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DEVICE ON MACHINES FOR FILLING COLLAPSIBLE TUBES

Filed July 21, 1960

3 Sheets-Sheet 1

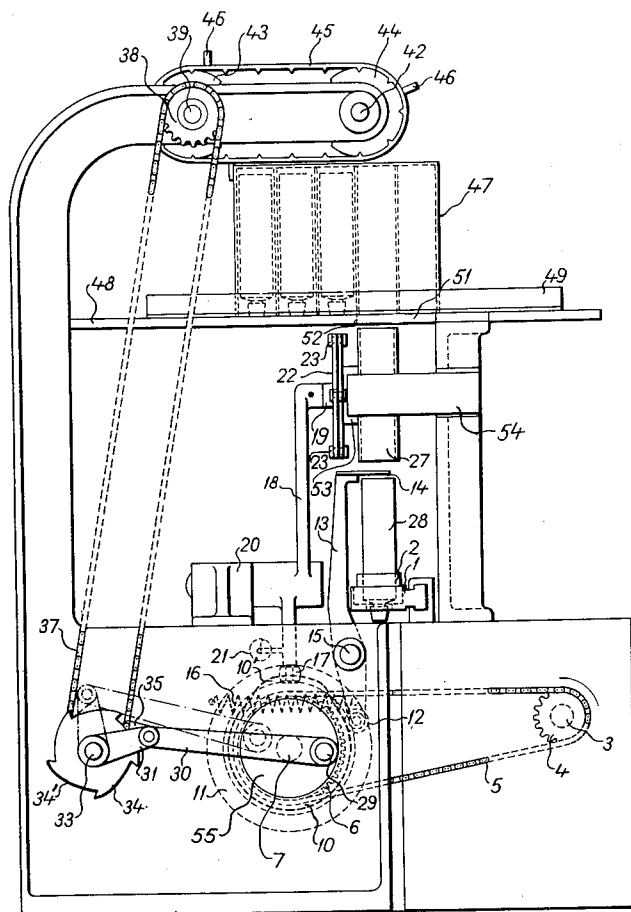


Fig. 1

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3 Sheets-Sheet 2

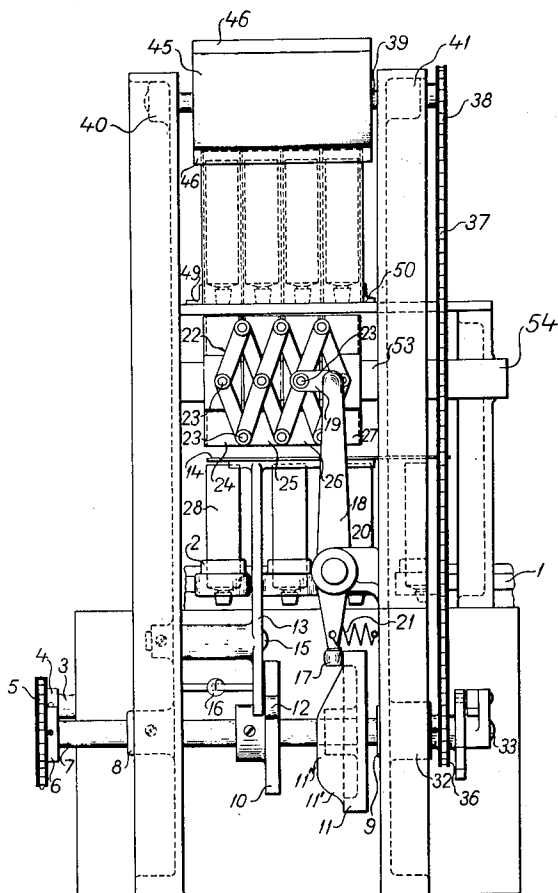


Fig. 2

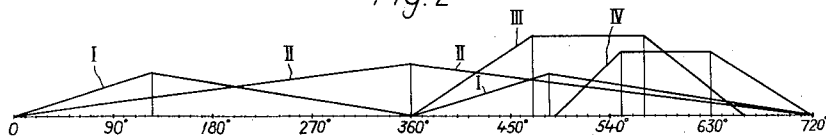


Fig. 4

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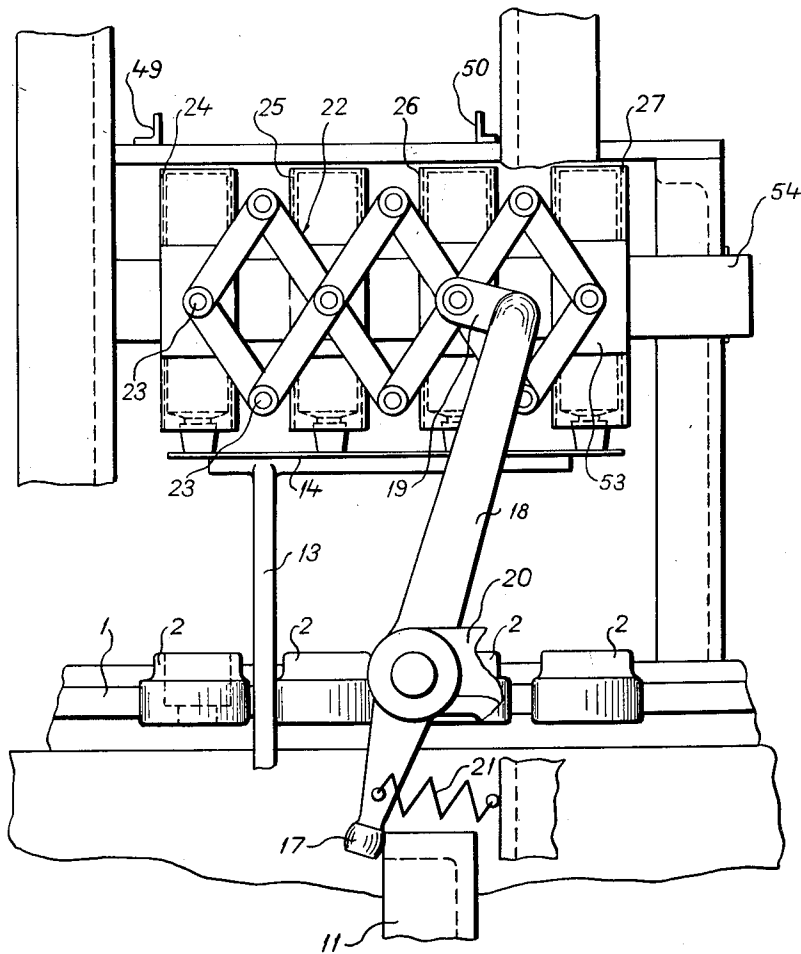


Fig. 3

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DEVICE ON MACHINES FOR FILLING COLLAPSIBLE TUBES

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6 Claims. (Cl. 214-307)

This invention relates to tube filling machines and more particularly to a device for facilitating the feeding of empty tubes to the tube holders on the tube conveyors of the machines.

Collapsible tubes to be filled are usually delivered in cartons having upwardly open cells which are each dimensioned to receive a collapsible tube and arranged such that the tubes will be positioned in rows and columns. Collapsible tubes to be manually fed to the tube holders on the conveyor of the machine and filled with material from its bottom end are delivered with their open bottom ends directed upwardly in the carton and usually the tubes are inserted in the holders on the conveyor of the machine by the person operating the machine who sticks a finger into, for example, each of four tubes and then removes the tubes from the carton. Said four tubes could not, however, be directly transferred to the tube holders because the distance between adjacent holders is considerably greater than the distance between the tubes stuck on the fingers even if the operator separates his fingers as much as possible. It is, thus, necessary to insert the tubes one after another in the holders which means a loss of time that may cause empty holders to reach the filling station or stations of the machine.

An object of the present invention is to overcome said disadvantage. The invention enables transport of the tubes from the carton to the tube holders on the conveyor without manual operations such that the capacity of the machine can be increased and that each of the tube holders always will carry a collapsible tube.

The invention comprises a device for feeding collapsible tubes from cartons divided into rows and columns by upwardly open cells, which cells each contain an empty collapsible tube with an open, downwardly directed filling end, to a tube filling machine of the type having a conveyor which is driven step by step, carries a plurality of equally spaced tube holders and feeds tubes inserted in said holders to one or more tube filling stations. This device includes a carton carrying surface for carrying a filled carton, positioned with the openings of the cells directed towards said surface, a driving means arranged to feed a carton on the carrying surface step by step towards and past one or more openings in the surface or, an edge of the surface, an adjustable tube guiding mechanism provided below and parallel with said openings or edge and carrying tube guides, the number of which is at least as great as the number of cells in a row of the carton and which tube guides in the adjusted tube receiving position of the tube guiding mechanism are each coaxial with a corresponding cell in a carton row to receive a tube when the tubes in a row fall from said edge of the carrying surface or through the opening or openings during the movement of the carton, retaining means for retaining tubes caught by the tube guides, guide means which adjust the tube guiding mechanism after tubes have been received by the tube guides thereon so that said tube guides are each set into a position above a respective tube holder on the conveyor, and release means for releasing said retaining means in predetermined positions of the conveyor so that tubes, received by the tube guides and retained therein will fall down into underlying tube holders on the conveyor.

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An embodiment of the invention will now be described by way of example with reference to the accompanying drawings, in which:

FIGURE 1 illustrates the essential parts of a tube filling machine provided with a device according to the invention,

FIGURE 2 is a left hand side view of the machine shown in FIGURE 1,

FIGURE 3 is a detail view illustrating the adjustable tube guiding mechanism for the tube guides, set into a position for transferring tubes into the holders on the conveyor, and

FIGURE 4 is a diagram illustrating the operations of the machine.

In the embodiment shown the tube filling machine conveyor 1 with tube holders 2, four of which are shown in FIGURES 2 and 3, feeds two tubes at a time from the left to the right towards filling stations (not shown). The main shaft 3 of the tube filling machine carries a chain wheel 4 which, via a chain 5, drives a chain wheel 6 secured to a shaft 7 which is journaled at 8 and 9 in the machine frame. Secured to the shaft 7 is a radial cam disc 10 and an axial cam disc 11. The cam disc 10 co-operates with a roller 12 which is rotatably mounted on the one end of a lever 13 which on its other end carries a tube retaining plate 14 forming the tube retaining means already mentioned. The lever 13 is pivoted to a fixed stub shaft 15 on the machine frame. Roller 12 is held in engagement with the cam disc 10 by a tension spring 16 provided between the machine frame and the lever 13. A roller 17 cooperates with cam disc 11 and is rotatably mounted on the one end of a lever 18 the other end of which is pivoted to the one end of a link 19. The lever 18 is pivoted to a bracket 20 secured to the machine frame and is held with its follower roller 17 in engagement with cam disc 11 by a tension spring 21 arranged between the machine frame and the lever 18. The link 19 is connected to a lazy tongs link system, generally denoted 22, having its crossing links pivoted on pins 23 in known manner. Tube guides 24, 25, 26 and 27 each consisting of a tubular member with an inner diameter allowing a collapsible tube to pass through are secured to individual guide members 53 all of which, except one of the outermost (the left hand member in FIG. 2), are arranged to slide along a guide bar 54 secured to the machine frame. Each guide member 53 is secured to one of the pivot pins 23 of the link system 22 so that the tube guides 24 to 27 will be uniformly moved with respect to one another by operating the lever 18. The tube guides 24 to 27 are provided above the tube retaining plate 14 so that tubes 28 inserted in the tube guides rest with their lower ends against the plate 14 when the plate 14 is in the position shown in the figures.

The shaft 7 also carries an eccentric 55 having a stub axle 29 radially displaced from the axis of shaft 7. A link 30 is pivoted to the axle 29. The free end of the link 30 is pivoted to an arm 31 which in turn is pivoted to a shaft 33 journaled in a bearing 32. A ratchet wheel 34 is secured to a shaft 33 and cooperates with a pawl 35 which is pivoted to the free end of the arm 30. The shaft 33 also carries a chain wheel 36 connected to a chain wheel 38 via a chain 37. The chain wheel 38 is secured to a shaft 39 which is rotatably mounted in two bearings 40, 41 in the machine frame. A drive roller 43 is mounted on the shaft 39 and a drive roller 44 is mounted on another shaft 42 parallel with shaft 39. Shafts 39 and 42 are mounted in the machine frame. Rollers 43, 44 are in driving connection with a conveyor belt 45 provided with outwardly projecting carton carriers 46. Below the conveyor belt 45 and at a distance from same, corresponding to the height of a carton 47, is provided a carton supporting table 48. The table 48 is provided with two

parallel guide rails 49 and 50 between which cartons are fed by the carriers 46 from the left to the right in FIGURE 1. The table 48 is further provided with an opening 51 between the rails 49, 50 having an edge 52 perpendicular to the rails. The opening 51 has a width which is at least equal to the diameter of the tubes used and its left hand edge 52 in FIGURE 1 runs parallel with the tube guides 24 to 27 and to the left of a vertical plane through the central axis of said holders to ensure that tubes falling down from the edge 52 will be received by the tube guides. The table 48 could alternatively terminate at the edge 52, in which case emptied cartons can be transported from the table by a conveyor belt or the like.

The machine operates as follows.

As shown in FIGURE 2 each carton row is assumed to comprise four cells with tubes to be filled. As shown in FIGURE 1 the carton 47 on the table 48 has been fed a distance corresponding to two cell rows. When positioning the carton 47 on the table 48 the opening of the carton and, thus, the openings of the cells are preferably covered with a separate sheet or a platen, which may be connected to the table 48 to prevent the tubes from falling out of the carton. The sheet or platen is then removed when the carton is in proper position. In the operative condition of the machine, shown in FIGURES 1 and 2 and corresponding to 0 degrees in the operating cycle illustrated in FIGURE 4 the last four tube holders 2 below the tube guiding mechanism have just received their tubes and the conveyor 1 is prepared to feed two tubes towards filling stations, not shown. In the embodiment shown this feeding operation takes place during the movement of the main shaft 3 through 125 degrees, illustrated by line I in FIGURE 4. During the remaining portion of the operation cycle, that is between 125 and 360 degrees, the conveyor 1 is at rest to allow the two tubes fed to be filled. During the rotation of the main shaft 3 through 360 degrees, chain wheel 6 is rotated through 180 degrees by chain 5 so that the lever 30 and its cooperating members 31 and 35 will be positioned as indicated in dash and dot lines in FIGURE 1 which means that the ratchet wheel 34 will be rotated one pitch. This movement is illustrated by the curve II in FIGURE 4. When rotating the ratchet wheel through the first pitch the carrier 46, resting against the rear upper edge of the carton, will be fed a distance corresponding to the width of a cell row so that four tubes will fall from the table edge 52 into the underlying tube guides 24 to 27. During the next revolution of the main shaft 3 arm 30 will be retracted to the position shown in full lines in FIGURE 1 and the carton will not be fed forward. The return movement of the arm 30 is illustrated by the falling portion of the curve II. During this revolution, that is the cycle between 360 and 720 degrees in FIGURE 4 the conveyor will be fed through two steps, as during the first revolution, and simultaneously roller 17 is urged outwardly by the cam surface 11' of the axial cam disc 11 so that lever 18 will be swung clockwise in FIGURE 2 and cause the link system to be positioned as shown in FIGURE 3 by the link 19. The roller 17 is now in the outermost position on the cam disc 11, that is, on the surface 11''. The clockwise movement of the lever 18 is illustrated by the rising portion of the curve III. The tube guiding mechanism remains operated in the adjusted position for the time the roller 17 contacts surface 11'' as illustrated by the horizontal portion of curve III in FIGURE 4. After termination of the movement of the conveyor 1 (the rising portion of curve I) roller 12 reaches the rising portion 10' on the cam disc 10 whereby the arm 13 (FIGURE 1) will begin to swing counterclockwise so that the tube retaining plate 14 will swing out from the tube guides 24 to 27 and, thus, tubes held by said guides will fall down into the four empty tube holders 2 which have been transported into proper position by the conveyor 1. The movement of the arm 13 is illustrated by

curve IV in FIGURE 4. The rising portion of this curve IV, illustrating the retraction of the tube retaining plate 14, terminates as shown about 20 degrees before the return movement of the tube guiding mechanism, illustrated by the falling portion of the curve III, is initiated. When the return movement of the arm 13, illustrated by the falling portion of curve IV, is completed the different parts of the machine are in the positions shown in FIGURES 1 and 2 and the next operation cycle can take place.

In the embodiment shown each carton contains five cell rows and the ratchet wheel has five teeth. When the first row in a new carton is to be fed past the edge 52 the foremost edge of the carton rests against a carrier 46 and consequently the thickness of said carrier must be taken into account. Every sixth feeding stroke is, therefore, increased by the thickness of the carrier 46 and accordingly the tooth distance 34' (FIGURE 1) is greater than the other tooth distances of the ratchet wheel 34.

The device can be modified in various ways within the scope of invention. It is, for example, possible to replace the table 48 and the carton feeding device with an endless belt terminated at 52 and arranged to advance cartons step by step as described. Opening 51 may be replaced by a number of openings corresponding to the cells in a row and dimensioned such that a tube can freely pass through each opening into the respective underlying tube guides.

What I claim is:

1. In apparatus for feeding collapsible tubes from cartons, divided up into upwardly open cells which are arranged in rows and columns and which each contain an empty collapsible tube with an open, downwardly directed filling end, to a conveyor carrying a plurality of equally spaced tube holders, which conveyor is driven step by step to advance tubes inserted in said holders to one or more tube filling stations, in combination a carton supporting surface for carrying a filled carton positioned with the openings of the cells directed towards said supporting surface, a driving means arranged to feed said carton on the supporting surface step by step towards and past at least one opening in the supporting surface positioned so as to uncover said cell openings when aligned therewith, an adjustable tube guide mechanism located below said surface and comprising a row of tube guides, the number of which is at least as great as the number of cells in a row of the carton, and retaining means supporting tubes in said guides; a control means for adjusting said tube guide mechanism into a first position in which each of said tube guides is coaxial with a corresponding cell in an uncovered carton row each to receive a tube from one of said cells, and into a second position in which said guides are each coaxial with a corresponding tube holder on the conveyor, and release means for releasing said supporting means of said tube guide mechanism to allow the tubes to fall down into underlying tube holders on the conveyor.

2. Apparatus as claimed in claim 1, and in which said tube guide mechanism comprises a guide rail on which all of the guides but one of the outermost are slidably arranged, and in that said guides are each secured to a pivot shaft of a lazy tongs link mechanism.

3. Apparatus as claimed in claim 1, and in which said supporting means includes a plate extending below said guides, a swingable lever to which said plate is secured and which lever is arranged to be swung from said guides in dependence on the position of the conveyor to allow collapsible tubes resting on said plate to fall down into underlying tube holders on the conveyor.

4. In apparatus for feeding collapsible tubes from cartons, divided up into upwardly open cells which are arranged in rows and columns and which each contain an empty collapsible tube with an open, downwardly directed filling end, to a conveyor carrying a plurality of equally spaced tube holders, which conveyor is driven step by

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step to advance tubes inserted in said holders to one or more tube filling stations, in combination a carton supporting surface for carrying a filled carton positioned with the openings of the cells directed towards said supporting surface, a driving means arranged to feed said carton on the supporting surface step by step towards and past an edge of the supporting surface, an adjustable tube guide mechanism located below said surface and comprising a row of tube guides, the number of which is at least as great as the number of cells in a row of the carton, and retaining means supporting tubes in said guides; a control means for adjusting said tube guide mechanism into a first position in which each of said tube guides is coaxial with a corresponding cell in an uncovered carton row each to receive a tube from one of said cells, and into a second position in which said guides are each coaxial with a corresponding tube holder on the conveyor, and release means for releasing said supporting means of said tube guide mechanism to allow the

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tubes to fall down into underlying tube holders on the conveyor.

5. Apparatus as claimed in claim 4, and in which said tube guide mechanism comprises a guide rail on which all of the guides but one of the outermost are slidably arranged and in that said guides are each secured to a pivot shaft of a lazy tongs link mechanism.

6. Apparatus as claimed in claim 4, and in which said supporting means includes a plate extending below said guides, a swingable lever to which said plate is secured and which lever is arranged to be swung from said guides in dependence on the position of the conveyor to allow collapsible tubes resting on said plate to fall down into underlying tube holders on the conveyor.

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