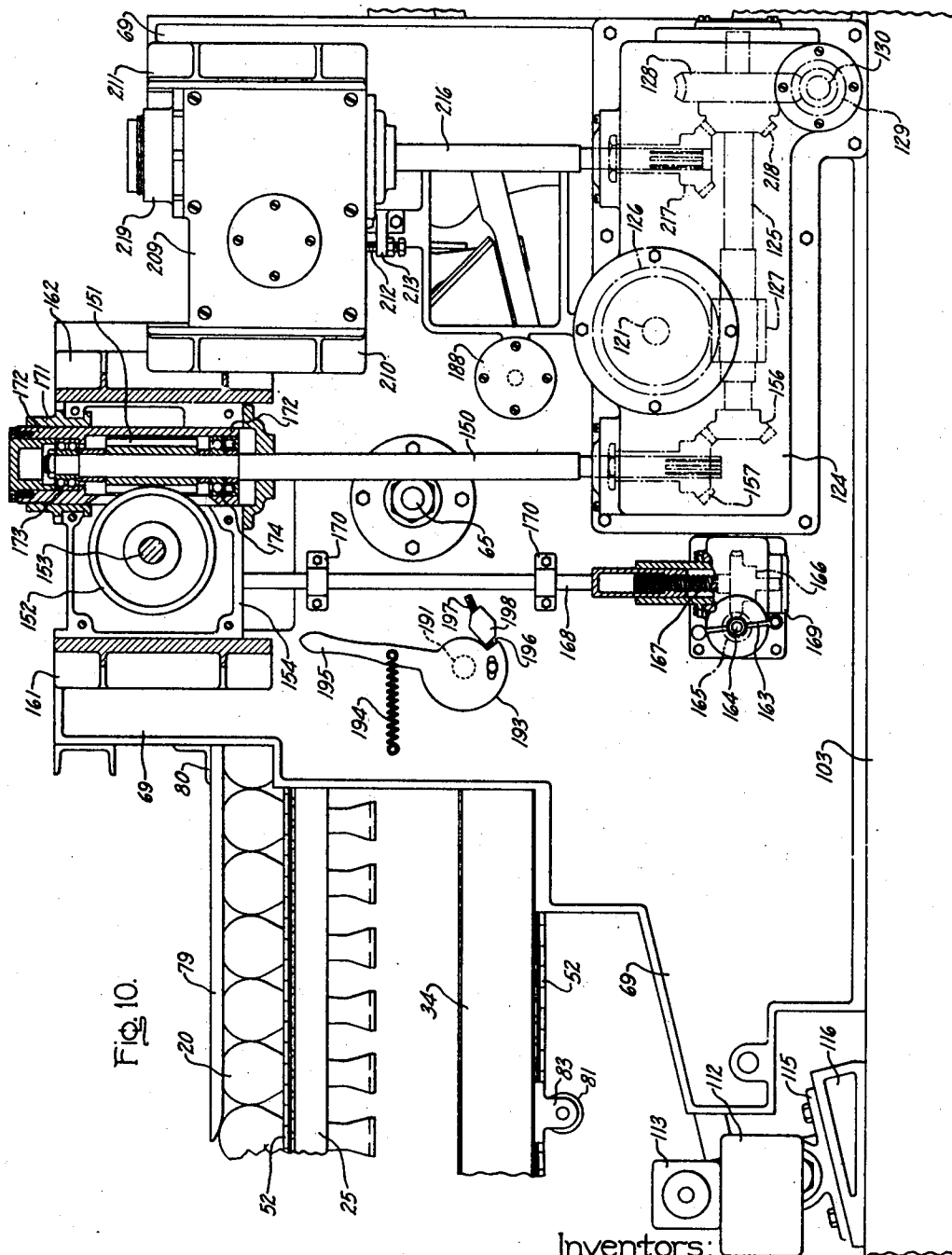


Fig. 10.

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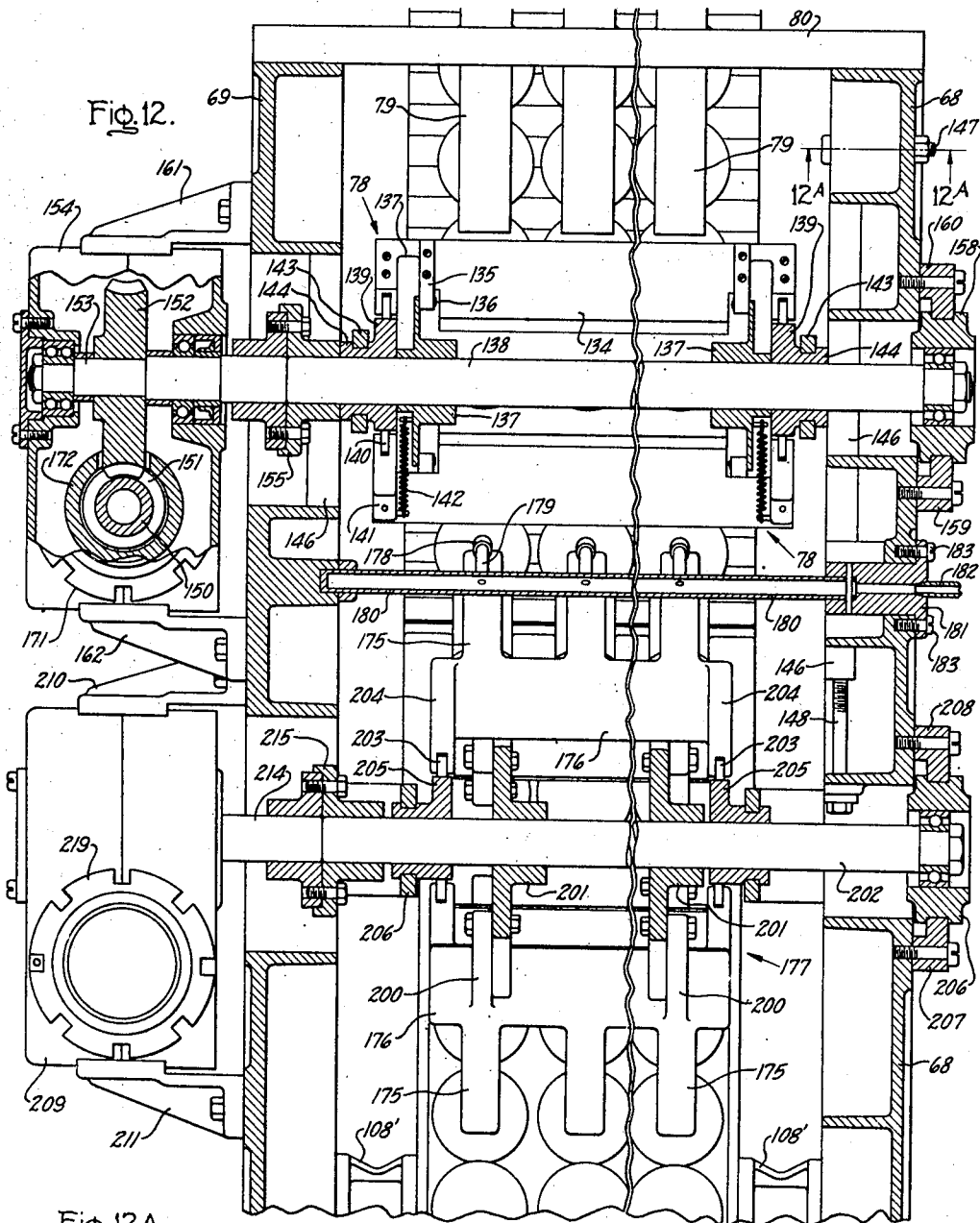
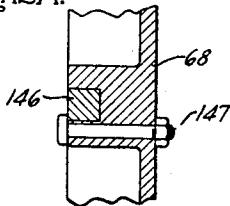


Fig. 12A.



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UNITED STATES PATENT OFFICE

2,439,883

ARTICLE TRAYING MACHINE

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Application February 22, 1943, Serial No. 476,780

9 Claims. (Cl. 226—14)

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Our invention relates to automatic apparatus for placing articles in trays and more particularly to automatic apparatus for placing bulbs for incandescent lamps and other electrical devices in an upright position in regularly spaced openings in trays.

The usual methods of manufacturing glass bulbs produce a continuously replenished supply thereof which must be placed in trays to enable the handling, inspecting, frosting and storing of the bulbs to be carried out efficiently. The bulbs are presented on a relatively wide moving belt and must be placed in a plurality of rows of openings in trays in an upright position. The bulbs cover almost the entire top surface of the belt and are provided in such quantities that trays are required to carry them from place to place either manually or in conveyor systems, etc.

An object of our invention is to provide apparatus for receiving a constant stream of disarranged bulbs, orientating said bulbs and thereafter placing them at selected positions in a tray.

Another object of our invention is to provide apparatus for automatically placing large quantities of bulbs into trays at a very high rate of speed.

Another object of our invention is to provide apparatus for automatically placing glass bulbs of different sizes and shapes in trays with negligible breakage and in a ready and satisfactory manner. Although all glass bulbs have a generally bulbous portion and an extended neck portion, they vary considerably and are very difficult to handle, particularly in large numbers, where many may be broken by striking against one another. The satisfactory manner of operation also depends on the ability of the machine to operate both at slightly and greatly varying speeds as the speed of manufacture of a bulb is often varied slightly whereas different bulbs are often manufactured at greatly different speeds.

Still another object of our invention is to provide automatic apparatus for orientating considerable numbers of bulbs into a common position, for advancing a succession of trays to a receiving or loading station and for inserting the neck portion of said bulbs into openings in the trays so that they are supported and held thereby.

Further objects and advantages of our invention will appear from the following description of a species thereof and from the drawing.

In the drawing, Fig. 1 is a side elevation of a portion (substantially one-half) of a machine constructed in accordance with our invention, which portion receives the glass bulbs and trays;

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Fig. 2 is a vertical section through the remaining portion of said machine, which portion coordinates the movements of the bulbs and trays and subsequently places the bulbs in the openings of the trays; Fig. 3 is a plan view partially broken away of the bulb receiving portion of the machine; Fig. 4 is a perspective view of one of the bulb guides and adjacent partitions; Fig. 5 is a perspective view of a portion of the bulb feed and storage chain; Fig. 6 is an elevation of a portion of the discharge end of the feed and storage chain, the bulb slide rails, and other apparatus at the bulb placement station X (Fig. 2) with the support bearings in the side frame and other portions thereof broken away; Fig. 7 is a vertical section along line 7—7 of Fig. 1 of the forward end of the tray conveyor; Fig. 8 is an end view partially broken away of the tray advancing means taken from a section through the tray conveyor along line 8—8 of Fig. 2; Fig. 9 is a perspective view of a portion of the tray advancing chain and the support bar therefor; Fig. 10 is a side elevation of the tray filling end of the machine with a portion of the drive means broken away; Fig. 11 is a view of the opposite end of the bulb escapement wheel from that shown in Fig. 2; Fig. 12 is a plan view of the tray filling end of the machine with a center portion and other top portions broken away; Fig. 12A is a vertical section through the escapement wheel adjusting bar along line 12A—12A of Fig. 12; and Fig. 13 is a view of the opposite end of the bulb placement wheel from that shown in Fig. 2.

The principal steps of operation of the machine shown in the drawing include the separation of the bulbs 20 received from the conveyor belt 21 into a plurality of rows corresponding to the rows of openings in the trays and, at the same time, the orientation of said bulbs 20 to corresponding positions. These operations are performed by the apparatus at the left of Fig. 1 and result in the placing of the bulbs 20 between the moving belts of the feeding and storage means 22 which advances the bulbs 20 to the right end of the machine shown in Fig. 2. In this latter portion of the machine, apparatus is provided for releasing single bulbs 20 from each of the rows simultaneously and for placing said bulbs 20 into the openings in the trays 23 during the course of the movement of said trays 23 through the machine. The trays 23 enter the machine at a point below the bulb conveyor 21 at the left end thereof and are advanced through the machine first by a conveyor belt 24 shown in Fig. 1 and then by the apparatus 25 shown in Fig. 2 which adapts the

motion thereof to the operation of the adjacent bulb release and placement apparatus. Separate electric motors are provided for driving the various portions of the machine.

The bulbs 20, as shown in Figs. 1 and 3, are introduced in the left end of the machine by means of the conveyor belt 21 and usually cover almost the full top surface thereof. The conveyor belt 21 extends to a position adjacent the feed roll 26 which is rotated in a clockwise direction causing said bulbs 20 to be fed immediately against the assembly comprised of the discs 27 which, in turn, divide them into a plurality (ten) of courses of movement. The roll 26 is located below the conveyor belt 21 and agitates the bulbs 20 so forcefully that they are virtually tossed into the disc assembly by the rotative movement of the roll 26 and are separated from each other somewhat so that they usually do not contact one another. The peripheral portion of the discs 27 is thin, whereas the center portion is relatively thick and the bulbs 20 which readily pass between adjacent discs 27 roll and move about until they are orientated into alignment with the space between the discs 27 and rest on the converging sides thereof. The disc assembly which includes the hub formed by a plurality of drums 28 is rotated at a relatively rapid rate so that the bulbs 20 contacting the discs 27 are quickly advanced and are removed from the path of succeeding bulbs 20. As shown in Fig. 3, the discs 27 are separated by the rings 29 and, together with the drums 28 of the hub and the end plates 30 at opposite sides thereof, are clamped into a unitary assembly by the tie bolts 31. A shaft 32 which extends completely through the assembly provides for the support thereof by its engagement with the brackets 33 on the girders 34 of the frame on opposite sides of the machine and provides for the rotation of the assembly by the drive means (Fig. 1) comprising pulley 36, belt 37, pulley 38, speed reducer 39 and the electric motor 40. The roll 26 is also turned by the shaft 32, the drive being provided by the pulley 41 (Fig. 3) on the end of said shaft 32 at the far side of the machine and the belt 42 which runs in a suitable groove 43 in the roll 26. Extending arms 44 of the brackets 33 support the opposite ends of the roll 26. In this particular instance both the discs 27 and the covering 45 over roll 26 are made of rubber so that the slippage between the bulbs 20 and these parts, the noise created by the engagement of the parts with the bulbs 20, and the breakage of the bulbs 20 are reduced to a minimum. These latter advantages are realized partly because the discs 27 are somewhat flexible. The speed of operation of the machine and consequent speed of rotation of the discs 27 often cause the bulbs 20 to be thrown upward against the cloth screen 46 which is carried by the frame 47 of pipes held by the arms 44 of brackets 33. The bulbs 20 are prevented from rolling outward away from the endmost discs 27 by shields (corresponding to that shown at 48). In this particular instance the bulbs 20 are still at a fairly high temperature, having been taken from an annealing oven by the conveyor belt 21, and it is preferred that a source of compressed air be connected to frame 47 and a series of openings be made in the under side of the cross members 49 and 50 thereof to allow cooling jets of air to play on the discs 27 to prevent them from reaching a high temperature and consequently deteriorating.

The bulbs 20 are carried along with discs 27 until the rotation thereof brings them into contact with the belts 51 whereupon they are sepa-

rated from the discs 27 and, while still retaining their ten separated courses of travel, are carried into the adjacent feed and storage means 22. The bulbs 20 come to rest on the belts 51 in a substantially horizontal position and are not correspondingly orientated as the open neck or bulbous portion may be foremost in its course of movement, but in either instance are carried with the belts 51 until the bulbous portion passes over and comes to rest on adjacent feed belts 52. In this manner all bulbs 20 are caused to rest in similar vertical positions between feed belts 52, which correspond in number to the discs 27 and therefore provide corresponding (ten) courses or channels of movement.

The belts 51 which provide for the transfer and final orientation of the bulbs 20 extend about the rings 29 located between each of the discs 27 and between the feed belts 52 to the idler drum 53 which turns on the shaft 54 held by the brackets 55 on the girders 34 of the frame of the machine. The rotation of the rings 29 creates the movement in the belts 51 which pass along a channel in the guide plates 56 (Figs. 1, 3 and 4) and between the partitions 57 in the course of their movement from between the discs 27 to a position between the feed belts 52. The guide plates 56 function as supports for the belts 51 and prevent them from being wedged between the discs 27 and belts 51 in certain instances. The partitions 57, on the other hand, confine the bulbs 20 to the course of movement and prevent them from rolling from the belts 51 so as to become disarranged and separated from their means of movement. Both the guide plates 56 and the partitions 57 are mounted on the transverse bar 58 held by the brackets 59 carried by the girders 34 at opposite sides of the machine.

The bulbs 20 are now held by the belts 52 of the feeding and storage means 22, which belts 52 are in alignment with the discs 27 and which are of such a width that the bulbous portions of said bulbs 20 rest on the belts 52 on opposite sides thereof, whereas the neck portions extend down therebetween. Each belt 52 is comprised of a chain 60 (Figs. 1, 2, 3 and 5) which extends about a sprocket 61 adjacent said discs 27 at the left end of the machine and a second sprocket 62 adjacent the tray filling apparatus at the right end of the machine and provides a series of fibre blocks 63 attached to the links thereof which butt against each other forming a smooth continuous surface for carrying the bulbs 20. The sprockets 61 and 62 which are mounted on the shafts 64 and 65 respectively, the former of which is held by the brackets 66 on the side girders 34 of the frame and the latter of which is pivoted in bearings (like that shown at 67, Fig. 6) in the side frames 68 and 69, are separated a considerable distance so that a comparatively lengthy section of the belt 52 is presented and so that a goodly number of bulbs 20 are held thereby at all times. All belts 52 are advanced by rotation of the sprockets 61 and 62, which are turned by the sprocket 70 on the end of shaft 65 adjacent side frame 68 and are moved independently of all other apparatus by means connected thereto through the chain 71. The chain 71, as shown in Fig. 2, passes over the idler sprockets 72 and 73 attached to the side frame 68 and a sprocket driven by the electric motor 74 and moves the belts 52 so rapidly that the bulbs 20 are carried away from the left end thereof as soon as they are received. In this

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way the bulbs 20 can not interfere with the movements of each other or be broken by contact with each other. The movement of the belts 52 slides them along the U-shaped bars 75 (Figs. 1, 2 and 5) which are mounted on the uprights 76 extending from the cross members 77 of the frame between the girders 34 and finally carries said bulbs 20 against the parts of the wheel 78 which control all further movements thereof.

Since the bulbs 20 are not divided equally between the ten different courses of movement defined by the belts 52 at all moments and are received at irregular intervals as shown, a considerable reserve supply thereof is provided on the belts 52 in order that a bulb 20 will always be in position to be released by the wheel 78. This reserve supply is in motion at all times but at a slower rate than the movement of the belts 52 and is not disturbed by the difference in motion as the belts 52 present a smooth preferably wax surface which permit them to slide below said bulbs 20. U-shaped guides 79 which are mounted over the reserve bulb supply on a cross bar 80 between the side frames 68 and 69 prevent the bulbs 20 from climbing over each other and moving out of position. It is preferred that an operator be stationed at the side of the machine adjacent the feed and storage belts 52 to check on the distribution of the bulbs 20 between the ten different courses of travel, as it may be necessary to clear broken bulbs which have been accepted by the machine and correct other conditions that are interfering with the proper distribution therein. It may also be necessary to remove, manually, incorrectly positioned bulbs 20 which have been thrown over the discs 27 and onto the belts 52 and move bulbs 20 from between one set of belts 52 to another on occasion. The return lengths of the belts 52 which extend between the lower edges of the sprockets 61 and 62 are supported at intervals by the rollers 81 and 82 (Figs. 1 and 2) which are held by the bearing blocks 83 attached to the under side of the girders 34 on opposite sides of the machine. In order that the machine be adapted to handle various sizes of bulbs and to operate at the sometimes slightly different speeds of operation of the apparatus advancing the bulbs thereto, it is preferred that the electric motor 74 be of an adjustable speed type and that means be provided for adjusting its speed as desired.

The release and placement of the bulbs 20 into the trays 23 is dependent on the advancement of said trays 23 through conveyor 24 located below the discs 27 etc., at the left end (Fig. 1) of the machine and the tray advancing apparatus 25 below the right end (Fig. 2) of the feed and storage belts 52. A source of trays providing a constant supply thereof must be connected to the end of the conveyor 24, which source in this particular instance is a conveyor (not shown) having considerable length so as to afford storage for a considerable number of trays 23 and therefore provide a ready source for the great number required. Common speeds of operation require that eight to fifteen trays 23 be provided every minute. The guide rails 86 of conveyor 24 can, if desired, be continuations of similar rails of the source of trays 23 and as shown in Fig. 7 provide slide ways for the angular bars 87 along opposite sides of the trays 23. The bars 87 extend completely around the flat plate 88 of the trays 23 which must advance into the present machine until the bar 87 along the for-

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ward edge engages and is pulled along by the moving belts 89—89. As shown in Fig. 1, each belt 89 passes around an idler pulley 90 on the stub shaft 91 extending from the bracket 92, passes along to the shoe 93 which raises it into the path of movement of the bars 87 of the trays 23 and passes around a driven pulley 94 (Figs. 2 and 8) on the driven shaft 95 under the right end of the machine. The brackets 92 are fastened to the bars 96 by bolts extending through slots therein and can be adjusted along said bars 96 to tighten or loosen the belts 89—89. The guide rails 86, in turn, are fastened together by the cross-bars 97, 98 and 99, the first two 97 and 98 of which support bars 96, and are supported at the left end of the machine by brackets 100 extending downward from the girders 34 of the frame. Ordinarily one tray 23 follows directly behind the preceding tray 23 and a continuous line thereof is moved along the guide rails 86 to the advancing means 25 adjacent the right end thereof. This end of said rails 86 is supported by the rod 101 carried by brackets 102 at opposite sides of the base 103 of the machine and extends between corresponding brackets 104 (only one being shown), on opposite sides of the end of said base 103, which support the girders 34. A roller 105 on a pin 106 on each bracket 104 provides an intermediate support for the lower span of the belts 89.

The tray advancing apparatus 25 as shown in Figs. 2 and 8 provides guide rails 107 similar to those of the conveyor 24 for supporting the trays 23 and also provides cams 108—108 in the direct line of movement of the bar 87 on the front and back edges to control the movement thereof. The guide rails 107 are stationary members being attached at intervals to the side frames 68 and 69 by the blocks 108' (indicated in dot-dash lines in Fig. 8) and provide inclined slide ways for carrying the trays 23 into operative relation to the bulb escapement and placement apparatus adjacent the right end of the feed and storage belts 52. The cams 108—108, on the other hand, prevent the passage of trays 23 into the tray advancing apparatus 25 except when said trays 23 are arranged so that the openings 109 therein can be advanced into operative relation to the bulb escapement and placement means in proper time relation to the operations thereof. When movement of the tray 23 is to occur, the regular rotation of the cams 108—108 which are attached to the pulleys 94—94 on the driven shaft 95 carries the notches 110 into position to receive the bar 87 at the front edge of the tray 23 so that the belts 89—89 can advance it beyond the cams 108—108. Normally, one tray 23 will butt tightly against another and the bars 87 at the back and front edge of succeeding trays 23 will pass into the notches 110 of the cam 108 automatically so that no interruptions will occur in the movements of the trays 23. If a tray 23 becomes separated from the succeeding tray 23 or is introduced at the incorrect time, the bar 87 at the front edge will butt against the raised portion of the cams 108—108 which stop it from moving momentarily. Such trays 23 are prevented from being forced over the raised portion of the cams 108—108 by the downward pressure of the roller 111 which is mounted so as to rest on the top surface thereof and which is weighted down by the blocks 112 attached to the bearing blocks 113 on the spindles extending from opposite ends thereof. Slotted arms 114 engaging the end spindles of roller 111 and attached to the guide

rails 107 at opposite sides of the machine limit the movement of the roller 111 to a substantially vertical direction. The adjacent ends of the driven shaft 95 is journaled in the bearing blocks 115 which rest on the inclined surfaces provided by the base plates 116.

At the same time, the notches 110 in the cams 108 are turned into position to receive the bar 87 at the edge of a tray 23, two dogs 117 and 118 on each of a pair of chains 119 extending between sprockets 120 and 121 on shafts 95 and 122 respectively are carried into positions in front and behind said bar 87. These dogs 117 and 118 now control the movement of the trays 23 as there is only sufficient space between them for the bars 87 at the back and front edge of abutted trays 23 and advance said trays 23 through the movement of the chains 119 which in turn are driven from the electric motor 123 in combination with the bulb escapement and placement means by the driving mechanism within the gear case 124 (Fig. 10) on side frame 69. As indicated in dot-dash lines, the shaft 121 is driven in combination with other apparatus of the machine from a lay shaft 125 within the gear case 124 through worm gears 126 and 127, which shaft 125 extends nearly the full length of the case and is driven at reduced speed through the worm gears 128 and 129 by the shaft 130 of the electric motor 123. Each dog 117—118 is fastened to ears (Fig. 9) extending from a link in the chain 119 and rests on corresponding ears of an adjacent link during the intervals it is following the straight course of movement between sprockets 120 and 121. Stationary slide bars 131 clamped to the rods 132 and 133 extending between side frames 68 and 69 of the machine provide a rest for the top straight portions of the chains 119 so that they follow the course of movement of the trays 23 at all times. In this particular instance, the electric motor 123 is the adjustable speed type and is caused to operate at a speed which will advance the trays 23 and operate other portions of the machine at a sufficient rate to care for all the bulbs 20 received by the machine. The trays 23 are advanced continuously at a uniform rate of speed and present a succession of openings 109 at the loading station X as said openings 109 are arranged at regular intervals along the tray 23. Succeeding trays 23 provide other similarly grouped openings 109 and form an endless procession thereof as the first and last openings 109 of adjacent trays 23 are spaced the same distance as those in the mid portion of a tray 23. The openings 109 are also divided into longitudinally extending rows corresponding in number (ten) to the courses of movement of the bulbs 20 held by the feed and storage belts 52.

Because of the high speed of operation of the machine, several bulbs 20 are in the process of being loaded into the trays 23 at all times, a process which includes the release of a bulb 20 from each of the ten courses of movement along the feed and storage belts 52 and then the neck first insertion of the bulbs 20 through the openings 109 in the trays 23. The release or escapement operation is performed by a wheel 78 (Figs. 2, 11 and 12) having a plurality of blades or paddles 134 which are carried down between the last two bulbs 20 in each course of movement along the feed and storage belts 52 in succeeding intervals and which prevent all but the last bulbs 20 from being advanced by said belts 52. The blades 134 are attached to short arms 135 pivotally mounted on pins 136 extending from

hubs 137—137 at the opposite ends of shaft 138 and, at the time of their first engagement with the bulbs 20, extend in a radial direction from the shaft 138. As the wheel 78 turns and succeeding bulbs 20 are separated from those in the line, the blades 134 swing up out of the path of movement of the bulbs 20 so that they are free to travel along with the feed and storage belts 52. This latter movement of the blades 134 is under the control of the cams 139 which are located on the ends of shaft 138 adjacent the hubs 137 and which are engaged by the rollers 140 on the arms 141 extending from the ends of said blades 134. The biasing of the springs 142 extending between posts in the hubs 137 and the arms 141 causes the blades 134 to be held so that the rollers 140 follow the contour of the cams 139 which do not turn with shaft 138 as they are held by the engagement of the yokes 143 with the flat portion of the bosses 144 thereof. A pin 145 attaches each yoke 143 to a bar 146 (Figs. 12 and 12A) which is held by the side frame (68 or 69) and which can be moved longitudinally therein, so as to turn the cam 139 and change the timing of the swinging movement of the blades 134, by adjustment to the clamping bolt 147 and the adjusting screw 148 (Fig. 12).

The rotation of the bulb escapement wheel 78, which is dependent on the rate of movement of the trays 23, originates in the lay shaft 125 (Fig. 10) of the driving means within the gear case 124 on the lower portion of the side frame 69 and is transferred to the shaft 138 supporting said wheel 78 through the vertical shaft 150 and the worm gear 151, worm wheel 152 and stub shaft 153 within the box 154 adjacent one end of said shaft 138. A flanged coupling 155 connects the end of the shaft 138 to the stub shaft 153 whereas the pair of bevel gears 156 and 157, the latter of which engages splines on the end of the shaft 150, connects shaft 150 and lay shaft 125.

When other sizes and shapes of bulbs 20 are being fed and different speeds of operation are being used, the escapement wheel 78 must be raised or lowered so as to operate properly. This adjustment is made by altering the position of the bearing block 158 in the slide ways provided in the guide bars 159 and 160 and the box 154 in the slide ways provided by the brackets 161 and 162, and is produced by manually rotating the crank 163 (Fig. 10) of means providing for the equal adjustment of both bearing block 158 and box 154. The crank 163 is attached to one end of a rod 164 extending between the side frames 68 and 69 of the machine and provides for the operation of corresponding means at each side of the machine which means (referring to the single instance shown) is comprised of the worm gear 165, worm wheel 166, the threaded spindle 167 and a vertically disposed rod 168. The rotation of the rod 164 and worm gear 165 causes the rotation of the worm wheel 166 and screws the spindle 167 in or out of the end of the rod 168 causing it and the box 154 which rests on its upper end to move down or up. The worm gear and wheel 165 and 166 respectively and spindle 167 are enclosed within the gear case 169 which also functions as a guide for the lower end of the rod 168. The brackets 170—170 similarly provide guiding means for intermediate portions of the rod 168. In the instance of the apparatus on the opposite side of the machine,

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the bearing block 158 (Fig. 11) rests on the end of a rod 168' corresponding to the rod 168.

The operations of the escapement wheel 78 must occur at different intervals with respect to the movements of the trays 23 on occasions when smaller and differently shaped bulbs are being fed and accordingly must be capable of being adjusted through the few degrees of separation between the blades 134 thereof. This adjustment is made in the drive means for the escapement wheel 78 by manually turning the bushing 171 held by the gear box 154 so that the screw threads of said bushing 171 move the sleeve 172 and the worm gear 151 vertically with respect to the worm wheel 152. The lead of the teeth of the worm gear 151 turns the worm wheel 152 and the escapement wheel 78 the required amount. Notches in the periphery of the bushing 171 permit the bushing 171 to be turned more readily and permit it to be locked in place by a pin (not shown) placed in an opening in the top of the gear box 154. The drive shaft 150 holding the worm gear 151 is mounted in the bearings 173 and 174 at a fixed position with relation thereto and is therefore moved vertically therewith. During this latter movement of the shaft 150 and that movement occurring during the vertical adjustment of the escapement wheel 78, the splines on the lower end of the shaft 150 slide in the bevel gear 157 without disturbing its position in the gear case 124.

A bulb 20, after being released by the escapement wheel 78, is carried along with the feed and storage belts 52 (Fig. 2) until it is brought against one of the moving fingers 175 of the placement means which controls and directs its movement to an opening 109 in the tray 23 at station X. The fingers 175 (Figs. 12 and 13) of the placement means are extending portions of the vanes 176 of the placement wheel 177 and are carried down between the feed and storage belts 52 during the counterclockwise rotation of the wheel 177 to a point where the force of the feed belts 52 and an air jet from the nozzle 178 cause the bulbs 20 to be laid thereagainst. The nozzle 178 is mounted on a pipe 179 extending from the manifold 180 which is, in turn, mounted in the side frame 69 and the cylindrical block 181 and which is connected to a source (not shown) of compressed air through the block 181 and pipe 182. Slots (not shown) in the flange of the block 181 permit it and the manifold 180 to be turned with respect to the clamping screws 183 so that the air jet may be redirected if desired. Still further rotation of the placement wheel 177, after the bulb 20 is laid on a finger 175 thereof, carries a succeeding finger 175 into position behind the bulb 20 so that it is separated from the next bulb 20 to be advanced along the feed belts 52 and carries the bulbous portion of said first bulb 20 from the feed belts 52 to the inclined guide rails 185 which are in line therewith. The guide rails 185 are stationary members being attached to the bar 186 extending between the cylindrical blocks 187—188 (Figs. 6 and 10) in the side frames 68 and 69 and support the bulb 20 which is moved therealong by the finger 175 of the placement wheel 177. The angularity of the finger 175 holding the bulb 20 changes during the rotation of the placement wheel 177 until the bulb 20, which is kept thereagainst by a second jet of air from the nozzle 189, is directly aligned with an opening 109 in the tray 23. Still further movement of the placement wheel 177 allows the bulb 20 to slide down the guide rails 185 so that

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the open neck of the bulb 20 passes into the opening 109 and allows the bulb 20 to travel along with the tray 23 so that it retains its relation with the said opening 109. Finally the bulb 20 slides from the guide rails 185 to the tray 23. As in the prior instance, the nozzles 189 are mounted on pipes 190 extending from a manifold 191 which is in turn held by cylindrical blocks 192 and 193 (Figs. 2 and 10 respectively) retained by the side frames 68 and 69 respectively. The manifold 191 is free to turn in block 192 and is positioned by the block 193 which is normally turned by the expansion of the spring 194 extending between posts in the handle 195 attached to the cylindrical block 193 and the side frame 69 so that the shoulder 196 thereof is against the stop screw 197 in the block 193 on side frame 69. Adjustment of the stop screw 197 turns the manifold 191 and redirects the air jets. In certain instances broken glass, etc., which may have fallen on the trays 23 and the adjacent parts of the machine and which may be interfering with the movements of the bulbs 20, can be dislodged therefrom by depressing the air jets momentarily through manual pressure on the handle 195.

The fingers 175 and vanes 176 of the placement wheel 177 are separated farther than succeeding openings 109 in the trays 23 and are caused to change their relation in the wheel 177 directly after the bulb 20 drops into the opening 109 so as not to interfere with the bulb 20 in the adjacent opening 109 in the tray 23. This action of the fingers 175 (Figs. 12 and 13) results from a corresponding movement of the vanes 176 which are mounted on arms 200 pivotally fastened to the hubs 201—201 adjacent the ends of the shaft 202, which movement is caused by the passage of the rollers 203 on other arms 204 extending from the ends of the vanes 176 from the high parts of the cams 205—205 located adjacent the hubs 201—201. The cams 205 are stationary members held in place by the yokes 206 which are attached to the side frames (68 or 69) and which engage flat sections of extending bosses thereof and allow the vanes 176 and fingers 175 to swing free of any control whatever until the fingers 175 are carried up from between the bulbs 20 in the tray 23. At such times the rollers 203 engage the low portions of the cams 205 which are followed until the placement wheel 177 completes still more of its revolution. The succeeding high parts of the cams 205 bring the vanes 176 back to their prior position. The means of supporting and rotating the placement wheel 177 corresponds to similar means associated with the escapement wheel 78 and comprises a bearing block 206 (Figs. 12 and 13) between the guide bars 207 and 208 on side frame 68 at one end thereof and the gear box 209 (Figs. 10 and 12) between the brackets 210 and 211 on side frame 69 at the opposite end thereof. Corresponding bolts 212 and brackets 213 below the bearing block 206 and the gear box 209 bear the weight of the opposite ends of the placement wheel 177 and permit it to be adjusted vertically. The gear box 209 and associated apparatus are duplications of box 154 and associated apparatus and provide a stub shaft 214 connected to shaft 202 by the flanged coupling 215 and a vertical drive shaft 216, connected through the splines on its lower end, the bevel gears 217 and 218 and worm wheel 128 to the lay shaft 125 of the drive means. The relation of the finger 175 of the placement wheel 177 to the other parts of the machine, particularly the

openings 109 in the trays 23, can be adjusted by rotating the bushing 219 on the box 209.

The bulb feeding or traying apparatus is operated continuously corresponding to the regular movements of the trays 23 and fills the openings 109 therein as rapidly as they are presented. As the trays 23 are filled, they are pushed along the rails 107 and 107 by the succeeding trays 23 and pass from the machine to another conveyor (not shown) or other means which is capable of carrying for them without disturbing their regular motion along the guide rails 107—107.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In apparatus of the class described for feeding articles such as lamp bulbs comprising means for guiding a row of the bulbs along a course of movement in a suspended neck-down position, placement means for directing movement of individual bulbs along the guiding means comprising a rotatable wheel having a plurality of radially extending fingers pivotally mounted thereon, means for turning said wheel to cause the fingers to be carried between succeeding bulbs in the guiding means and to control the movements and position of the bulbs, and means for changing the radial relationship of the fingers in the wheel upon delivery of the bulbs from the guiding means.

2. In an electric lamp bulb traying apparatus, the combination of means for conveying bulbs in suspended neck-down position along a plurality of parallel horizontal courses of movement, each of said courses terminating in a downwardly inclined slide means, an escapement wheel above and adjacent the end of said courses of movement, said escapement wheel being mounted on a horizontal axis and having radially extending blades adapted to extend between the bowl portions of successive bulbs in each of said courses, a rotatable placement wheel disposed above said slide means on a horizontal axis and having a plurality of fingers for engaging the bowl portions of the bulbs in said slide means and controlling their position and movement therein, and means for turning the escapement and placement wheels in proper time relation to cause the escapement wheel to release a bulb from each of the courses to the slide means and the placement wheel whence they are guided neck end foremost into a tray.

3. In an electric lamp bulb traying apparatus, the combination of means for supporting a row of bulbs by their bowl portions so they hang neck down and conveying them along a horizontal course of movement terminating in downwardly inclined slide rails from which they are directed neck end foremost into apertures in a tray, an escapement wheel mounted above and adjacent the end of said course of movement on a horizontal axis transverse to said course of movement, said wheel having adjustable, approximately radially extending, blades adapted to enter between the bowl portions of successive bulbs in said course of movement, means for rotating said wheel in a direction corresponding to the direction of travel of the bulbs in said course to cause successive blades on said wheel to be interposed between successive bulbs to thereby segregate and release the bulbs one at a time while restraining the remaining bulbs in the course, and means to automatically adjust each blade, upon segregation of a bulb, in a direction which increases its angularity with respect to the next succeeding blade whereby to

effect speedier release of the segregated bulb, a rotatable placement wheel located above said slide rails on a horizontal axis transverse to the direction of movement of the bulbs in said slide rails, said placement wheel having approximately radially extending fingers adapted to engage the bulbs in said slide rails to control their position and movement therein, and means to synchronize the rotation of the escapement and placement wheels to cause the escapement wheel to release bulbs to the slide rails and the placement wheel in proper time sequence.

4. In apparatus of the class described, the combination with means for supporting a row of electric lamp bulbs by their bowl portions so they hang neck down and conveying them along a horizontal course of movement, of an escapement wheel mounted above and adjacent the end of said course of movement on a horizontal axis transverse to said course of movement, said wheel having adjustable, approximately radially extending blades adapted to enter between successive bulbs in said course of movement, means for rotating said wheel in a direction corresponding to the direction of travel of the bulbs in said course to cause successive blades on said wheel to be interposed between successive bulbs to thereby segregate and release the bulbs one at a time while restraining the remaining bulbs in the course, and means to automatically adjust each blade, upon segregation of a bulb, in a direction which increases its angularity with respect to the next succeeding blade whereby to effect speedier release of the segregated bulb.

5. Apparatus for loading electric lamp bulbs into trays comprising the combination of a source of disarranged bulbs, a continuously moving horizontal storage conveyor composed of a plurality of endless belts in spaced side-by-side relation arranged to carry rows of bulbs in suspended neck-down position between adjacent pairs of belts, means between said source and said storage conveyor constructed and arranged to segregate bulbs received from said source and guide them into said storage conveyor, a tray conveyor for trays having transverse rows of apertures corresponding in number to the rows in said storage conveyor, said tray conveyor being constructed and arranged to carry said trays under and beyond the end of said storage conveyor in the same general direction in which the bulbs are moved in said storage conveyor, release means adjacent the end of said storage conveyor constructed and arranged to periodically and simultaneously release single bulbs from the rows in said storage conveyor and guide them neck-end foremost into a transverse row of apertures in a tray, and mechanism for synchronizing the operation of the bulb release means with the movement of trays in said conveyor.

6. Apparatus for loading electric lamp bulbs into trays comprising the combination of a source of disarranged bulbs, a continuously moving horizontal storage conveyor composed of a plurality of endless belts in spaced side-by-side relation arranged to carry rows of bulbs in suspended neck-down position between adjacent pairs of belts, means between said source and said storage conveyor constructed and arranged to segregate bulbs received from said source and guide them into said storage conveyor, said means comprising a plurality of pairs of tapered discs of flexible non-metallic material mounted in spaced relation on a common horizontal shaft and arranged to receive bulbs from said source at a point above

the said shaft whereby to segregate the bulbs and carry them over in separate rows, a tray conveyor for trays having transverse rows of apertures corresponding in number to the rows in said storage conveyor, said tray conveyor being constructed and arranged to carry said trays under and beyond the end of said storage conveyor in the same general direction in which the bulbs are moved in said storage conveyor, release means adjacent the end of said storage conveyor constructed and arranged to periodically and simultaneously release single bulbs from the rows in said storage conveyor and guide them neck-end foremost into a transverse row of apertures in a tray, and mechanism for synchronizing the operation of the bulb release means with the movement of trays in said conveyor.

7. Apparatus for loading electric lamp bulbs into trays comprising the combination of a source of disarranged bulbs, a continuously moving horizontal storage conveyor composed of a plurality of endless belts in spaced side-by-side relation arranged to carry rows of bulbs in suspended neck-down position between adjacent pairs of belts, means between said source and said storage conveyor constructed and arranged to separate bulbs received from said source and guide them into said storage conveyor, said means comprising a plurality of pairs of tapered discs of flexible non-metallic material mounted in spaced relation on a common horizontal shaft and arranged to receive bulbs from said source at a point above the said shaft whereby to segregate the bulbs and carry them over in separate rows, and a plurality of endless belts around said shaft between pairs of adjacent discs and extending into the spaces between the pairs of spaced belts in said storage conveyor for carrying the segregated bulbs from said discs to said storage conveyor, a tray conveyor for trays having transverse rows of apertures corresponding in number to the row in said storage conveyor, said tray conveyor being constructed and arranged to carry said trays under and beyond the end of said storage conveyor in the same general direction in which the bulbs are moved in said storage conveyor, release means adjacent the end of said storage conveyor constructed and arranged to periodically and simultaneously release single bulbs from the rows in said storage conveyor and guide them neck-end foremost into a transverse row of apertures in a tray, and mechanism for synchronizing the operation of the bulb release means with the movement of trays in said conveyor.

8. Apparatus for loading electric lamp bulbs into trays comprising the combination of a source of disarranged bulbs, a continuously moving horizontal storage conveyor composed of a plurality of endless belts in spaced side-by-side relation arranged to carry rows of bulbs in suspended neck-down position between adjacent pairs of belts, means between said source and said storage conveyor constructed and arranged to segregate bulbs received from said source and guide them into said storage conveyor, a tray conveyor for trays having transverse rows of apertures corresponding in number to the rows in said storage conveyor, said tray conveyor being constructed and arranged to carry said trays under and beyond the end of said storage conveyor in the same general direction in which the bulbs are moved in said storage conveyor, release means adjacent the end of said storage conveyor constructed and

arranged to periodically and simultaneously release single bulbs from the rows in said storage conveyor and guide them neck-end foremost into a transverse row of apertures in a tray, said release means including a rotatable paddle wheel located adjacent and above the end of said storage conveyor on a horizontal axis so that successive paddles enter between the upper bowl portions of successive bulbs in each row of bulbs in said storage conveyor, and mechanism for synchronizing the operation of the bulb release means with the movement of trays in said conveyor.

9. Apparatus for loading electric lamp bulbs into trays comprising the combination of a source of disarranged bulbs, a continuously moving horizontal storage conveyor composed of a plurality of endless belts in spaced side-by-side relation arranged to carry rows of bulbs in suspended neck-down position between adjacent pairs of belts, means between said source and said storage conveyor constructed and arranged to segregate bulbs received from said source and guide them into said storage conveyor, a tray conveyor for trays having transverse rows of apertures corresponding in number to the rows in said storage conveyor, said tray conveyor being constructed and arranged to carry said trays under and beyond the end of said storage conveyor in the same general direction in which the bulbs are moved in said storage conveyor, downwardly inclined slide rails extending from the ends of the rows in said storage conveyor toward said tray conveyor, an escapement paddle wheel located adjacent and above the end of said storage conveyor on a horizontal axis so that successive paddles enter between the upper bowl portions of successive bulbs in each row of bulbs in said storage conveyor, a rotatable placement wheel located above said slide rails on a horizontal axis and having a plurality of fingers for engaging the bowl portions of the bulbs in said slide rails and controlling their position and movement therein, and means for turning the escapement and placement wheels in proper time relation to the movement of the trays in said conveyor to cause the escapement wheel to simultaneously release a bulb from each of the rows in said storage conveyor to the slide rails and the placement wheel whence the bulbs are guided neck-end foremost into the apertures in a tray.

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