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(54) APPARATUS FOR FEEDING ROD-LIKE ARTICLES

(71) We, MOLINS LIMITED, a British Company, of 2, Evelyn Street, Deptford, London, SE8 5DH., do hereby declare this invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to apparatus for feeding rod-like articles, such as cigarettes or cigarette filter rods, from trays. For convenience reference will be made generally to "cigarettes" but it should be understood that the invention is applicable to similar rod-like articles such as cigarette filter rods and rod-like smokeable articles other than cigarettes.

One form of apparatus for unloading trays of cigarettes and for feeding the cigarettes away, for example to a packing machine, is described in British Patent Specification No. 1,191,342. With that apparatus the tray to be unloaded is received in an upright position and inverted to an upsidedown position, thus allowing cigarettes in the tray to pass through the open top of the tray into a hopper.

Where trays are supplied successively to the unloading apparatus and batches allowed to fall into the hopper it is important to ensure that the batch of cigarettes from one tray does not have to fall too far onto the upper surface of the previous batch of cigarettes, since otherwise misalignment of and/or damage to the cigarettes may occur. It is therefore also important that the upper surface of the cigarettes in the hopper should be reasonably level, and preferably be maintained level during feed of cigarettes from the hopper. In the case of a hopper having substantially vertical side walls and from which the cigarettes are fed horizontally past one of the side walls, for example on a band conveyor, the upper surface of the cigarettes between the side walls tends to become upwardly inclined in the direction towards the side wall past which the cigarettes are fed. Consequently the resultant apex of the cigarettes may have to be removed to make room for the next batch of cigarettes or, alternatively, a considerable vertical clearance may have to be allowed, which could result in cigarettes becoming disorientated as they drop onto the top of the previous batch.

stantially horizontal platform which supports each batch of cigarettes as it moves down out of its tray and carries a plate which contacts the top surface of the previous batch so as to maintain the top surface level. British Patent Specifications Nos. 1,231,842 and 1,339,887 also each describe tray unloading apparatus including a member which bears against the descending upper surface of a batch to maintain it level. British Patent Specification No. 1,461,774 describes a tray unloader including a hopper having a particular arrangement of delivery conveyors which is helpful in maintaining level the descending upper surface of cigarettes.

The present invention provides apparatus for feeding rod-like articles such as cigarettes, comprising support means for holding a tray containing rod-like articles at a discharge position; conveyor means for moving away articles delivered by a tray at said discharge position; and flow restricting means between said discharge position and said conveyor means for maintaining the upper surface of rod-like articles supplied by the tray substantially level as said surface falls, said flow restricting means including a series of spaced parallel elements. In a preferred arrangement the distance between the spaced elements and said conveyor means generally increases in the direction of movement of the conveyor means.

The flow restricting means at least to some extent reduces or tends to reduce the interaction of rod-like articles on its opposite sides. The spaced elements may be arranged so that the articles are delivered at generally increased levels above the conveyor means in the direction of movement of said conveyor means. The elements could be arranged on a generally inclined plane or other (imaginery) surface.

The apparatus may be adapted to receive and supply successive trays for unloading. The flow restricting means may be arranged in a hopper or other passage between a tray in the unloading position and the conveyor means. The conveyor means may include one or more endless band conveyors and if there are two or more they may be run at different speeds. The tray support and flow restricting means may be part of a unit which is removable away from the conveyor means so that the unit may be used to supply articles to the conveyor means

The unloading apparatus of British Patent Specification No. 1,191,342 includes a sub-

only when required. This could be useful where, for example, the conveyor means forms part of a conveyor system linking one or more cigarette making machines to one or more cigarette packing machines and where the facility of a tray unloader to supplement the supply of rod-like articles to the system is not required continuously.

It may be noted that in a preferred arrangement the flow restricting means may be regarded as defining a transfer region between the tray and the conveyor means, the transfer region being inclined upwardly to the horizontal in the general direction of movement of the conveyor means. Thus in this arrangement, with a vertical downfeed of articles from the tray, the height of the articles over the upstream end of the flow restricting means is greater than that over the downstream end.

The invention will now be further described, by way of example only, with reference to the accompanying diagrammatic drawings, in which:—

Figure 1 is a longitudinal sectional view of apparatus incorporating a tray unloader;

Figure 2 is a sectional view on the line II—II of Figure 1, and

Figure 3 is an end elevation of apparatus incorporating a tray unloader similar to that shown in Figure 1.

Figure 1 shows a rectangular cigarette tray 10 in an inverted position over a hopper reservoir region 12. The tray 10 is supported between fixed side walls 14*a*, 14*b* and against a back wall 15, and rests at a level determined by shorter internal side walls 16*a*, 16*b*. The walls 14*a*, 16*a* extend downwards to a position just above the level of a ribbed band conveyor 18. A further band conveyor 20 extends in horizontal alignment with the conveyor 18 and is separated from it by a short bridge piece 22. The walls 14*b*, 16*b* terminate some distance above the level of conveyor 20. The conveyors 18 and 20 could be at slightly different levels, as for example in the arrangement of British Patent Specification No. 1,231,842.

The walls 16*a*, 16*b* and conveyors 18, 20 define the hopper region 12. The conveyor 20 extends beyond the region 12 and underneath one run of a ribbed band conveyor 24. A pair of laterally spaced curved band conveyors 26 lead from the end of conveyor 20 to a vertical ribbed band conveyor 30. The conveyors 24 and 30 constitute an elevator for a stack of cigarettes. The elevator could take the form of the elevator disclosed in British Patent Specification No. 1,453,191. This specification also describes the use of conveyor bands provided with protrusions or ribs to aid movement of rod-like articles.

The hopper region 12 below the tray 10 is provided with a series or grid of spaced parallel rods 32 which are parallel to the lengths of the cigarettes in the tray 10 and which lie on an imaginary surface which extends generally

downwards from the side wall 16*b* towards the side wall 16*a*. The rods 32 project from and are supported by the back wall 15. In the arrangement shown in Figures 1 and 2 (which are approximately to scale) the rods are about 12 mm in diameter and are spaced at 50 mm centres; the centre of the highest rod is 124 mm above conveyor 20 whilst that of the lowest rod is 44 mm above conveyor 18; the internal width of tray 10 is about 673 mm.

The conveyors 18, 20, 24, 26 and 30 are driven to remove a continuous stack 34 of cigarettes from the hopper region 12 and elevate it, for example to a packer hopper. The height of the stack 34 is about 90 mm.

Cigarettes are supplied to the hopper region 12 by inverting successive trays 10 over the region. Conventional cigarette trays such as the tray 10 have an open front face and top side. The top side may be provided with a removable or releasable closure device, which could take the form of a slat or a band. A tray 10 is presented to the apparatus with its closure device in position and is inverted so that the open front is adjacent the back wall 15 and the closure device spans the gap across the tops of the internal side walls 16*a* and 16*b*. The closure device is then removed and the cigarettes descend to the hopper region 12.

As has been mentioned already it is important that cigarettes should not be allowed to fall too far when the closure device is removed (or released). Thus the level of cigarettes in the hopper region 12 should remain relatively high during a tray change; consequently, trays should be changed quickly or the feed of stack 34 will have to be interrupted. Equally it is important that the upper surface of the cigarettes in the hopper region 12 should be fairly level and even.

The grid formed by the rods 32 is instrumental in maintaining the surface 36 of the cigarettes level as they are fed from a tray 10 by regulating their flow onto the conveyors 18 and 20. In effect the grid and conveyors 18, 20 define a wedge-shaped region which is more directly under the influence of the conveyors than the rest of the cigarettes in the hopper region 12 and tray 10. In other words the grid defines approximately a dividing line between the cigarettes above the rods, which have a component of movement which is largely vertical, and the cigarettes between the rods and the conveyors, which cigarettes have a substantial component of movement in a horizontal direction.

In the absence of a grid of rods 32 or other spaced elements the cigarettes nearest the walls 14*a*, 16*a* would be moved away by the conveyors 18, 20 more rapidly than those nearest the walls 14*b*, 16*b*, where a dead zone tends to develop. Thus the falling surface of the cigarettes in the tray 10 and hopper region 12 would have a pronounced slope in a direction downwards from the walls 14*b*, 16*b* to the

walls 14a, 16a. One theory for the success of the present downwardly-inclined grid is that since the height of the stack under direct influence of the conveyors is reduced in the region nearest the walls 14a, 16a the flow of cigarettes horizontally away from that region is reduced, thereby counteracting the tendency of the surface level to fall more rapidly. One effect of the proximity of the rods 32 to the conveyor surface in the region adjacent the wall 16a is that there appears to be more resistance to horizontal movement of cigarettes: this accounts for the use of a ribbed band conveyor 18, which provides a more positive drive. The use of a continuous conveyor, with or without protrusions, across the width of the hopper region 12 is not ruled out.

The size and spacing of the rods 32 of the grid to produce the best results in maintaining a level surface with any particular size and type of rod-like article may be a matter for some experiment. The present dimensions have been found to be particularly successful with cigarettes (or cigarette filter rods) having diameters of about 8 mm. The use of a grid of rods (or other flow control means) defining a downwardly-sloping exit is believed to be generally beneficial over a wide range of dimensions.

A tray unloader similar to that shown in Figures 1 and 2 may be incorporated in apparatus as shown in Figure 3, which includes means for inverting a tray. Figure 3 shows a tray support 140 rotatable about a pivot 142 and arranged to hold a tray 110 against a back wall 115 and over a hopper region 112. The support 140 includes a slot 144 for reception of removable slat which forms a closure for the inverted open upper end of the tray 110. Alternatively the support 140 and slot 144 are usable with modified trays which include a flexible band which is draped across the open upper end of a full tray and released and removed manually when the tray has been inverted and it is desired to release the cigarettes: this type of tray is relatively common in Russia. The hopper region 112 includes a side wall 116a and is arranged above a ribbed band conveyor 118.

The tray support is shown at 140' in chain-dot lines in position to receive a full tray 110'. The tray 110' is delivered to the support 140' with its open face and side uppermost. The edges of the front face of the tray are located by the support and the open top side moved up and held against a stop, which may be the closure in the form of a slat inserted in the slot 144. Subsequently the support and tray are rotated by hand about pivot 142 until the open front of the tray 110 abuts the back wall 115. The closure is released (e.g. the slat is removed from slot 144) and the cigarettes descend into the hopper region 112. The tray 110 and support 140 could be arranged so that a slat can be removed in a direction at right angles to the

cigarettes (i.e. parallel to conveyor 118) or in a direction parallel to their lengths (i.e. from the left hand side as viewed in Figure 3).

One use envisaged for the present apparatus is as a temporary or occasional means of supplementing the supply of cigarettes to a system which includes conveyors for moving cigarettes as a stack from one or more making machines to one or more packing machines. Thus the conveyor 118 could form part of a conveyor system which normally moves a stack of cigarettes past the tray unloading apparatus. In order that the wall 116a of the hopper region 112 should not prevent such operation when the tray unloading unit is not in use, the whole unit, including back wall 115, support 140 and hopper region 112, is pivotable at 146 on a fixed bracket 148. The unit may then be rotated about 146 away from the conveyor 118 and into the position indicated at 150 in chain-dot lines. It is a simple matter to swing the unit back into its operative position whenever it is required to unload cigarettes from trays onto conveyor 118.

WHAT WE CLAIM IS:—

1. Apparatus for feeding rod-like articles such as cigarettes, comprising support means for holding a tray containing rod-like articles at a discharge position; conveyor means for moving away articles delivered by a tray at said discharge position; and flow restricting means between said discharge position and said conveyor means for maintaining the upper surface of rod-like articles supplied by the tray substantially level as said surface falls, said flow restricting means including a series of spaced parallel elements.

2. Apparatus as claimed in claim 1, wherein the distance between the spaced elements and said conveyor means generally increases in the direction of movement of the conveyor means.

3. Apparatus as claimed in claim 1 or claim 2, wherein said conveyor means comprises endless band conveyor means arranged to convey a stack of articles from the flow restricting means in a direction which is substantially at right angles to that at which the articles pass to said flow restricting means from a tray at the discharge position.

4. Apparatus as claimed in claim 3, wherein the endless band conveyor means includes two or more endless band conveyors.

5. Apparatus as claimed in any preceding claim, wherein the flow restricting means is arranged in a passage between said discharge position and the conveyor means.

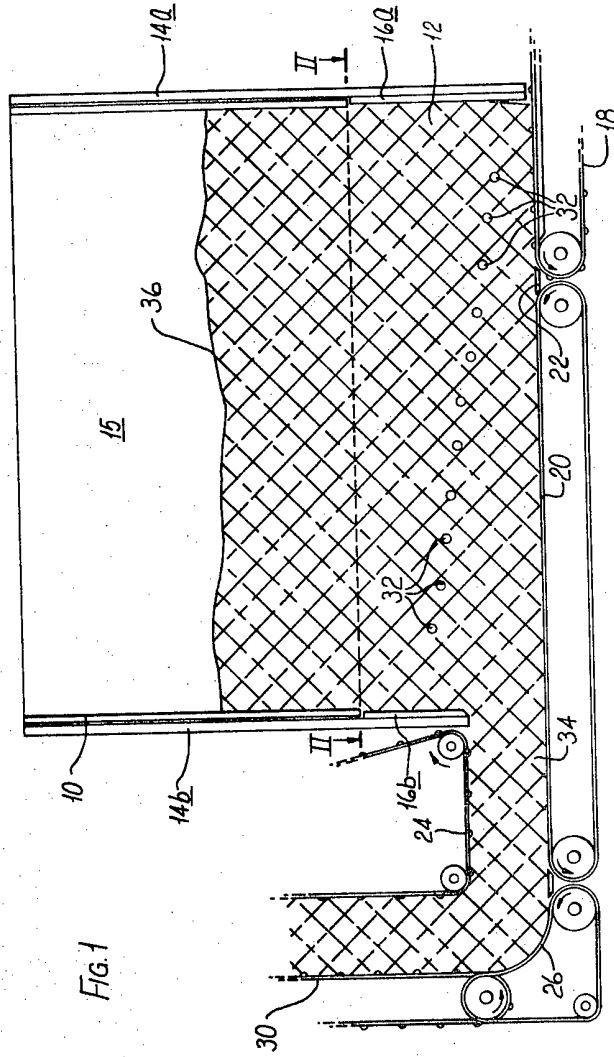
6. Apparatus as claimed in any preceding claim, wherein the tray support means and flow restricting means are part of a unit which is removably mounted adjacent the conveyor means.

7. Apparatus for feeding rod-like articles, substantially as herein described with particular reference to the accompanying drawings.

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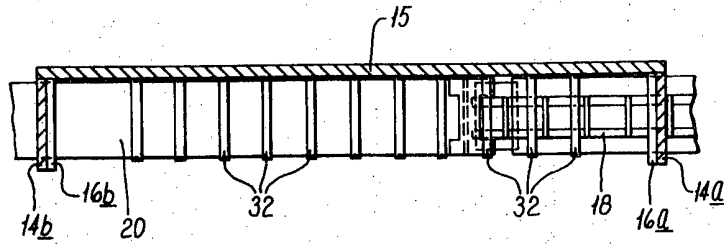


FIG. 2

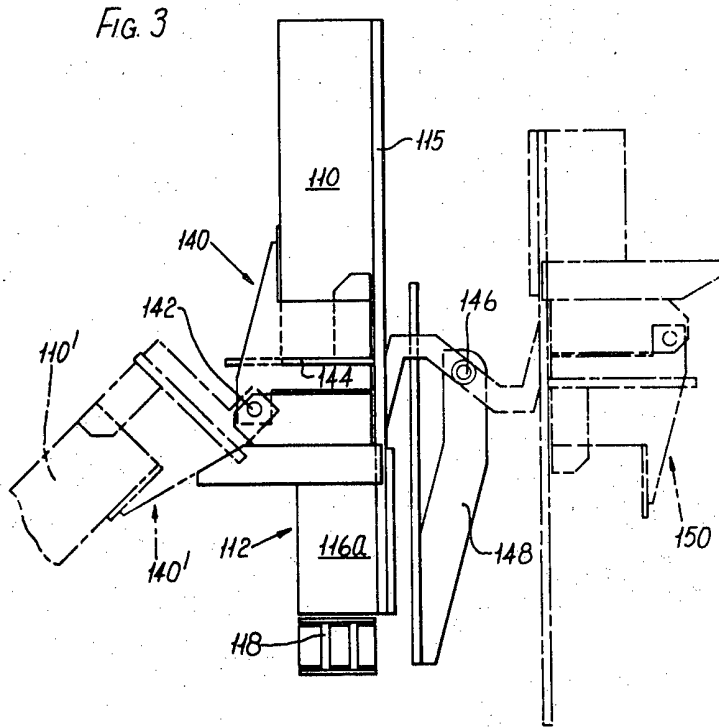


FIG. 3