APPARATUS FOR ORIENTING CYLINDERS

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Claims. (Cl. 192—43)

This invention relates generally to apparatus for manipulating work units, and particularly to improvements in apparatus for manipulating a random arrangement of work units to orient the same and convert the random arrangement of work units into a uniform arrangement of work units.

The assembly of certain articles may involve the manipulation of work units cylinders, for example, closed at one end and open at the opposite end, the purpose of the manipulation being to orient the several cylinders in a continuously moving line thereof so that corresponding ends of the cylinders face in the same direction. The assembly of said articles may additionally involve feeding the cylinders, oriented as aforesaid, to means for advancing the articles.

An important object of the present invention is the provision of improved apparatus for orienting cylinders in a continuously moving line thereof in which some of said cylinders lead with their closed ends and some with their open ends.

Another important object of the present invention is the provision of such apparatus having improved means operable for terminating advance of the leading cylinder in one of two predetermined positions, depending upon whether the leading cylinder leads with its closed or with its open end.

Still another important object of the present invention is the provision of such apparatus, including improved means operable in the manner aforesaid, including improved means operable for removing the leading cylinder from the line of cylinders and delivering the same to means from which the cylinders may drop by gravity in properly oriented condition.

A further object of the present invention is the provision of such apparatus, including means operable in the manner aforesaid, including improved means operable for controlling the feeding of properly oriented cylinders to means for advancing the work.

Other objects of the invention will become apparent when the following description is read with reference to the drawings, in which:

FIGURE 1 is a side elevation of exemplary apparatus constructed in accordance with the invention, part of the figure being shown in section;

FIGURE 2 is a fragmentary plan view of the apparatus shown in FIGURE 1;

FIGURE 3 is a fragmentary front view of the apparatus, part being broken away;

FIGURE 4 is a section on line 4—4 of FIGURE 2;

FIGURE 5 is a section on line 4—4 of FIGURE 2, showing a different operating condition;

FIGURE 6 is an enlarged view of a fragmentary portion of FIGURE 2;

FIGURE 7 is a section on line 7—7 of FIGURE 6;

FIGURES 8 and 9 are sections respectively on lines 8—8 and 9—9 of FIGURE 1;

FIGURE 10 is a plan view as indicated by line 10—10 of FIGURE 1; and

FIGURE 11 is a section on line 11—11 of FIGURE 3.

Referring to the drawings, the exemplary apparatus constructed in accordance with the invention comprises a frame structure including a horizontally extending circular top member 10. Mounted upon this top member is a frame including a horizontally extending base plate 12 carried by a pair of side plates 14 and fixed to the top member 10 by studs 16. The side plates 14 are arcuate in shape and carry an upright plate 18 fixed thereto as by studs 20. Overlying the plates 14 is a plate 22 secured in flatwise relation to the plate 18. The upper narrow edges of the plates 18 and 22 are grooved and the grooves conjointly form a way 24. On opposite sides of the way 24 respectively are guide plates 26 and 27 secured to the plates 18 and 22 by screws 28.

The plate 18 has secured thereto, by means not shown, a pair of inclined plates 30 which in turn have secured thereto, as by studs 32, an inclined plate 34. The plates 18, 30 and 34 conjointly form a funnel, the interior of which is visible through an opening 36 formed in the plate 34. Extending across the funnel is a bar 38, the opposite end portions of which are fixed respectively in the upper marginal portion of the plate 18 and in the plate 34.

Underlying the plates 30 and 34 is an elongated member 40 provided with a central bore 42. The member 40 is generally round in transverse section, the upper end portion thereof being flat, as at 43, and the lower end portion thereof being flat, as at 45. The flat 43 is seated against the plate 18, to which plate the member 40 is fixed by means not shown. At the upper end of the member 40, the bore 42 is tapered, as at 44.

The lower end portion of the member 40 extends below the plate 18. Referring particularly to FIGURE 11, this lower end portion is cut away, as at 46, whereby to provide a longitudinally extending flat surface 48 normal to the flat 43 and 45, a longitudinally extending flat surface 50 tangent to the flat 43 and a longitudinally extending flat surface 52 tangent to the bore 42 and normal to the flat surface 50. Extending from the surface 50 circumferentially about half way toward the surface 48 is a somewhat narrow opening or slot 53.

Partially closing the opening 46 is a gate 54 secured to the member 40, a hinge 56 and screws 58. The gate 54 is biased toward closed position by a tension spring 60, which tension spring is anchored to the gate 54, as at 61, and to a bracket 62, which bracket is fastened to the member 40 by any suitable means.

Referring particularly to FIGURE 3, mounted upon the plate 18, as by brackets 64, is a pneumatic motor 66 having a piston rod 68. Also mounted upon the plate 18 is a stop 70. The pneumatic motor and the stop are located at the lower end of the way 24.

Referring particularly to FIGURE 1, fixed to the fore portion of the base plate 12 is a bearing block 72, which bearing block is bored for receiving a shaft 74 which extends therethrough and carries at one end thereof a rocker arm 76 extending upright between the side plates 14. The rocker arm is secured to the shaft 74 by a setscrew 78, the opposite end of the shaft being provided with a collar 80. Referring particularly to FIGURES 1 and 2, the upper end of the rocker arm carries a bar 82 secured to the rocker arm as by studs 83. The bar 82 carries bracket 84 which is adapted to extend over the way 24. Pivoted to the bracket 84, as at 86, is a latch plate 88, the lower narrow edge of which is curved, as at 90. The free end 92 of the latch 88 rests upon the bar 62.

Referring particularly to FIGURE 1, secured to the rocker arm 76, as by a pivot 96, is a flat bar member 98 which extends horizontally inwardly from the marginal area of the top member 10. The free end of the bar 98 is provided with a longitudinally extending elongated slot 100 which receives a hub 102 of a cam 104 (FIGURE 9). Working upon the cam 104 is a cam follower 106 in the form of a roller 106 freely revolvable about a pin 107 carried by the member 98. Extending through the cam 104 is a shaft 108 to which the cam is fixed, as by a setscrew 109. Intervening the member 98 and the base plate 12 is a
tension spring 110 anchored to the member 98 by a pin 111 and to the base plate 12 by a pin 112 (FIGURES 1 and 2). Overlying the cam 104 is a second cam 114 having a hub 116 and fixed to the shaft 108, as by a setscrew 117 (FIGURE 10). The hub 116 is received by an open slot 118 in the flat bar member 119 and extending longitudinal of the latter. Working on the cam 114 is a cam follower in the form of a roller 122 freely revolutive about a pin 123 carried by the member 120. The opposite end of the member 120 has fixed thereto, as by screws 124, a plate 126, cut out, as at 128, to form a hook 130 (FIGURE 10). The hooked end is then inserted into the inner opening 53 formed in the member 40. Intervening the member 120 and a side plate 14 is a tension spring 132 anchored to the member 120 by a pin 134 and to the side plate 14 by a pin 135 (FIGURES 1 and 2).

Underlying the cam 104 is a cam 136 having a hub 138 and secured to the shaft 108 as by a setscrew 139 (FIGURE 8). Underlying the cam 136 is a sleeve bearing 140 (FIGURE 1) having intermediate the ends thereof a radially extending flange 142 through the medium of which it is seated upon the top member 14, as by bolts 144. Fixed to the flange 142 is a bracket 146 mounting a valve unit 148, which valve unit mounts a bracket 150 to which there is pivoted, as at 152 (FIGURE 8), an arm 154. This arm carries a cam follower in the form of a roller 156 freely revolutive about a pin 157 carried by the arm 154. Letting the cam follower particularly to FIGURE 2, valve 148 is provided with a connection 158 for a line communicating with a source of air under pressure, and with connections 160 and 162 for connection with lines for delivering air to the pneumatic motor. The valve 148 is also provided with a pin 164 (FIGURE 8) spring biased outwardly toward the arm 164 by means not shown. The lines leading from the connections 160 and 162 respectively connect to opposite ends of the cylinder 66 respectively at 164 and 166 (FIGURE 2).

In the operation of the apparatus, a conveyor ring 169 extending about the top member 10 carries partially assembled work units comprising nozzles 170, projected downwardly into apertures spaced circumferentially equally about the ring 168, and inserts 174. As each work unit is presented beneath the member 40, it is fitted with a cylinder 176 of casing section 176 closed on one end, as at 178, and open at the opposite end, as at 180 (FIGURE 3). The casing sections 176 are fed down the way 24, some with closed ends leading and some with open ends leading. The advance of a leading section leading with its open end terminates after the center of gravity of the section advances beyond the bar 38. Each leading section is removed from the way and tumbled over the bar 38, being thereby oriented and falling from the bar 38 with open end first into the member 40. When the casing sections pass from the member 40 they are applied to the partially assembled units passed under the member 40 by the ring 168.

Power is supplied by suitable means, not shown, to the shaft 108, which shaft rotates the assembly comprising the cams 104, 114 and 136. The cam 104 works on the follower 106 to shift the member 98 axially against the influence of the spring 110, in consequence of which the member 98 is reciprocated through the limit of relative movement of the hub 102 in the slot 108. Thus the rocker arm 76 is swung back and forth about the shaft 74. Each time the arm is rocked counterclockwise, as viewed in FIGURE 1, the bar 82 engages the side of a leading casing section 176 and pushes it laterally out of the way 24 and onto the bar 38 from which it tumbles into the member 40.

Referring particularly to FIGURE 4, a casing section 176 leading with the open end thereof engages the pin 70 which is arranged to stop the casing section after its center of gravity passes beyond the bar 38.

The cam 156 actuates the roller 156 and the arm 154, which arm controls the position of the pin 163, which in turn controls the supply of air to the double acting piston 68. Referring particularly to FIGURE 6, each time the arm 154 is extended, it abuts the closed end of a casing section leading with the closed end thereof, and it stops the casing section before the center of gravity thereof passes beyond the bar 38. Each time the rocker arm 76 is rocked counterclockwise to push the casing section 176 from the way 24, the pin plate 126 extends a small distance. When the rocker arm is rocked clockwise, the piston is extended. The timing is such that the terminal portion of the piston rod is retracted at least as far as the stop 70 before the casing section 176 is pushed from the way 24. Furthermore, the timing is such that the latch 88 is positioned under the closed end of the casing section 176 thereby to effectively keep the casing section from following the retracting piston rod.

It will be evident that when the leading casing section leads with the open end thereof, the piston extends freely into the open end of the casing section 176 and withdraws before the lead section is pushed from the way.

The cam 114 actuates the roller 122 against the influence of the spring 132, in consequence of which the member 120 and the plate 126 carried thereby are re-circugated. The plate 126 slides back and forth in the narrow recess between the arms 154, and the plate 132, as shown in FIGURE 11, the hooked end 136 of the plate 126 extends across the bore 42 in the member 40 and blocks passage of the casing sections 176. In the extended position of the plate 126 the passage is cleared for passage of a casing section 176.

It will be understood that the ring 168 is advanced intermittently (by means not shown) and that after a casing section 176 is released from the member 40 and applied to the underlying nozzle 170, the ring 168 advances the assembled nozzle 170, insert 174 and casing section 176 through the gate 54 and presents the next following nozzle 170 and insert 174 for application of a casing section 176. The gate 54 recloses automatically after passage of each of the assemblies aforesaid. It will be apparent that the rocker arm 76, piston 68, slide plate 126 and ring 168 are operated in predetermined timed relation to another to effect the desired end.

It will be understood, of course, that the present invention, as hereinbefore described and shown in the accompanying drawings, is susceptible of various changes and modifications which may be made without departing from the principles of the invention. For example, although the ring 168 is described as being advanced intermittently, in some applications of the apparatus, the oriented work might be applied to a member advanced continuously, as a continuously moving conveyor belt. Accordingly, the invention is not to be regarded as restricted except as required by the appended claims.

What is claimed is:

1. In apparatus for manipulating the cylinders in a line thereof in which each cylinder has a closed end and an open end and in which the cylinders are arranged with some of the closed ends leading and others following, means providing a way for said line of cylinders, a member providing a horizontal edge extending laterally from said way providing means, stationary means for terminating advance of a lead cylinder leading with the open end thereof after the center of gravity of the cylinder advances beyond said edge, a cylinder and piston type pneumatic motor the piston of which is extensible for terminating advance of a lead cylinder leading with the closed end thereof before the center of gravity of the
cylinder advances as far as said edge and the closed end as far as said stationary means, said piston when extended being adapted for projection freely into the open end of a lead cylinder leading with the open end thereof, means operable for shifting each successive lead cylinder laterally out of said line of cylinders onto said edge, means for actuating said shifting means and piston in predetermined timed relation for extension of said piston upon each non-working stroke of said shifting means and retraction of said piston upon each working stroke of said shifting means, and means for receiving said cylinders as they tumble one by one from said edge with the open ends thereof leading.

2. Apparatus for manipulating cylinders, each of which has a closed end and an open end, comprising means providing a way for delivering said cylinders in a line, some of the cylinders being arranged with their closed ends leading and others being arranged with their open ends leading, a member providing a horizontal edge extending laterally from said way, means providing a stationary stop extending across said line of cylinders at a location beyond said edge and adapted to engage the end of a cylinder leading with its open end to terminate the advance of same after the center of gravity thereof advances beyond said edge, a member extensible from behind said stop and therebeyond in line with said cylinders to engage a cylinder leading with its closed end, thereby to terminate the advance thereof before its center of gravity advances beyond said edge, said extensible member being adapted to project freely into lead cylinders leading with their open ends, means operable to shift each successive lead cylinder laterally from said way and onto said edge, means for extending and withdrawing said extensible member in timed relation to operation of said shifting means, said member being thereby extended during advance of cylinders along said way and while said shifting means is inoperative and withdrawn during operation of said shifting means, and means for receiving said cylinders as they tumble one by one from said edge with the open ends thereof leading.

3. Apparatus according to claim 2 wherein said way is inclined downwardly toward said stop and extensible member, and including latch means operable concurrently with operation of said shifting means to engage the lower end of a cylinder leading with its closed end, thereby to keep the line of cylinders from following said extensible member as the same is withdrawn.

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