APPARATUS FOR FEEDING ROD SHAPED ARTICLES TO CONSUMING MACHINES

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References Cited
UNITED STATES PATENTS
3,527,369 9/1970 Bonfleth et al. 214/301

ABSTRACT
A feeding apparatus which delivers batches of arrayed cigarettes to the magazine for a packing machine. The panels of the magazine are formed with vertical recesses for the rigid bars of a confining device which supports an inverted cigarette tray during evacuation of its contents into the magazine. The tray can be lifted and lowered by a frame at the upper end of the confining member. The internal surfaces of the bars are flush with the internal surfaces of the respective panels of the magazine and the width of as well as the distances between the bars which are adjacent to the ends of the cigarettes are less than the diameter of a cigarette. The lateral walls of the confining device may comprise single or twin bars whereby the length of a cigarette exceeds the width of a single bar or the distance between the twin bars.

10 Claims, 3 Drawing Figures
APPARATUS FOR FEEDING ROD SHAPED ARTICLES TO CONSUMING MACHINES

CROSS-REFERENCE TO RELATED APPLICATION

The feeding apparatus of the present invention constitutes an improvement over and a further development of the apparatus disclosed in our copending application Ser. No. 737,447 filed June 17, 1968 now U.S. Pat. No. 3,527,369 by Ulrich Bornfleth et al. and owned by the assignee of the present application.

BACKGROUND OF THE INVENTION

The present invention relates to apparatus for feeding cigarettes or analogous rod shaped articles into magazines which supply the articles to packing or other consuming machines. More particularly, the invention relates to improvements in feeding apparatus of the type disclosed in the aforementioned copending application of Bornfleth et al. Still more particularly, the invention relates to improvements in magazines and confining means for use in the apparatus of Bornfleth et al.

Bornfleth et al. disclose a feeding apparatus wherein the magazine for a packing or other consuming machine supports a confining device which is movable up and down with reference to the magazine to provide a duct wherein the articles can be temporarily stored when the magazine is filled. The magazine receives batches of article from filled containers in the form of trays or chargers which are delivered by a receptacle capable of inverting a filled container above the open top of the magazine so that the contents of the tray are free to descend by gravity and enter the magazine. The purpose of the confining device is to insure that the magazine can be filled to and beyond capacity and that a fresh batch can be delivered before the topmost layer of articles in the magazine exceeds a level which is well below the lowermost layer of articles in the inverted tray. This insures that the descending articles need not cover a substantial distance and are therefore less likely to leave their optimum positions for stacking in the magazine. The confining device of the apparatus disclosed in the application of Bornfleth et al. comprises deformable auxiliary walls which are movable up and down above the open top of the magazine so as to share the movements of an inverted tray which is free to move with reference to its receptacle.

SUMMARY OF THE INVENTION

An object of the invention is to provide the filling apparatus with a novel and improved confining device which is simple, rugged and capable of extended use.

Another object of the invention is to provide a confining device whose walls are constructed and assembled in such a way that they insure accurate guidance of cigarettes or analogous rod shaped articles during gravitational descent into the magazine of a packing or other consuming machine and which cannot pinch, squeeze, bend and/or otherwise deform or damage the articles during transfer into the magazine.

A further object of the invention is to provide a confining device which can be used in filling apparatus for existing consuming machines and is not influenced by dust, moisture and/or particles of tobacco or filter material.

An additional object of the invention is to provide a confining device which is capable of positively preventing misalignment of articles which are being evacuated from an inverted tray or an analogous container and are in the process of entering the magazine or hopper of a packing or other consuming machine.

The invention is embodied in an apparatus for feeding to a packing or other consuming machine cigarettes or analogous rod shaped articles which are stored in containers of the type having walls defining a space for the storage of a batch of arrayed parallel articles. The novelty resides in the provision of a magazine or hopper having panels defining an open top, confining means at least partially surrounding the open top and comprising rigid auxiliary walls having preferably bar-shaped portions movable up and down in recesses provided therefor in the panels of the magazine, means for moving the confining means up and down with reference to the magazine whereby the confining means defines at least a portion of an upright duct which registers with the open top of the magazine, a receptacle for filled containers, and drive means for moving the receptacle with a filled container therein to a position in which the filled container is inverted and rests on the confining means so that the contents of such container can descend into the magazine by way of the duct. The inverted container is movable up and down with the confining means so that the articles which find no room in the magazine proper can be temporarily stored in the duct.

The bars of the auxiliary walls are preferably of polygonal cross section (most preferably of rectangular cross section) and are snugly received in the respective recesses. Such recesses are preferably machined into the internal surfaces of the respective panels and the internal surfaces of the bars are preferably coplanar with the internal surfaces of the respective panels.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved feeding apparatus itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood from the following detailed description of certain specific embodiments with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary perspective view of a feeding apparatus which embodies one form of the invention;

FIG. 2 is an enlarged fragmentary perspective view of a detail in the apparatus of FIG. 1; and

FIG. 3 is a fragmentary perspective view of a second feeding apparatus.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The feeding apparatus of FIGS. 1 and 2 comprises a frame 201 having an upright frame member 202 which supports a horizontal arm or beam 205 extending above a consuming machine 203, for example, a cigarette packing machine. The machine 203 has or supports a magazine or hopper 204 which receives batches of rod-shaped articles 210, for example, plain or filter cigarettes, from filled containers in the form of chargers or trays 209. Such filled trays 209 are supported by a platform 206 which forms part of the frame 201 and is disposed at a level above a second or lower platform 207 for empty containers or trays 212. The upper platform 206 supports two parallel belt conveyors 208 which transport filled trays 209 in the direction indicated by the arrow toward a transfer zone or station where the trays 209 are taken over by a receptacle 214. The lower platform 207 also supports two belt conveyors 211 which transport empty trays 212 away from the discharge end or lower end of a receiving means here shown as a vertical chute 213. The upper platform 206 is shorter than the lower platform 207; it terminates at the intake end of the chute 213 so that the receptacle 214 can discharge an empty tray 212 into the chute prior to accepting a filled tray 209. The conveyor system which delivers filled trays 209 to the conveyors 208 on the upper platform 206 and removes empty trays 212 from the conveyors 211 of the lower platform 207 forms no part of the present invention. The chute 213 is adjacent to a suitable braking device (not shown) which prevents excessive acceleration of empty trays 212 during gravitational descent onto the belt conveyors 211.

The receptacle 214 is a cage which is rigidly connected with two coaxial sleeves 215 (only one shown in FIG. 1) slideable along and rotatable with a horizontal shaft 217 so as to enable the receptacle to travel between the transfer station above the
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chute 213 and an evacuating station above the magazine 204, as well as to invert a filled tray 209 at the evacuating station so that the contents (cigarettes 210) of the filled tray can be discharged into the magazine 204. The receptacle 214 is further provided with two additional coaxial sleeves 221 (only one shown) which are reciprocable along a second horizontal shaft 223 parallel to the shaft 217. The shaft 223 is mounted on two levers 224, 225 which are fixedly secured to the shaft 217. The means for reciprocating the receptacle 214 along the shaft 217 and for pivoting the receptacle about the axis of the shaft 217 further comprises a drive including a motor (not shown) which is mounted in the frame member 202 and moves the shaft 217 by way of a suitable linkage. The manner in which the receptacle 214 is movable along and pivotable about the axis of the shaft 217 is disclosed, for example, in German Utility Model No. 1,938,552 published in "Beiträge zum Stand der Technik in der tabakverarbeitenden Industrie," volume No. 3/1966, published Aug. 1, 1966.

The means for releasably coupling a filled tray 209 to the receptacle 214 during transport from the transfer station to the delivery position at the evacuation station and an empty tray 212 during transport from the evacuation station to the intake end of the chute 213 comprises two lateral coupling members or clamps 226 which are mounted on the receptacle 214 and two coupling members or clamps 227 which are also mounted on the receptacle 214. The clamps 226 and 227 are pivotable on pins which are mounted in bearings provided on the respective lateral walls of the receptacle 214. Springs are provided to permanently bias the clamps 226 to their retaining or coupling positions in which the clamps engage the front edges of the side walls 209a of a filled tray 209 in the receptacle 214. The clamps 226 are automatically pivoted to open positions when the receptacle 214 approaches the transfer station; such opening of the clamps 226 is effected by stationary cams (not shown) which are mounted in front of the upper platform 206 so that the receptacle 214 can automatically discharge an empty tray 212 for gravitational descent through the chute 213 and that the belt conveyors 208 are thereupon free to advance the foremost filled tray 209 into the empty receptacle. The bottom clamps 227 are connected to the bottom wall of the receptacle 214 by hinges 232 and are provided with laterally extending shafts 233 for roller followers 234. Springs 235 are attached to the receptacle 214 and bias the bottom clamps 227 to their retaining or coupling positions.

The invention is further provided with a pivotable L-shaped cover or lid 236 which closes the top of a filled tray 209 during transport away from the transfer station and during inversion at the evacuation station. The cover 236 is biased by a spring (not shown) which tends to hold it in the open or inoperative position, so that the cover then permits evacuation of cigarettes 210 from a tray 209 which is held in inverted position above the top of the magazine 204. The pivoting or rocking mechanism which moves the cover 236 to and retains it in the closed or operative position (at least during inversion above the magazine 204) is preferably constructed in the same way as described in the copending application Ser. No. 737,447 now U.S. Pat. No. 3,527,369 of Bornfleth et al.

The magazine 204 has two side panels 204a, a front panel 204c, and a rear panel 204d. In accordance with a feature of the invention, the magazine 204 supports a novel confining device having auxiliary walls or guides which constitute extensions of the panels 204a, 204c and extend between the panels 204a, 204c and the side walls 209a and rear wall 209d of an inverted filled tray 209 at the evacuation station. The auxiliary walls are denoted by the reference characters 286 and 287. The auxiliary wall 287 (i.e., the extension of the front horizontal 204c of the magazine 204) faces the rear panel 204d and is adjacent to one end of each cigarette 210 which descends into the magazine 204 on its way into the consuming machine 203. The walls 286, 287 are reciprocable up and down (as indicated by the arrow A) and the wall 287 comprises a row of parallel vertical strips or bars 288a, 288b, 288c . . . 288n (e.g., a total of 30 strips) which are reciprocable in vertical recesses or grooves 289a, 289b, 289c . . . 289n provided in the internal surface of the front panel 204c. The cross section of each strip 288 and of each recess 289 is of rectangular outline. The width x of each bar 288 in a plane which is normal to the direction of the arrow A and the distance y between the adjoining bars 289 is in the direction indicated by the arrow B is less than the diameter of a cigarette 210. This insures that the adjacent ends of the cigarettes 210 cannot penetrate into the gaps between the bars 288 and/or into the recesses 289.

Each of the auxiliary walls 286 constitutes an extension of the respective lateral panel 204a and each thereof comprises a single vertical strip or bar 291 which is reciprocable in a vertical recess 292 provided in the internal surface of the respective panel 204a. The width x of each recess 292 as considered in the longitudinal direction of the cigarettes 210 in a filled tray 209 at the evacuation station is less than the length of a cigarette; therefore, the cigarettes cannot penetrate into the recesses 292 during evacuation from the inverted filled tray 209 which is supported at a level above the open top of the magazine 204. These surfaces of the bars 288, 291 which face toward the interior of the space between the auxiliary walls 286, 287 are flush with the internal surfaces of the respective panels 204a, 204c, and each such bar completely fills the respective recess 289, 292 in the lower end positions of the auxiliary walls. Thus when the walls 286, 287 are permitted to descend to their lower end positions, the cigarettes 210 which are located in the magazine 204 are confined by the horizontal surfaces which are located in three planes, namely, in the planes of the internal surfaces of the panels 204a and in the plane of the internal surface of the panel 204c. The auxiliary walls 286, 287 are rigid with and depend from a U-shaped frame 246 which is provided with sleeves movable up and down with two vertical rods 247, 248. The upper ends of the rods 247, 248 are connected to each other by a horizontal travers 249. The rods 247, 248 are rigid with brackets 254, 255 forming part of a bearing block 253. The block 253 is further provided with a supporting plate 256 which mounts a reversible gear motor 257 having an output shaft provided with a pinion 258 in mesh with a vertical toothed rack 259 which is secured to and extends downwardly from the traverse 249.

The bars 291 of the auxiliary walls 286 support a level detector which includes a light source 263 mounted in a hole of one of the bars 291 and a photosensitive receiver 264 mounted in a registering hole of the other bar 291. The means for removing the bottom clamps 227 with reference to the main portion of the receptacle 214 comprises two actuating rods 265 which extend forwardly from the brackets 254, 255. The feeding apparatus further comprises means for lifting a filled tray 209 with reference to the receptacle 214, for guiding the raised filled tray during pivotal movement in a downward direction, and for returning the tray to its original position with reference to the receptacle. Such means includes a yoke-like guide 266 which is mounted on two vertical bars 267, 268 supported by the block 253. Still further, the apparatus comprises a preferably transparent or translucent plate-like realigning member 269 (consisting e.g., of flexiglas) which extends upwardly from the rear panel 204c of the magazine 204 and serves as a means for preventing excessive axial displacement of cigarettes 210 during pivoting of a filled tray 209 with the receptacle 214. Such axial displacement of cigarettes 210 could take place under the action of centrifugal force. The realigning member 269 extends upwardly beyond the bearing sleeves 251, 252 and its width equals or approximates that of the receptacle 214. The lateral portions of the upper part of the realigning member 269 are formed with cutouts 271 which permit passage of the lateral clamps 226 during pivotal movement of the receptacle 214.

The operation:

It is assumed that the consuming machine 203 draws cigarettes from the magazine 204 and that the supply of the cigarettes in the magazine has been depleted to such an extent that the light beam issuing from the light source 263 can reach
the photosensitive receiver 264 so that the latter produces a signal. It is also assumed that the auxiliary walls 286, 287 dwell in their lower end positions; these walls follow the downward movement of the uppermost layer of cigarettes 210 in the magazine 204. The signal from the photosensitive receiver 264 starts the operation of the drive for the receptacle 214 which dwells in an inclined position adjacent to the evacuating station (such inclined position of the receptacle 214 is shown in FIG. 1) in front of the magazine 204. The drive causes the receptacle 214 to pivot and to thereby invert a filled tray 209 therein so that the tray moves to a position above the open top of the magazine 204. The thus inverted filled tray 209 rests on the frame 246 of the confining device. In the course of inversion of the filled tray 209 in the receptacle 214, the actuating rods 265 engage and pivot the bottom clamps 227 against the opposition of the respective springs 235 to thus free the tray 209 for movement relative to the receptacle. As soon as the receptacle 214 inverts the filled tray 209 therein, the cover 236 is actuated by its pivoting mechanism so that it moves to the open position and permits the cigarettes 210 to descend by gravity. Furthermore, the pivoting mechanism for the cover 236 actuates a switch (not shown) which starts the motor 257 in a direction to lift the frame 246 and the auxiliary walls 286, 287. Consequently, the inverted tray 209 rises with the frame 246 and relative to the receptacle 214 which cannot interfere with such movement because the bottom clamps 227 are held in open positions by the actuating rods 265. The ascending bars 288, 291 of the auxiliary walls 286, 287 share the upward movement of the tray 209 by moving in the respective recesses 289, 292 to thereby "lengthen" the respective front and lateral panels of the magazine 204 at the rate at which the inverted tray rises. This insures that the cigarettes 210 which descend by gravity are properly guided and confined at all times. The motor 257 moves the frame 246 and the inverted tray 209 thereon to its upper end position whereby the cigarettes 210 descend into the duct surrounded by the bars 288, 291 and realigning member 269. When the inverted tray 209 reaches its upper end position, it actuates a switch (not shown) which arrests the motor 257 and adjusts the level detector 263, 264 in such a way that the latter is set to produce signals which effect a downward movement of the frame 246. In the meantime the filled tray 209 is converted into an empty tray 212 which continues to rest on the frame 246 in the latter's upper end position.

If the consuming machine 203 remains in operation and withdraws cigarettes 210 from the magazine 204, the level of the topmost layer of cigarettes in the duct surrounded by the receiving members 209 and 272 decreases in such a way that the light beam passing from the light source 263 can reach the photosensitive receiver 264 which transmits a signal to the drive for the receptacle 214. A cam mechanism of this drive pivots the receptacle 214 about the axis of the shaft 217 whereby the pivoting receptacle moves the empty tray 212 off the frame 246. The receptacle 214 then reassumes the inclined position shown in FIG. 1. The drive thereupon moves the receptacle 214 lengthwise of the shaft 217 to the transfer station where the empty tray 212 is permitted to descend in the chute 213 and to come to rest on the belt conveyors 211 of the lower platform 207. The receptacle 214 thereupon accepts the foremost filled tray 209 from the belt conveyors 208 on the upper platform 206 and is returned to the inclining position of FIG. 1 in which it remains until the drive receives a fresh signal to invert the receptacle and the filled tray therein.

When the photosensitive receiver 264 sends a signal to the drive for the receptacle 214, it also starts the motor 257 in a direction to lower the frame 246 with the auxiliary walls 286, 287. Such movement of the frame 246 is terminated when the light beam between the light source 263 and the detector 264 is interrupted by the cigarettes 210 in the duct between the realigning member 269 and the auxiliary walls 286, 287. It is to be borne in mind that the components 263, 264 of the level detector are mounted on the bars 291 of the auxiliary walls 286, i.e., that they share all movements of the frame 246. If the consuming machine 203 operates normally, the supply of cigarettes 210 in the duct between the member 269 and walls 286, 287 descends gradually or stepwise whereby the receiver 264 intermittently starts the motor 257 in a direction to lower the frame 246, always to the extent necessary to interrupt the light beam between the light source 263 and the receiver 264. When the frame 246 reaches its lower end position with reference to the magazine 204, it actuates an adjusting device which sets the level detector in such a way that the next-following signal from the receiver 264 effects an upward movement of the frame 246 to its upper end position. As the level of the supply of cigarettes 210 in the magazine 204 descends below the level of the light beam which is produced by the source 263, the drive for the receptacle 214 is again started in the manner necessary to invert the filled tray 209 and to place it on top of the frame 246 while the latter dwells in the lower end position. The motor 257 thereupon moves the frame 246 to its upper end position and the evacuation of the contents of the filled tray is carried out in the same way as described above.

FIG. 3 illustrates a portion of a second feeding apparatus wherein the lateral auxiliary walls 386 of the confining device comprise pairs of vertical bars or strips 391a, 391b of rectangular cross-sectional outline. The distance 'z' between the bars 391a, 391b of each lateral auxiliary wall 386 is less than the length of a cigarette. These bars are reciprocal in vertical recesses 392a, 392b provided in the internal surfaces of the respective side panels of the magazine 304. Therefore, 386c, 386b, 386a . . . of the front auxiliary wall are constructed and configured in the same way as the bars 288. These bars are received in recesses 391a, 391b of each of the front panel 304c. The numeral 346 denotes the frame of the confining device and the numeral 304d denotes the rear panel of the magazine. The internal surface of the bars 391, 388 are flush with the internal surfaces of the respective panels of the magazine 304 and each of these bars is snugly received in the respective recess.

The light source (corresponding to the element 263 of FIG. 1 or 2) can be mounted on the bar 391a and/or 391b of one lateral auxiliary wall 386 and the receiver (corresponding to the receiver 264 of FIG. 1) can be mounted on the bar 391a and/or 391b of the other lateral auxiliary wall. Also, such parts can be mounted directly on the frame 364 at an appropriate level below the tray-supporting top surface of such frame.

An important advantage of the improved feeding apparatus is that it employs a rigid confining device and that the bars of the confining device are dimensioned, distributed and configured in such a way that they are not affected by dust, moisture and/or fragments or tobacco and/or filter material. Furthermore, a rigid confining device insures a very satisfactory guidance of cigarettes which descend from an inverted tray 209 into the interior of the magazine 204 or 304. Moreover, a rigid confining device can stand long periods of use and can readily support and lift a filled tray 209 during transfer of arrayed cigarettes into the magazine.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of our contribution to the art and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. In an apparatus for feeding to a consuming machine 203 cigarettes or analogous rod shaped articles which are stored in containers of the type having walls defining a space for the storage of a supply of parallel articles, a combination comprising a magazine having panels defining an open top; confining means at least partially surrounding said open top and comprising rigid auxiliary walls having portions movable up and
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A combination as defined in claim 2, wherein said bars are snugly received in the respective recesses of said panels.

5. A combination as defined in claim 3, wherein the distance between the bars of at least one of said auxiliary walls is less than the maximum transverse dimension of an article so that the articles cannot penetrate into the recesses for such bars or between the bars of said one auxiliary wall.

6. A combination as defined in claim 5, wherein said magazine includes a front panel and a pair of lateral panels and the recesses for the bars of said one auxiliary wall are provided in said front panel, said front panel being normal to the longitudinal directions of articles in said magazine and said duct.

7. A combination as defined in claim 3, wherein said auxiliary walls include two lateral walls each having a single bar, said single bars flanking the articles in said duct and each having a length which is at least slightly less than the length of an article.

8. A combination as defined in claim 3, wherein said auxiliary walls include two lateral walls which flank the articles in said duct, each of said lateral walls comprising two parallel bars separated from each other by a gap whose width is less than the length of an article.

9. A combination as defined in claim 3, wherein said panels have internal surfaces and said recesses are provided in the internal surfaces of the respective panels.

10. A combination as defined in claim 9, wherein said bars have internal surfaces which are coplanar with the internal surfaces of the respective panels.

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