July 25, 1961 S. DEMITRAK 2,993,613

AUTOMATIC TUBE LABELLING MACHINE

Filed April 23, 1959

3 Sheets-Sheet 1

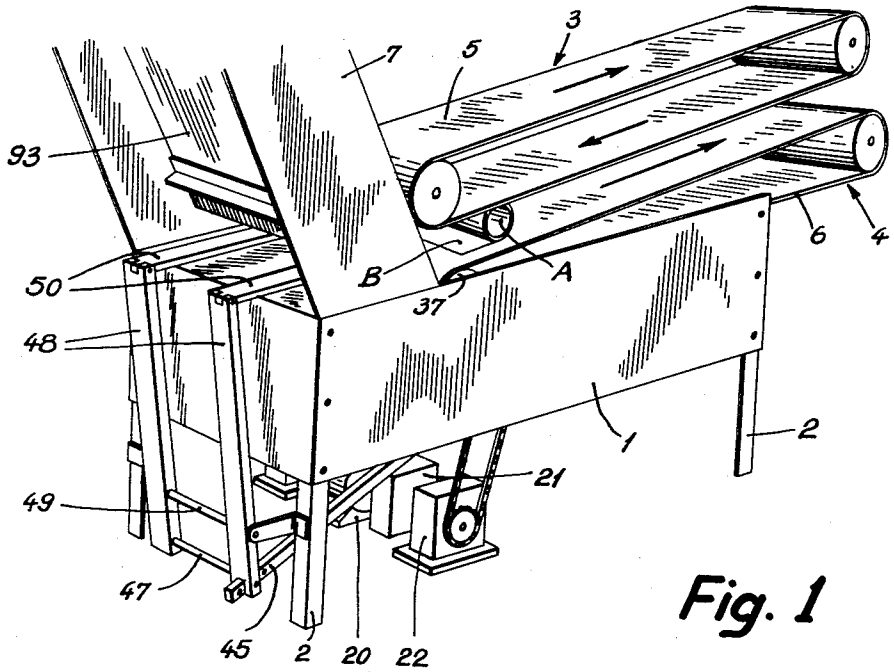


Fig. 1

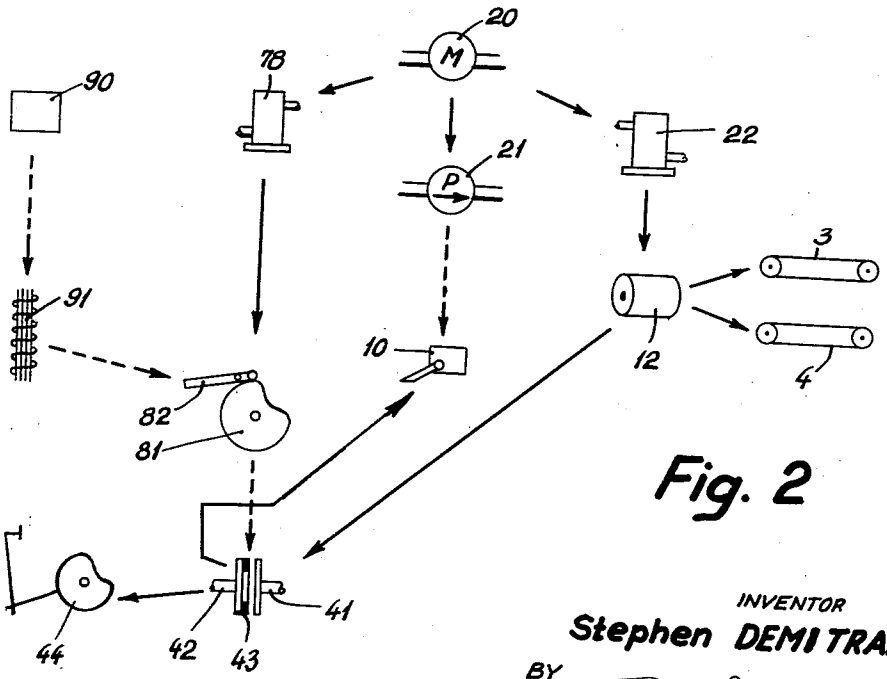


Fig. 2

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3 Sheets-Sheet 2

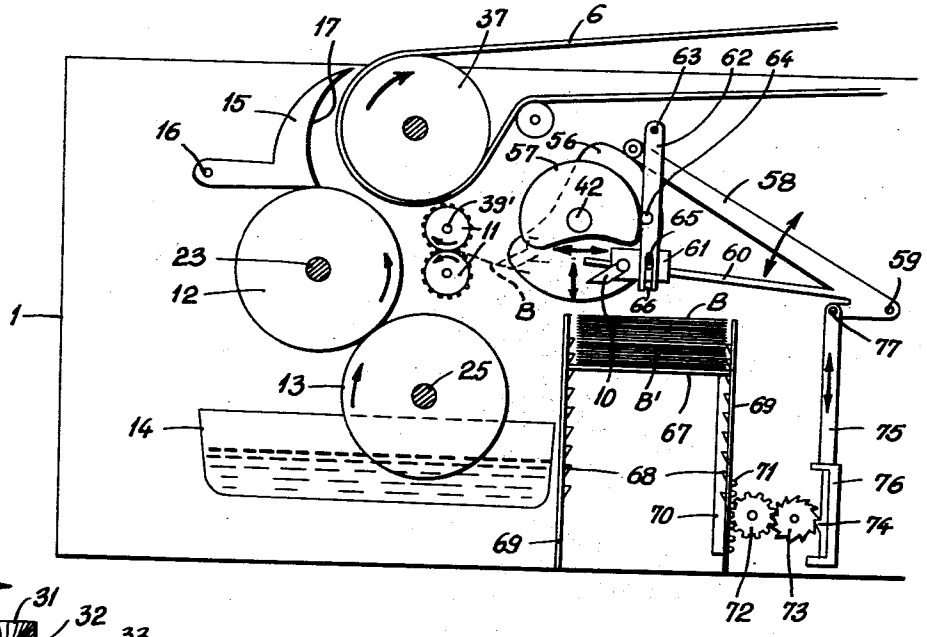


Fig. 5

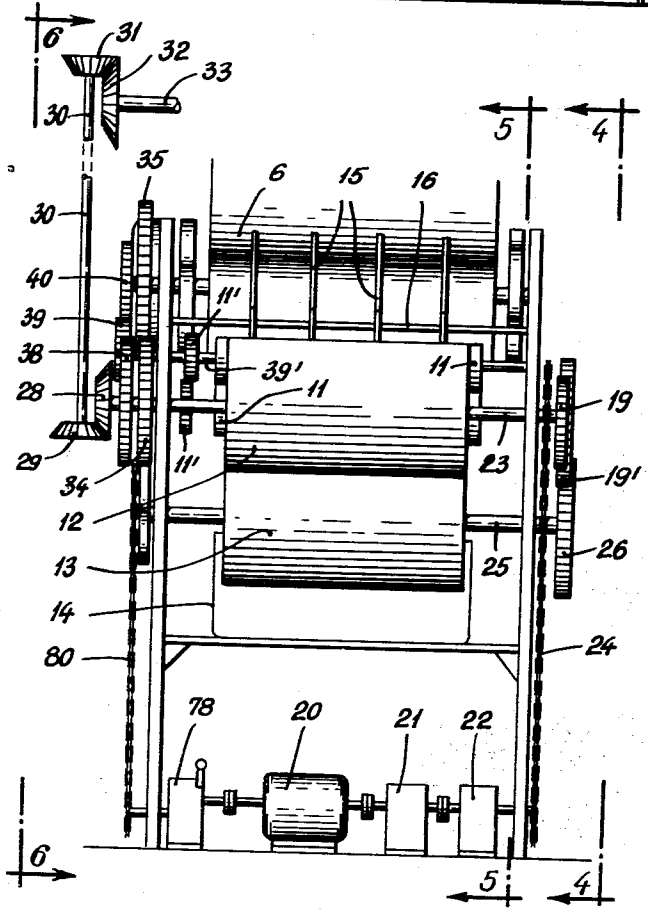


Fig. 3

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AUTOMATIC TUBE LABELLING MACHINE

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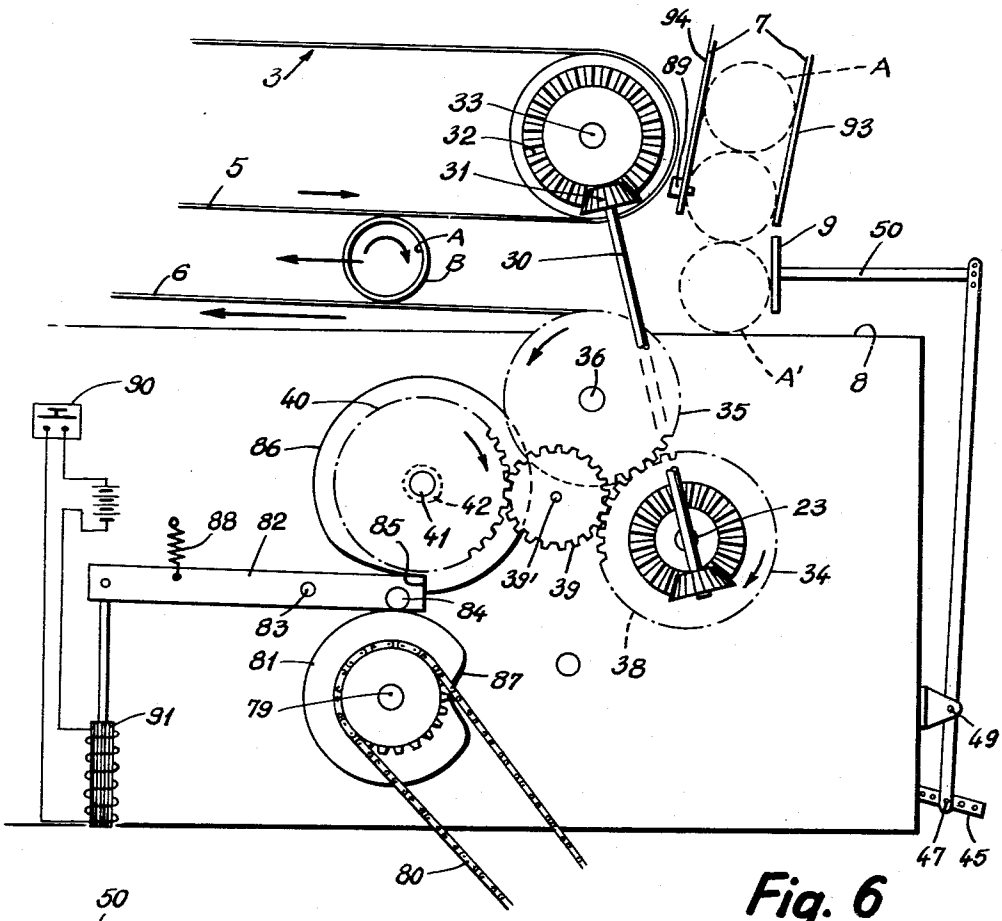


Fig. 6

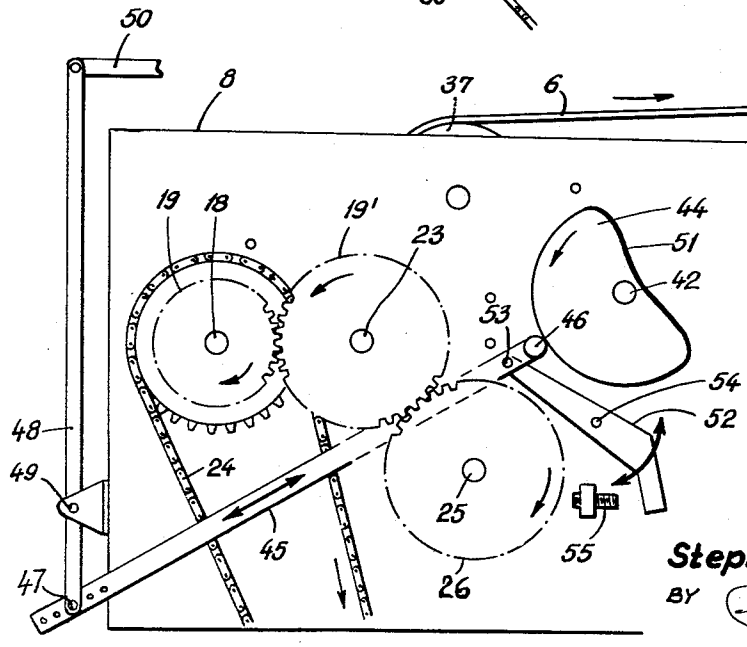


Fig. 4

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AUTOMATIC TUBE LABELLING MACHINE

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3 Claims. (Cl. 216—55)

The present invention relates to a labelling machine for cylindrical objects, and more particularly to a labelling machine in which the label is adhesively applied to a cylindrical object, such as a fiber tube, in such a manner that the label adheres over its entire surface.

In already known labelling machines of the character above mentioned, the tubes or other cylindrical articles have to be fed to the machine by hand. Furthermore known machines require a considerable length for handling tubes of relatively large diameter.

The general object of the present invention is the provision of an improved tube labelling machine which works in an entirely automatic manner and which can handle tubes of various diameters, for instance, tubes varying between one to six inches of diameter.

Yet another important object of the present invention is a labelling machine of the character described which has a small overall length compared to the diameter of tubes it can label.

Yet another object of the present invention is the provision of a machine of the character described, having a novel and improved label feeding mechanism whereby a fresh stack of labels can be inserted within the machine without having to stop the same.

Other objects of the present invention are the provision of a machine of the character described which has a high capacity and in which a certain latitude is possible in the relative timing of the operation of the tube and of the label feeding mechanisms.

The foregoing and other important objects of the present invention will become more apparent during the following disclosure and by referring to the drawings, in which:

FIGURE 1 is a partial somewhat schematic perspective view of the machine;

FIGURE 2 is a diagram of the various elements and their driving connections;

FIGURE 3 is an end view of the machine;

FIGURE 4 is a side view seen along line 4—4 of FIGURE 3;

FIGURE 5 is a side view seen along line 5—5 of FIGURE 3; and

FIGURE 6 is a side view seen along line 6—6 of FIGURE 3.

Referring now more particularly to the drawings in which like reference characters indicate like elements throughout, the labelling machine is characterised by the provision of two superposed parallel endless conveyor belts having adjacent parallel runs travelling in opposite directions and at constant but unequal speeds such as to impart to a tubular article lodged between the two adjacent runs, a relatively high speed rotational movement and a slower translational movement, the label being fed between the article and the lower run so as to be applied over the surface of the article during said rotational movement, pusher means being adapted to automatically feed the article to the conveyor belts in timed relation with respect to the means for feeding the glue coated labels to the belt. The speed of the operation of said article pusher means and label feeding means is adjustable in accordance with the diameter of the articles being labelled and so as to allow for the size of the labels. Referring to FIGURE 1, the machine comprises a housing 1 supported on ground engaging legs 2. Upper and

lower conveyor belt arrangements 3 and 4 respectively are supported on top of the housing 1 by brackets (not shown) and their belts 5 and 6 travel in the same direction, such that the lower run of upper belt 5 travels in opposite direction but at a lower speed than the upper run of lower belt 6, in accordance with the direction of the arrows. The tubular articles A to be labelled, which may consist for instance of fibre cylindrical objects adapted to constitute containers when fitted with end metal caps, are supplied from a hopper or chute 7 upstanding from one end of the housing 1, said chute being adapted to supply the articles A to the inlet end of the conveyor belt arrangements and in such a position that the axis of the articles A will be perpendicular to the direction of travel of the belts 5 and 6. The articles A are stacked in parallel relationship within the hopper 7 transversely thereof, as shown in FIGURE 6, the lowermost article A' resting on a table 8 ready to be engaged by pusher plate 9 which will displace the same to the left, as seen in FIGURE 6, for engagement between the conveyor belts 5 and 6.

Referring to FIGURE 5, which shows the opposite side of the machine as compared to FIGURE 6, labels B to be applied to articles A are stacked as shown at B', and are picked up one by one by vacuum head 10 and are transferred to feeding rollers 11 as indicated in dotted lines and thence to the peripheral surface of a glue transfer roller 12, where it is coated with glue over its entire surface. The glue is uniformly applied to roller 12 by means of glue pick up roller 13 in contact with roller 12 and partly immersed within glue port 14.

Label removing blades 15 which are disposed in spaced vertical planes, are pivoted to the housing at 16 and have a curved edge 17 with its lower end resting on the periphery of roller 12. Blades 15 serve to remove the glue coated label from roller 12 and transfer the same, glued face up, unto the upper run of the lower conveyor 4, thus the glued label is ready to be picked up by the article A fed over the same. Rotation of the article A causes the wrapping of the label around the latter.

A single electric motor 20 drives the entire machine, said motor 20 is disposed underneath the housing 1, as shown in FIGURES 1 and 3, and one end of its double shaft is coupled to a vacum pump 21 which produces vacum in the head 10, and to a constant speed reducer 22, the output shaft of which drives at a constant speed, a shaft 18 through transmission chain 24. Shaft 18 drives in turn the glue transfer roller 12 which is secured to a transverse shaft 23 (see FIGURE 4 where gears 19 and 19' are in mesh). The glue pick up roller 13 is mounted on a shaft 25 fitted with a gear wheel 26 meshing with gear wheel 19' secured to driving shaft 23. The other end of shaft 23 is provided with a bevelled pinion 28 meshing with bevelled pinion 29 of a telescopic shaft 30 serving to drive the upper conveyor belt arrangement 3 through pinions 31 and 32 and shaft 33. The driving shaft 30 is telescopic because the whole conveyor arrangement 3 is adjustably secured on its supporting brackets so as to adjust the distance separating the lower run of said conveyor 3 from the upper run of the lower conveyor 4 to suit articles A of different diameters.

The shaft 23 also drives the lower conveyor belt 6 by means of gear wheel 34 secured to shaft 23 and meshing with gear wheel 35 secured to shaft 36 of the driving pulley 37 of the lower belt 6. Another gear wheel 38 is secured to shaft 23 and meshes with gear wheel 39 which rotates shaft 39' and one of the feeding rollers 11, the latter being in mutual driving arrangement by intermeshing gear wheels 11', as shown in FIGURES 3 and 5.

The gear wheel 39 in turn meshes with a gear wheel

40 secured to the input shaft 41 of a friction clutch 43 the output shaft 42 of which rotates in a controlled intermittent manner as it will be described hereinafter.

Thus all the elements previously described, namely, the two conveyors 4 and 5, the feeding rollers 11, the glue rollers 12 and 13 and the input clutch bearing shaft 41 rotate at a constant speed being driven from constant speed reducer 22.

The output shaft 42 of the friction clutch 43 has mounted thereon a cam 44 (see FIGURE 4) which actuates the pusher plate 9 through a linkage comprising a rod 45 having a cam follower 46 in engagement with cam 44, said rod 45 being adjustably pivoted at 47 to lower end of arms 48 fulcrumed at 49 to the housing 1 and having their upper end pivotally connected to bars 50 secured to pusher plate 9. The stroke of the pusher plate 9 is adjustable by having means for preventing the cam follower 43 from reaching the bottom of the recessed part 51 of cam 44. Said means comprise a lever 52 pivoted to rod 45 at 53 and to the housing at 54, and having its other end adapted to abut adjustable stopper screw 55; thus it is possible to adjust the stroke of the pusher plate in accordance with the diameter of articles A. The inner limit position of the pusher plate remains the same and corresponds to the cam follower 46 riding on the circular part of the cam 44 but the retracted position of the pusher plate varies by preventing more or less the inward movement of the rod 45 when the cam follower is opposite the recess 51 of cam 44.

The output shaft 42 of the clutch arrangement drives also the label feeding mechanism, said mechanism comprises two cams 56 and 57 secured to output shaft 42 (see FIGURE 5). Cam 56 serves to guide the pivotal movement in a vertical plane of a V-shaped lever 58 pivoted to the housing at 59 and on the branch 60 of which is slidably mounted a rider 61 carrying the vacuum operated label pick-up head 10. Another lever 62 pivoted at 63 on the housing has a cam follower 64 riding on cam 57 and serves to control the reciprocating movement of rider 61, said rider having a lateral pin 65 engaging a notch 66 made in lever 62. When the rider is opposite the label stack B' it is allowed to drop unto said stack and picks up the topmost label. Then cam 56 causes upward movement of the rider and cam 57 causes transverse movement of said rider so that the head 10 presents a label to the feeding rollers 11 as shown in dotted lines in FIGURE 5.

In accordance with the invention, there is provided a levelling mechanism for the stack B'. The stack B' is supported on a removable shelf 67 which rests on the teeth 68 of four posts 69. An elevating frame 70 engageable with shelf 67 is arranged for vertical movement along the posts 69 and said frame is provided with rack teeth 71 meshing with a gear wheel 72 adapted to be rotated by ratchet wheel 73 movable step by step by a pawl 74 formed at the lower end of a rod 75 guided in bracket 76 and movable up and down in a reciprocating movement by the V-shape lever 58 to which it is pivotally connected at 77. Normally, the up and down movement of the head 10 during label picking and feeding operation is insufficient for the pawl 74 to descend sufficiently for engaging the next tooth of the ratchet wheel 73. But the level of the stack B' finally decreases sufficiently so that the pawl 74 will move sufficiently downwardly to engage the next ratchet tooth and upon subsequent rising movement of the V-lever 58, the ratchet wheel 73 will be rotated to thereby elevate the frame 70 and the whole stack of labels B. When only a few labels are left on the shelf 67, a fresh stack with its own shelf is inserted underneath the spent stack, the frame 70 having been previously lowered to its lowermost position, so that the fresh stack is inserted over said frame; the frame and fresh stack are then raised to contact the spent stack and the first shelf is removed from between the two stacks.

The label feeding mechanism and the pusher plate for feeding the articles A between the two conveyor belts move in a related sequence and in an intermittent manner, the timing of which depends on the diameter of the articles A which also govern the size of the labels B; thus the timing or rate of speed of operation of the label picking mechanism and articles pusher mechanism is regulated by the means for controlling the operation of the clutch 43. Said last named means include a variable speed reducer 78 driven by motor 20 and in turn driving a shaft 79 through the sprocket gear and chain arrangement 80 (see FIGURES 3 and 6). A notched wheel 81 is mounted fast on shaft 79, said wheel rotates continuously at an adjusted speed regulated by reducer 78 and normally maintains a lever 82 in a locking position, shown in FIGURE 6. More specifically, the lever 82 which is pivoted on the housing at 83 has a lateral roller 84 riding on the periphery of wheel 81 and is thereby maintained in a locking position in which the outer end of lever 82 engages a radial step 85 made in a stepped wheel 86 secured to the output shaft 42 of the clutch system; thus whenever the lever 82 is in locking position, the stepped wheel 86 is prevented from turning and the labels and articles feeding mechanism are inactive. When roller 84 enters notch 87 of wheel 81, lever 82 pivots downwardly under the action of spring 88 thereby allowing stepped wheel 86 to make one full turn which corresponds to one complete feeding operation of the pusher plate 9 and of the label picking head 10.

In order to prevent operation of the labels and articles feeding mechanisms when the chute 7 is empty, a feeler member 89 extends within the chute adjacent the lower end thereof and maintains a switch 90 in opened position as long as there is an article A in contact with feeder member 89. The switch 90 in turn controls the electric circuit of a solenoid operated plunger 91 connected to the releasing lever 82. Whenever the chute is empty, the solenoid is energized and the plunger 91 maintains the lever 82 in locking position thereby preventing rotation of wheel 86 and actuation of the feeding mechanisms.

The chute 7 has an adjustable wall 93 the distance of which from the opposite wall 94 is adjustable, by suitable means (not shown) in accordance with the diameter of the articles A.

It will be noted that the timing of the feeding on the articles A to the conveyor belts in relation with the feeding of the glue coated labels need not be highly accurate as long as the article is not fed behind the forward edge of the label. In other words, the article may be without trouble fed a small distance ahead of the forward edge of the label and it will still pick up the label properly as it is rotated backwards on the lower belt due the reverse action of the upper belt.

The presence of the upper belt enables also to reduce considerably the overall length of the machine because the number of rotations of each object A is increased considerably in relation to the length of the translational movement of said articles. The ratio of the speeds of the two conveyors may be varied; a good ratio has been found to be three and a half to one, that is the lower conveyor travels at a speed three and a half times faster than the upper conveyor. With this ratio the machine can conveniently handle tubes, the diameter of which vary between one to six inches.

Due to the fact that the presence of the two conveyors rotate each article several times during the translational movement through the machine, the label is efficiently applied because it comes in pressing contact with the belts several times during the labelling operation.

The machine is entirely automatic in operation, the articles being simply stacked within the hopper 7 and being discharged at the outlet end of the conveyor belt arrangements in fully labelled condition.

While a preferred embodiment in accordance with the

present invention has been illustrated and described, it is understood that various modifications may be resorted to without departing from the spirit and scope of the appended claims.

What I claim is:

1. An automatic labelling machine for adhering labels to the entire cylindrical surface of tubular objects comprising a conveyor system having two superposed parallel endless conveyor belts, end rollers on which said belts are trained, driving means to move adjacent runs of said belts at constant speed and in opposite direction, the top run of the lower conveyor belt moving from the inlet to the outlet end of said conveyor system and at a greater speed than the lower run of the upper conveyor belt, said adjacent runs spaced a distance corresponding to the diameter of said tubular objects, such that an object fed to the inlet end of the conveyor system is engaged by said adjacent runs and caused to move towards the outlet end of said conveyor system while being rotated about its own axis, a platform mounted adjacent the inlet end of the conveyor system at the level of the top run of the lower conveyor belt and terminating short of the end roller at the inlet end of said lower conveyor belt, hopper means disposed above said platform for maintaining a stack of said objects with the lowermost object resting on said platform, pusher means movable across and over said platform and operable to engage and move the lowermost object laterally of the stack and into engagement with said conveyor belts, and means for feeding a glue coated label, glued face up, onto the top run of the lower conveyor belt at the inlet end of said conveyor system in

timed relation with the operation of the pusher means, said label feeding means disposed below said lower conveyor belt and including curved guiding members associated with the end roller at the inlet end of said lower conveyor belt and successively directing labels onto said lower belt, whereby said labels are transported by said lower belt and are caused to adhere to said objects over their entire peripheral surface during rotation of said objects between said conveyor belts.

2. An automatic labelling machine as claimed in claim 1, wherein the dimensions of said hopper, the distance between the adjacent runs of the two conveyor belts, and the stroke of the pusher means are adjustable in accordance with the diameter of said tubular objects.

3. An automatic labelling machine as claimed in claim 1, further including means for varying the speed of operation of said pusher means and of said label feeding means in accordance with the diameter of said objects and consequently the size of said labels.

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