LABEL FEEDER WITH VARIABLE SPEED DRIVE
Karl Alan Münch, Neutraubling, Germany, assignor to Hermann Kronseder, Neutraubling, Germany
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II Claims

ABSTRACT OF THE DISCLOSURE
Label feeder in a high speed bottle labeling machine, the feeder being disposed between a relatively stationary label magazine and a rapidly rotating labeling drum. The feeder comprises a label transfer roller with a transport mechanism to move it between the magazine and the drum at a variable speed. A roller drive mechanism is provided to give the relatively stationary label magazine a small movement in the direction of rotation of the label transfer roller while the roller picks a label out of the magazine. This prolongs the time that the suction nozzle has to remove the label from the magazine.

In preferred embodiments of the invention, the variable speed drive comprises a gear and pinion train which constitutes a lost motion drive connection as the label transfer roller shifts away from the label magazine, thus to further reduce the speed of rotation of the roller as it picks the foremost label out of the magazine, and constitutes an increased motion drive connection when the roller shifts away from the label magazine. This also prolongs the time that the suction nozzle has to remove the label from the magazine.

Other objects, features, and advantages of the invention will appear from the following disclosure.

DESCRIPTION OF THE DRAWINGS
FIG. 1 is a plan view of the labeling machine embodying the present invention.
FIG. 2 is a cross sectional view taken through the variable speed drive which turns the label transfer roller at various speeds.
FIG. 3 is a plan view of the apparatus shown in FIG. 2.
FIGS. 4 through 11 are diagrammatic plan views similar to FIG. 3 and illustrating various positions of the parts in one complete rotation cycle of the label transfer roller.
FIG. 12 is a plan view similar to FIG. 3, but showing a modified embodiment in which the relatively stationary label magazine is given a slight movement in the direction of rotation of the label transfer roller when the roller picks a label out of the magazine.

PREFERRED EMBODIMENTS OF THE INVENTION
Although the disclosure hereof is detailed and exact to enable those skilled in the art to practice the invention, the physical embodiments herein disclosed merely exemplify the invention which may be embodied in other specific structure.

In its general arrangement, the labeling machine is conventional and similar to those shown in patents hereinafter mentioned. The machine typically comprises a conveyor 16 on which cylindrical objects to be labeled, such as bottles 17, are conveyed in the direction of arrow 18 past a label drum 19 which rotator in the direction of arrow 27. Labels 20 temporarily held by suction port or nozzle label retaining means 42 to 49 are carried past a gluer 21 which coats glue strips on the outwardly facing side of the labels 20. Thereafter, the leading edge of the label 20 is adhered to a bottle 17 at the labeling stations 22 where the drum intersects conveyor 16. The opposite side of the bottle rolls against a resilient backing pad 23 to wrap the label around the bottle. There is also desirably a pressing station 24 beyond the labeling station 22, at which the bottle again rolls across a backing pad 28 under pressure of moving belt 25, thus to press the label against the bottle and remove wrinkles, etc.

The labels 20 are stored in one or more label magazines 26 which are relatively stationary with respect to the rapidly rotating drum 19. Label magazines 26 can be completely motionless, as shown in the embodiments of FIGS. 1 through 11, or can have a slight oscillatory movement, as shown in the embodiment of FIG. 12.

High speed bottle labeling machines embodying the present invention typically achieve an output rate of 36,000 bottles per hour. This requires relatively high speed rotation of the labeling drum 19. In early machines of this type in which the speeds were not so high, the
labels 20 in magazines 26 were sometimes transferred directly to the label drum by mounting the magazine 26 so that it could oscillate toward and away from the face of the drum, and thus transfer labels directly thereto. However, as machine speed increased, there was insufficient time within which the label could be transferred smoothly, and it is not feasible to oscillate the label magazine that fast.

The method shown in the prior patents hereinbefore mentioned were then adopted and in which an intervening label transfer roller was utilized to pick the label out of the magazine and transfer it to the drum. However, these machines are also unable to adequately cope with the high speed of rotation of the drum.

The present invention also utilizes a label transfer roller 30, but this roller is provided with roller drive and transport mechanism which enable it to pick a label out of the magazine 26 and transfer it to the rapidly rotating drum 19 smoothly and without damage to the label or loss of the label in the transfer sequence. As shown in FIG. 1, several sets of magazines 26 and label transfer rollers 30 may be clustered about the labeling drum 19. These work in sequence to reduce the speed requirements for each set.

As is generally typical in this art, the label transfer roller 30 is provided with a retaining or return mechanism, such as suction ports or nozzles 31 which lead through the communicating ducts 32, 33, 34 to a suction hose 35 by means of which the ports 31 are subject to suction at appropriate times in the transfer cycle. The label transfer roller 30 is mounted on a driven shaft 36 which is rotatably mounted in bearing 37 on the arm 38 of a swing frame 39. Swing frame 39 is mounted for swinging motion on an axle shaft 44 fixed on the machine 15. Axle shaft 44 is spaced from roller 30 so that the frame 39 pivots about the shaft to swing the roller on a short path directly between the label magazine 26 and the labeling drum 19.

The labeling drum 19 is also provided with a series of suction ports 42 connected through duct 43 to a suitably controlled source of suction coordinated with the source of suction for the ports 31 and with the transport mechanism for roller 30, so as to transfer label 20 from the roller 30 to the drum 19, as hereinafter described.

The variable speed drive means for label transport may take various different forms. In the embodiment disclosed for exemplification of the invention, it comprises a driving shaft 45 rotatably mounted in a bearing 46 on arm 47 of the frame 39. Driving shaft 45 is laterally offset from the driven shaft 36 on which roller 30 is mounted.

Driven shaft 36 carries at its lower end a crank 48 at the end of which there is a depending cam follower roller pin 51 which projects into a cam slot 52 in cam 53 which is mounted on the driving shaft 45. By reason of the lateral offset of the driving shaft 45 and the driven shaft 36, relatively constant rotation of the driving shaft 45 and cam 53 will produce variable speed rotation of the driven shaft 36 and label transfer roller 30. If desired, crank 48 may be in the form of a disk, to reduce dynamic imbalance.

Driving shaft 45 also carries a swing frame transport cam 54 the edge of which bears against a cam roller 55 mounted on a stationary part 56 of the machine frame. The roller transport frame 39 is biased toward roller 55 by the pressure of spring 57 which has one end in bearing 37 and the other end in bearing engagement with a fixed machine frame part 58. Accordingly, the spring 57 urges the swing frame 39 to rotate counterclockwise, as viewed in FIG. 3, about its axle shaft 44, thus to maintain the cam 54 in pressure following contact with the roller 55. Roller 30 is fast to a drive pinion 61 which meshes with gear 62 which is freely rotatable on the axle shaft 44. Gear 62 is driven from any convenient source, such as the power input drive pinion 63, the motion of which is timed with the rotation of the labeling drum 19 and bottle conveyor 16.

A series of diagrammatic views illustrating sequential positions of the parts for one complete 360° rotation of the drive shaft 45 is shown in FIGS. 4 through 11 inclusive. From one figure to the next the shaft 45 has turned through approximately 45°. These figures illustrate the manner in which the lateral offset between the parallel driving shaft 45 and driven shaft 36 will accelerate the peripheral speed of rotation of the label transfer roller 30 as its suction ports 31 approach the labeling drum 19 (FIGS. 10 to 11, in sequence) and decelerates the speed of rotation of the label transfer roller 30 as its suction ports 31 approach the label magazine 26 (FIGS. 4 to 1 in sequence). While the bottommost label 20 in magazine 26 is being picked out of the magazine (FIGS. 7, 8, 9) the label transfer roller turns very slowly. While the label 20 is being released or transferred to the suction ports 42 on rapidly rotating drum 19 (FIG. 4), label transfer roller 30 has a high peripheral speed of rotation substantially equal to the peripheral speed of rotation of drum 19. Accordingly, the variable speed drive tends to match the speed of the roller 30 to the speed of the machine component with which it coacts in the label transfer sequence.

For example, as the driving shaft 45 moves through approximately 45° to swing the cam 53 from its position shown in FIG. 11 to its label release position shown in FIG. 4, the crank arm 48 for the driven shaft 36 will move through almost 90°. Accordingly, during this portion of the transfer cycle, there is a motion multiplying effect between the driving shaft and the label transfer roller 30.

Conversely, when the suction ports 31 of label transfer roller 30 are proximate the label magazine 26 in label pick-up positions (FIGS. 7 and 8), rotation of the driving shaft 45 to swing the cam 53 through 45° from its position shown in FIG. 7 to its position shown in FIG. 8 will result in only a very slight arc of rotation of the crank arm 48, thus to turn the label transfer roller 30 through only about 5° from FIG. 7 to FIG. 8.

The reason for the variation in speed of the label transfer roller 30 is because of the constant change in effective moment arm from the axis of driving shaft 45 to the end of crank arm 48 (roller 51) on driven shaft 36. For example, in FIG. 4 position of the parts, there is a substantial distance between the axis of the driving shaft 45 and cam follower roller 51, whereas in the FIG. 8 position of the parts, there is very little distance between the axis of shaft 45 and the crank roller 51. Slight variations in the geometry of the parts, such as the length of the crank arm 48, the offset between the shafts 45, 36, etc., can produce any desired variation between the speed of the roller 30 in its various positions.

The cam 54 is so positioned on shaft 45 with respect to the cam 53 that the swing frame 39 moves under pressure of spring 57 to a position proximate the drum 19 when the roller 30 is turning at its highest speed, as shown in FIG. 4, and is moved under pressure of roller 55 to a position proximate the label magazine 26 when the roller 30 is turning at its lowest speed, as shown in FIG. 8.

The parts are so arranged that the peripheral speed of the roller 30 will substantially match the peripheral speed of the labeling drum 19 in the FIG. 4 position of the parts, whereas the speed of rotation of the roller 30 will be very low in the FIG. 8 position of the parts. As is clear from the foregoing description, it would be possible to dimension the parts of the variable speed drive that the roller 30 could be brought to a full stop in its FIG. 8 position, at which point suction has just previously been applied to its ports 31.

Because of the meshing relationship between gear 62 and pinion 61, it is also clear that in the course of shifting motion of the label transfer roller 30 away from the label magazine, there will be lost motion between the pinion 61 and gear 32 to still further reduce the speed of
rotation of the roller 30, thus to minimize relative movement between the roller 30 and magazine 26 and still further smooth the transfer of the label out of the magazine. Conversely, as the frame 39 swings away from the label drum 19, there will be increased motion between the pinion 61 and gear 62 to accelerate the peripheral speed of the roller 30.

Fig. 12 illustrates a modified embodiment in which the label magazine 26 is mounted on a pivot shaft 65 having fixed thereto a lever 66 with a cam follower roller 67 at its end. Roller 67 bears against the cam 70 mounted on a shaft 71 having a sprocket driven by chain 72 from shaft 45. The roller 67 is kept tight against the cam 70 by spring 73.

The cam 70 is timed with the cam 54 so that as the label transfer roller 30 moves at low speed past the label magazine 26, swinging movement in the direction of arrow 68 is imparted to the label magazine 26. Thus the discharge end of the magazine 26 moves in the same direction and substantially at the same speed as the periphery of label transfer roller 30. This arrangement further minimizes the possibility of jamming of the emerging label with respect to the flanges or hooks 74 by which the foremost label 20 is held in the magazine 26. Moreover, the leading hook 74 is thus disposed at a more favorable angle for the release of the leading edge of the foremost label.

Figs. 2, 3 and 4 show the roller 55 at the lowest point on the cam 54. In this position the transfer roller 30 is nearest the label drum 19.

In the position shown in Fig. 8, the gradual drop-off on the cam 54 has just reached the roller 55, and the label transfer roller has just started to swing away from the label magazine. This shift continues through Figs. 9, 10 and 11, until the low point of the cam 54 reaches the roller 55, at the Fig. 4 position.

Fig. 3 also illustrates a provision for a stop lug 75 on the frame 39. This stop lug is disposed adjacent a stop finger 76 actuated by a motor 77 which is responsive to the presence or absence of a bottle on the conveyor 16 at a position along the conveyor which corresponds to the section port 42 to which a label is being transferred. In the absence of a bottle, the finger 76 will be moved into a position blocking movement of the lug 75, and thus prevent the application of a label to the drum 19. The finger 76 is desirably backed up by a machine frame part 78. If a bottle is present at the appropriate place on the conveyor, the finger 76 remains withdrawn, and the swing frame 39 is free to complete its swinging motion toward the label drum 19.

The label feeder of the present invention is relatively simple to construct and makes possible increased bottle handling capacity of the labeling machine.

What is claimed is:

1. A labeling machine having a relatively rapidly rotating label drum, a relatively stationary label magazine past which the label drum moves at a high speed, a label transfer roller which transfers labels from the label magazine to the label drum, a roller drive mechanism to rotate the roller on its own axis and transport mechanism to transport the roller between a label pick up position proximate the label magazine and a label release position proximate the labeling drum, the improvement in which said transport mechanism comprises a swing frame mounted on an axle shaft spaced from the roller and on which said frame pivots to swing the roller on a short path directly between the label magazine and the labeling drum, said roller drive comprising variable speed drive means for turning the roller about its own axis at relatively low speed when it is proximate the relatively stationary label magazine, and for turning the roller about its own axis at relatively high speed when it is proximate the rapidly rotating label drum.

2. The labeling machine of claim 1 in which said variable speed drive means comprises means for accelerating roller speed as it approaches the labeling drum and decelerating roller speed as it approaches the label magazine.

3. The labeling machine of claim 1 in which said label magazine is motionless while the roller removes a label therefrom.

4. The labeling machine of claim 1 in which said label magazine is provided with means for moving it in the same direction as the rotation of the roller while the roller removes a label therefrom.

5. The labeling machine of claim 4 in which said means comprises a pivotal support for the label magazine, a lever for turning the magazine on said support and a lever actuator timed with said transport mechanism.

6. The labeling machine of claim 1 in which said variable speed drive means comprises laterally offset driving and driven shafts, a crank on one shaft and a crank drive cam on the other shaft, whereby relatively constant speed rotation of the driving shaft will produce variable speed rotation of the driven shaft.

7. The labeling machine of claim 6 in which said variable speed drive means further comprises a drive pinion on the driving shaft, bearings on the swing frame on which the driven and driving shafts are mounted to swing about said axle shaft, a drive gear coaxial with the said axle shaft, said drive gear meshing with said pinion.

8. The labeling machine of claim 7 in which said gear and pinion constitute a lost motion drive connection when the frame swings to move the roller away from the label magazine and constitutes an increased motion drive connection when the frame swings to move the roller away from the labeling drum.

9. The labeling machine of claim 1 in which said transport mechanism further comprises a driving shaft for the roller, a cam on the driving shaft and a cam roller on the machine with which the cam coacts to swing the frame.

10. The labeling machine of claim 1 in which said swing frame has a stop lug, and means responsive to the flow of objects to be labeled through said machine for arresting said stop lug to prevent the frame from swinging far enough to transfer a label from the roller to the labeling drum where there will be no object to receive it.

11. The labeling machine of claim 1 in which said label transfer roller is provided with suction means by which the foremost label is picked out of the magazine when said means touches the label.

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BENJAMIN A. BORCHELT, Primary Examiner
S. C. BENTLEY, Assistant Examiner

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