Nov. 3, 1970 K. A. MÜNCH 3,537,934

LABEL FEEDER WITH VARIABLE SPEED DRIVE

Filed Jan. 25, 1968 3 Sheets-Sheet 1

Fig. 12

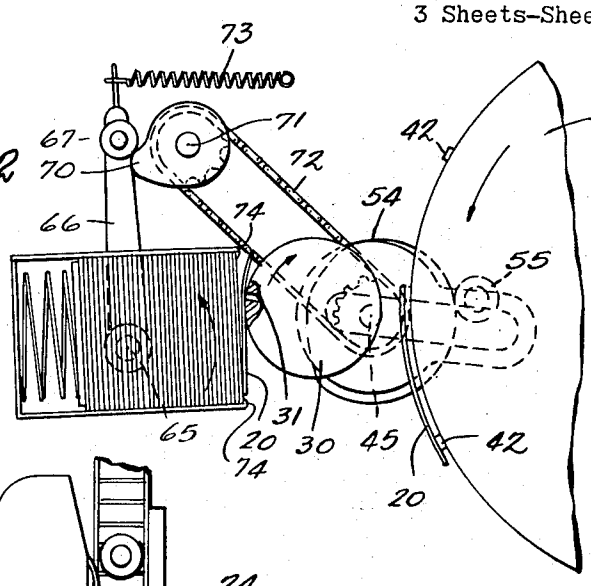
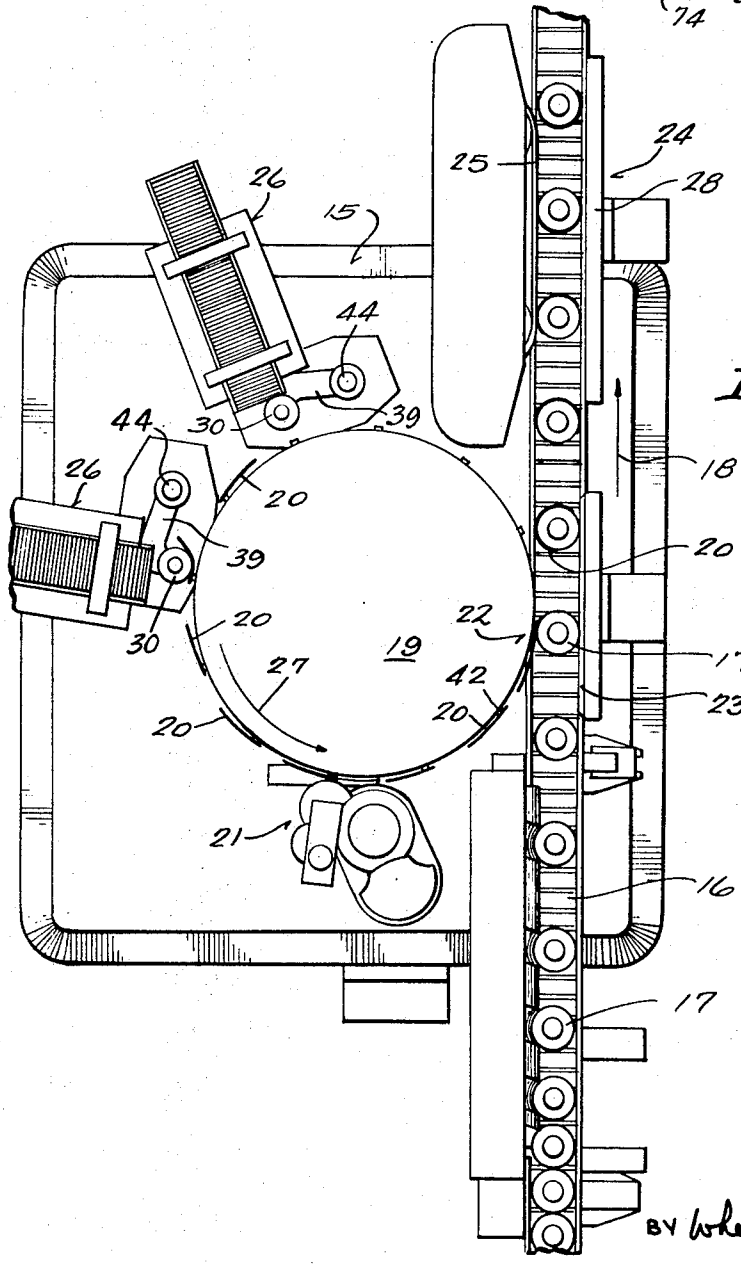


Fig. 1



INVENTOR
KARL A. MÜNCH

BY Wheeler, Wheeler, House & Clemency
ATTORNEYS

Nov. 3, 1970 K. A. MÜNCH 3,537,934

LABEL FEEDER WITH VARIABLE SPEED DRIVE

Filed Jan. 25, 1968 3 Sheets-Sheet 2

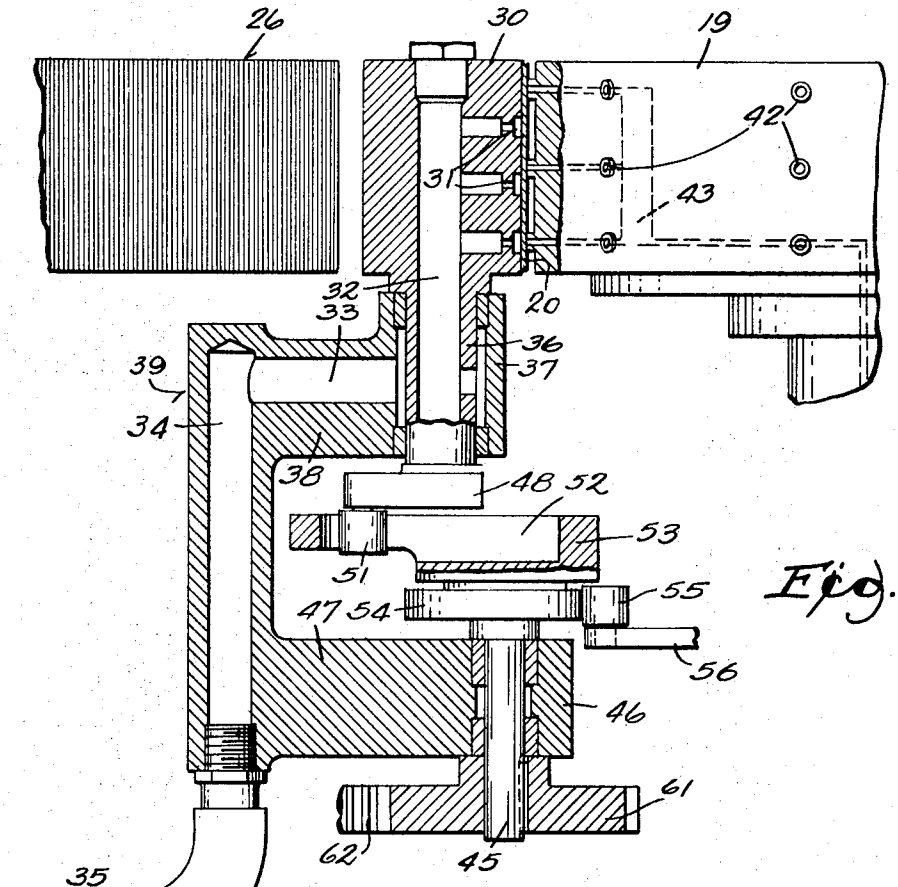


Fig. 2

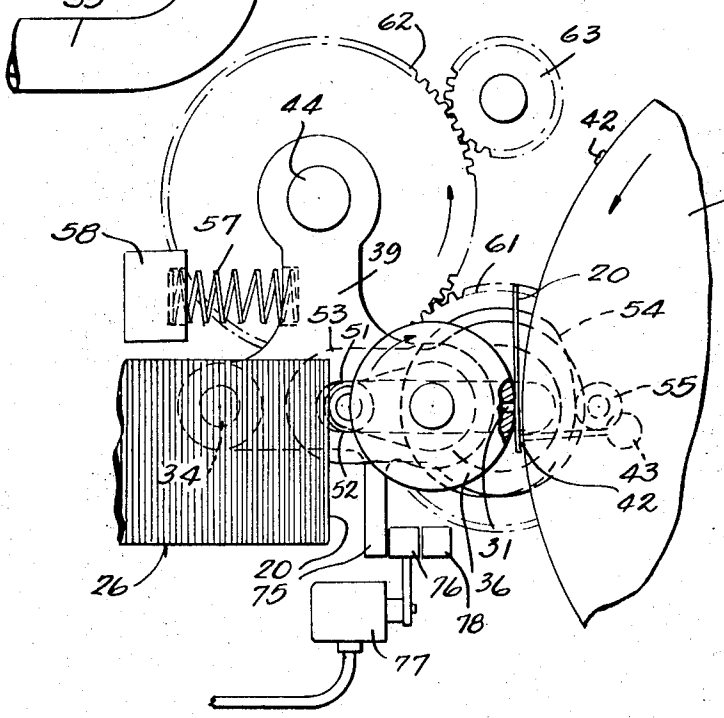


Fig. 3

INVENTOR
KARL A. MÜNCH

BY Wheeler, Wheeler, House & Clemency
ATTORNEYS

Nov. 3, 1970 K. A. MÜNCH 3,537,934

LABEL FEEDER WITH VARIABLE SPEED DRIVE

Filed Jan. 25, 1968 3 Sheets-Sheet 3

Fig. 4

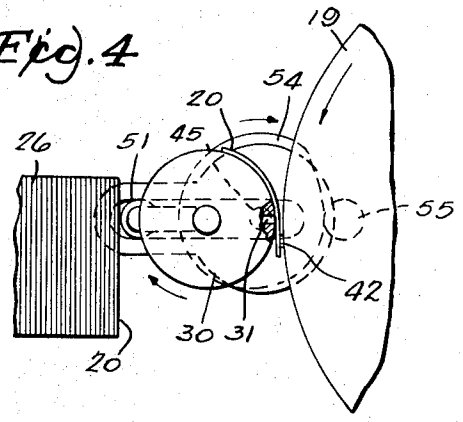


Fig. 5

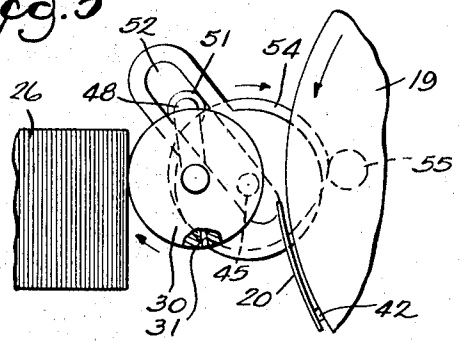


Fig. 6

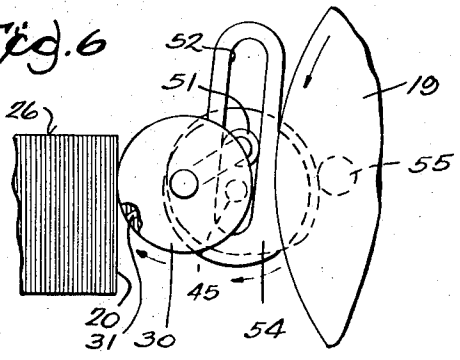


Fig. 7

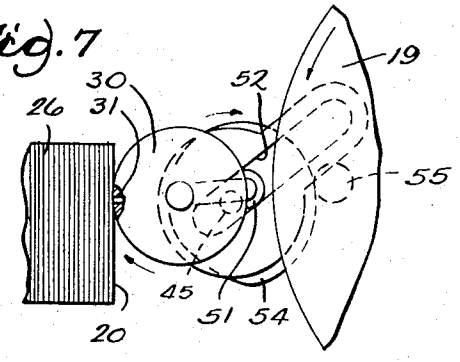


Fig. 8

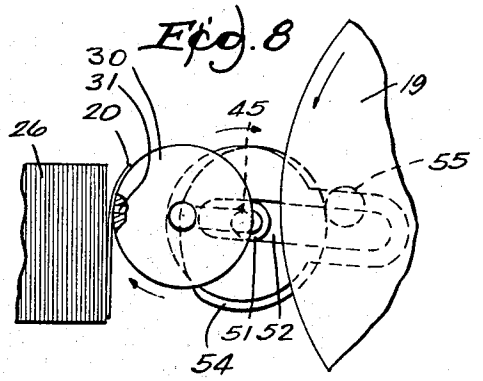


Fig. 9

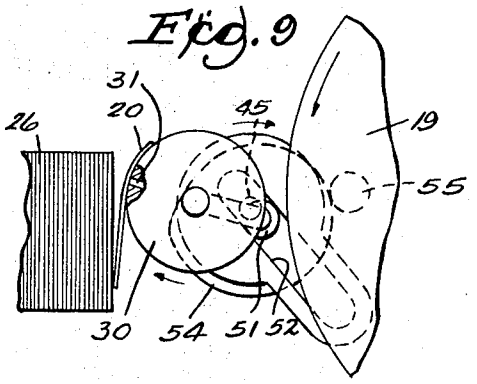


Fig. 10

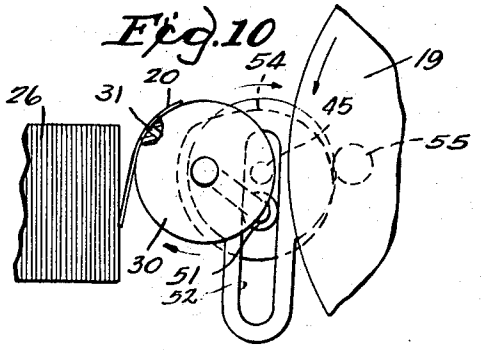
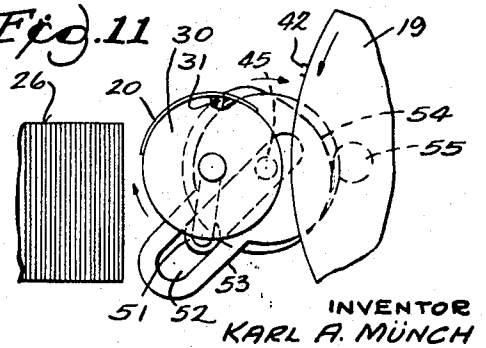


Fig. 11



INVENTOR
KARL A. MÜNCH

BY Wheeler, Wheeler, House & Clemency
ATTORNEYS

United States Patent Office 3,537,934 Patented Nov. 3, 1970

3,537,934

LABEL FEEDER WITH VARIABLE SPEED DRIVE

Karl Alan Münch, Neutraubling, Germany, assignor to Hermann Kronseder, Neutraubling, Germany

Filed Jan. 25, 1968, Ser. No. 700,578
Claims priority, application Germany, Feb. 11, 1967, 1,586,366; June 29, 1967, 1,586,368
Int. Cl. B65c 9/12; B65h 3/10
U.S. Cl. 156—364 11 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 and with a variable speed roller drive mechanism to turn the roller about its axis at relatively low speed when its label retainer means is proximate the relatively stationary label magazine, and to turn the roller about its own axis at relatively high speed when its label retainer means is proximate the rapidly rotating labeling drum.

BACKGROUND OF THE INVENTION

The transfer of labels from a relatively stationary magazine to a rapidly rotating labeling drum presents increasingly difficult problems as the speed of the drum increases with higher output capacities of the machine. Typical examples of prior devices utilizing a label transfer roller between a label magazine and a labeling drum are shown in French Pat. 1,243,908, German Pat. 1,169,-837, U.S. Pat. 2,525,741, and U.S. Pat. 3,196,070. The devices shown in these patents are not entirely satisfactory because they do not match the speed of rotation of the label transfer roller to the relatively sationary label magazine and to the rapidly rotating labeling drum. Accordingly, the labels are not smoothly transferred, particularly in high speed operations.

SUMMARY OF THE INVENTION

In accordance with the present invention, the label transfer roller is mounted to swing or shift on a short path directly between the relatively stationary label magazine and the rapidly rotating labeling drum. The roller is driven by a variable speed drive mechanism which turns the roller about its own axis at a relatively low speed when its label retainer means is proximate the relatively stationary label magazine, and turns the roller about its own axis at relatively high speed when its label retainer means is proximate the rapidly rotating labeling drum. As the transfer mechanism shifts the roller on its path between the label magazine and the labeling drum, the variable speed drive accelerates the speed of rotation of the label transfer roller as it shifts toward the labeling drum and decelerates the speed rotation of label transfer roller as it shifts toward the label magazine.

The variable speed drive mechanism is such that the peripheral speed of rotation of the label transfer roller is approximately equal to that of the labeling drum as the label is transferred from the label transfer roller thereto.

By reason of the variable speed drive, the labels can be transferred smoothly, even though there is only a very short path of movement of the label transfer roller between the labeling drum and the label magazine.

In some embodiments of the invention the label magazine is motionless at all times. In other embodiments 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 labeling drum. 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 a labeling machine embodying the present invention.

FIG. 2 is a vertical cross section 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 **15** is conventional and similar to those shown in patents hereinbefore 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 labeling drum **19** which rotates in the direction of arrow **27**. Labels **20** temporarily held by suction port or nozzle label retaining means **42** to drum **19** 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 surface 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 expedients 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 series of means for retaining labels, 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 engagement with the frame **39** 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**.

Driving shaft **45** 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 to 4, 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. 4–8 in sequence). While the foremost 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 explanation, it would be possible to so 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 label 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 suction 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 labeling 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. In a labeling machine having a relatively rapidly rotating labeling drum, a relatively stationary label magazine past which the labeling drum moves at a high speed, a label transfer roller which transfers labels from the label magazine to the labeling 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 labeling 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.

References Cited

UNITED STATES PATENTS

2,764,408	9/1956	Weiler	271—33
3,196,070	7/1965	Della Vite	156—571

FOREIGN PATENTS

1,169,837	11/1964	Germany.

BENJAMIN A. BORCHELT, Primary Examiner

S. C. BENTLEY, Assistant Examiner

U.S. Cl. X.R.

156—571; 271—5