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(71) Applicant
Shibuya Kogyo Co. Ltd., (Japan),
Koh-58 Mamedahonmachi, Kanazawa-shi, Ishikawa-Ken, Japan

(72) Inventors
Hideo Tanaka, Shiaru Muranaka,
Toshiaki Naka, Yoshikazu Miyashita

(74) Agent and/or address for service
W. P. Thompson & Co., Coopers Building, Church Street, Liverpool L1 3AB

(54) Labelling Machine

(57) A roll labeller for labelling containers (10) one by one automatically wherein a predetermined length of label sheet (2) is uncoiled from a roll (1) and the label sheet (2) is cut by a cutter (7) thereby producing a cut sheet of label to which glue is applied while it is being transported and attached to the corresponding container (10). The labeller includes a feed roller (5) for intermittently feeding the label sheet (2) to the cutter (7), and a mechanism (11, 12, 13) for transporting containers to be labelled along a container transportation path (11). The labeller also includes two independent drives (21, 22); one (22) for driving the feed roller (5) and the other (21) for driving the container transporting mechanism (11, 12, 13). Detecting devices (24, 25 and 27) are provided which supply signals to a controller (23) in order to control the feeding of the label sheet.

Fig. 1

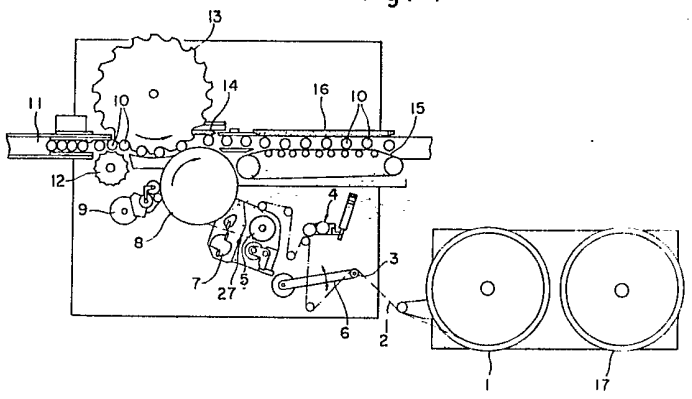

Fig. 2

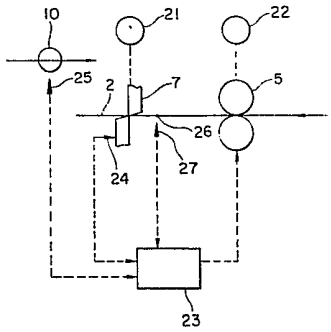

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Fig. 1

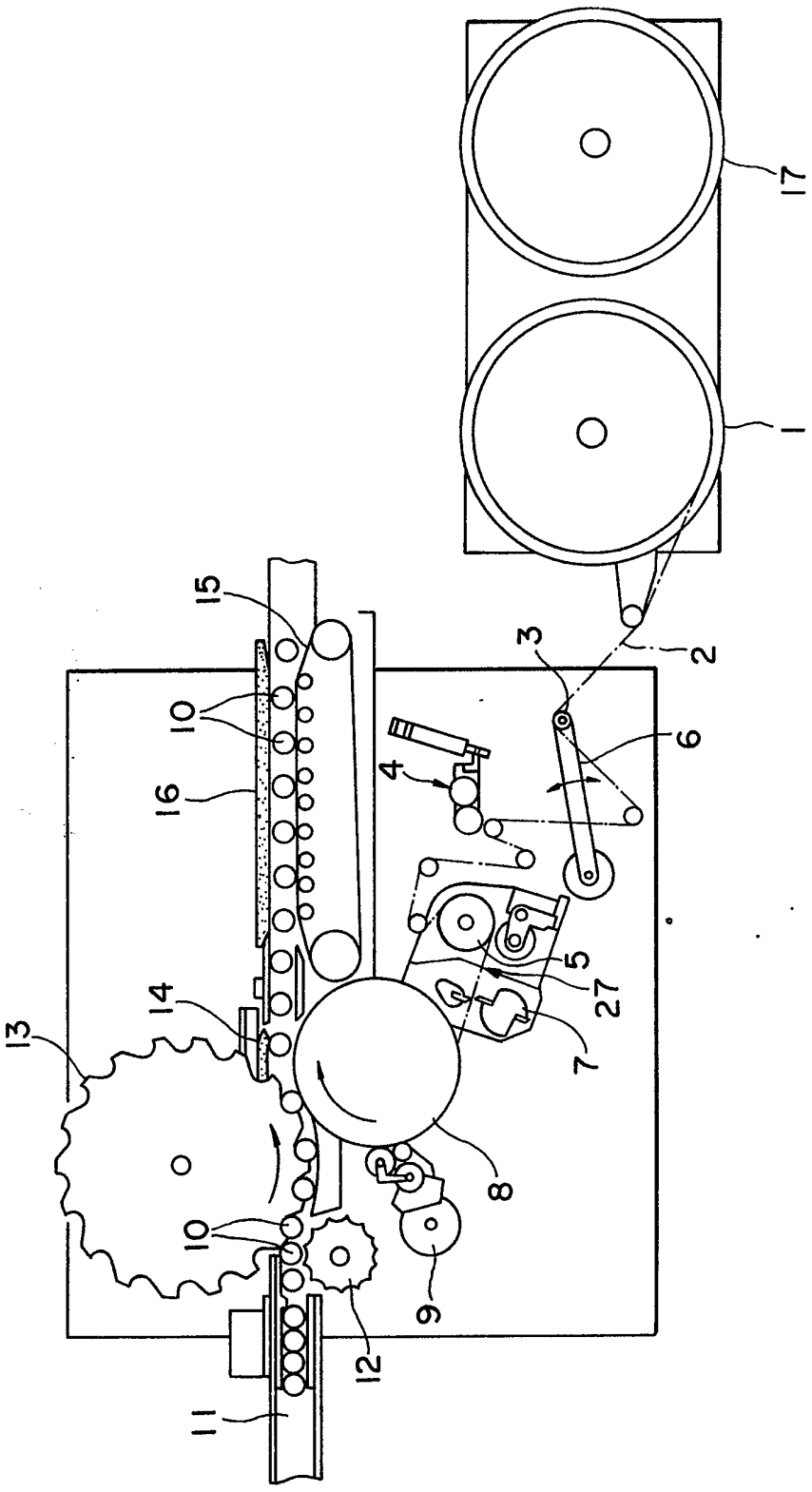

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Fig. 2

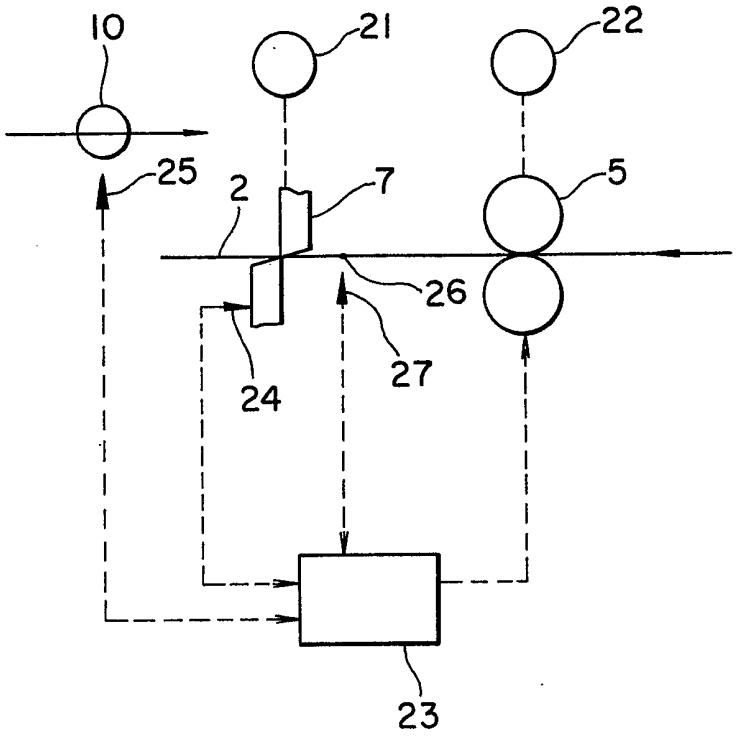
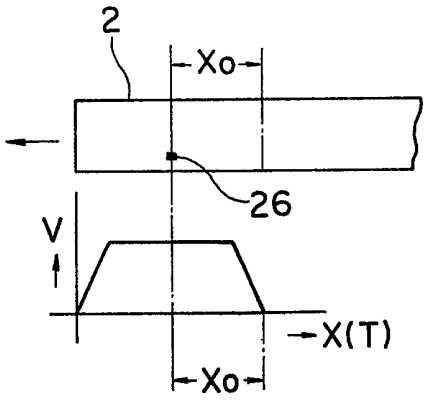


Fig. 3



SPECIFICATION

Labelling Machine

The present invention relates to a labelling machine for labelling containers one by one.

More particularly, the present invention relates to a labelling machine for automatically glueing labels to containers such as bottles and cans and particularly to a roll labeller or labelling machine of the type in which a label sheet in the form of a roll is unwound, cut and glued to a container. More specifically, the present invention relates to a roll labeller in which a label sheet unwound from a roll is intermittently supplied to a cutting section where the label sheet is cut into a desired size, and the label thus cut is glued to a container which is being transported by a container transporting mechanism.

In certain prior art roll labellers, a label sheet unwound from a roll is intermittently supplied to a cutting section by a feeding mechanism, where a label having a desired shape and size is cut from the label sheet. In such roll labellers, typically, the label sheet is provided with registration marks which are detected to produce detection signals while the label sheet is being supplied by the feeding mechanism. In response to each of such detection signals, there is generated a feed stop command signal which causes the feeding mechanism to stop supplying the label sheet.

In the above-described prior art roll labellers, however, a time interval from the generation of the stop feed command signal to the actual stoppage of the label sheet feed, is fixed. Accordingly, if the transportation speed for transporting containers to be labelled along a predetermined transportation path varies, the feeding speed of label sheet also varies in response thereto. This, in turn, causes, the supplied amount, i.e. length of label sheet, to vary during the time interval between the generation of feed stop command signal and the actual stoppage of the supply of label sheet. As a result, for example, during a start-up mode in which the operational speed gradually changes from a low level to a high level, the timing to generate a feed stop command signal in response to the detection signal, must be suitably adjusted in association with the transporting speed of containers and thus the operational speed of roll labeller.

For this reason, in the prior art roll labellers, typically, the operational speed of the roll labeller is monitored and the above-mentioned timing is suitably adjusted in accordance with the actual operational speed of the roll labeller. However, with such a construction, it is necessary to adjust such timing in a continuous manner in accordance with changes in the operational speed, and optimum adjustment of such timing over the entire range of operational speed is not always easy.

It is a primary object of the present invention to provide an improved labelling machine.

Another object of the present invention is to provide an improved labelling machine of the type in which a label sheet unwound from a roll is cut to a desired size and the thus cut label is fixedly attached to a container.

A further object of the present invention is to provide a roll labeller which does not require adjustment of the timing for generating a feed stop command signal in response to a detection signal, as required in the prior art roll labellers.

A still further object of the present invention is to provide a roll labeller which is highly reliable in operation, easy in maintenance, flexible in applications.

According to the present invention, there is provided a labelling machine for labelling containers one by one, comprising container transporting means for transporting containers to be labelled along a predetermined container transportation path, supplying means for intermittently supplying predetermined lengths of continuous label sheet to cutting means to thereby produce a cut sheet of label of desired length, and application means for applying said cut sheet of label to one of said containers, a first driving means being arranged to drive at least said container transporting means and a second driving means, independent of said first driving means, being arranged to drive said supplying means.

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

Fig. 1 is a schematic illustration showing the overall construction of one embodiment of labelling machine constructed in accordance with the present invention;

Fig. 2 is a block diagram showing the operative relation between the main elements of the labelling machine shown in Fig. 1; and

Fig. 3 is a schematic illustration showing the relation between the distance from a registration mark on a label sheet to a severing position, and the feed speed of the label sheet.

Referring to Fig. 1, there is shown a roll labeller constructed in accordance with one embodiment of the present invention. This labeller includes a roll 1 of label sheet 2. Label sheet 2 unwound from the roll 1 and in the form of a continuous belt, is supplied to a feed roller 5 via a plurality of rollers, including a tension roller 3, as indicated by the dash-dotted line. The tension roller 3 is rotatably supported at the tip end of a tension arm 6 which is pivotally supported and movable as indicated by the double-headed arrow. The tension arm 6 is normally biased in the counter-clockwise direction by, for example, a spring. This biassing maintains the label sheet between the roll 1 and the feed roller 5 under a predetermined tension. A printer 4 is disposed along the path of label sheet 2 from the roll 1 to feed roller 5, so that desired data such as lot number and date of manufacture, may be printed on the surface of the label sheet 2.

From the feed roller 5, the label sheet 2 is supplied to a rotary cutter 7 where the label sheet 2 is cut to produce a cut sheet of label having a

desired length. The cut sheet of label is then attracted by suction to lie with its front surface in contact with the peripheral surface of an application drum 8, the cut sheet of label being transported on the peripheral surface of the drum 8 in the direction of drum rotation indicated by the arrow. A glue applying device 9 is provided adjacent to the application drum 8 so that glue is applied to the rear side of the cut sheet of label carried on the peripheral surface of the drum 8. The cut sheet of label now having glue on its rear surface, is then applied to a container 10 which is being transported along a predetermined transportation path as will be described in more detail herebelow, so that the container 10 is then properly labelled.

Containers 10 are transported from the left to the right in Fig. 1, on a conveyor belt 11 which basically defines the transportation path of containers 10. Adjacent to the conveyor belt 11 is disposed a stopper wheel 12 which prevents too many containers 10 from being transported at a time. Also disposed adjacent to the conveyor belt 11 and immediately downstream of the stopper wheel 12, is a star wheel 13 which is provided with a plurality of notches along its periphery at equal intervals. The star wheel 13 is rotated counterclockwise as indicated by the arrow, thereby causing the containers 10 to be spaced apart one from another, over a predetermined distance on the conveyor belt 11 in association with the rotation of the application drum 8. Thus, as described above, the containers 10 are labelled as they are brought into contact with the application drum 8 while being transported by the star wheel 13.

An outlet pressure pad 14 is provided immediately downstream of the star wheel 13 and spaced from the peripheral surface of the application drum 8, by a predetermined distance across the belt conveyor 11. Accordingly, the containers 10 released from the star wheel 13 are transported and guided between the application drum 8 and the outlet pressure pad 14, and are rolled along the pressure pad 14 whereby the cut sheet of label is smoothed around the container 10 under pressure. Further downstream, an elongated pressure pad 16 extends along one side of the conveyor belt 11 over a predetermined distance. An endless belt 15 extending between a pair of rollers, is located opposite to and spaced from the pad 16, across the conveyor belt 11. The endless belt 15 is also driven so that the portion of the belt nearest to pad 16 moves in the same direction as that of the conveyor belt 11. Thus, the containers 10 roll along the elongated pad 16 while being transported as sandwiched between the pad 16 and the belt 15. In this way the cut sheets of label are firmly and fixedly attached to containers 10.

Adjacent to the roll 1 is disposed another roll 17 of label sheet which is to be used after the roll 1 has all been used. Thus, when only a small amount of roll 1 is left, the trailing end of the label sheet of roll 1 is connected to the leading end of the label sheet of roll 17. These ends are joined manually or by a roll labeller connector well known to one skilled in the art.

As shown in Fig. 2, a first motor 21 is arranged to drive the rotary cutter 7. It is to be noted that the first motor 21 is also connected to synchronously drive other components such as drum 8 and star wheel 13, with the exception of feed roller 5. A second motor 22 such as a stepping motor, servo motor and pulse motor, is provided exclusively to drive the feed roller 5 so that the feed roller 5 may be rotated independently of the first motor 21.

Also as shown in Fig. 2, a detector 24 is provided adjacent to the rotary cutter 7 so as to detect the operating condition thereof and another detector 25 is provided at an appropriate position along the path of the containers 10 prior to labelling, for detecting the presence or absence of the containers 10. These detectors 24 and 25 are arranged to supply detection signals to a controller 23 which controls the feeding of label sheet. In response to detection signals from the detectors 24 and 25, the controller 23 determines whether or not label sheet from the roll 1 is to be supplied, and, if affirmative, it supplies a drive signal to the feed roller 5 which is thus rotated to thereby supply the label sheet from the roll 1.

Also as shown in Fig. 2, there is provided a further detector 27 disposed at an appropriate position along the travelling path of the label sheet from the roll 1 to the rotary cutter 7, for detecting registration marks provided on the label sheet unrolled from the roll 1. When detecting a registration mark, the detector 27 supplies a detection signal to the controller 23 which then causes the feed roller 5 to stop the supply of label sheet. To explain further, upon receipt of a detection signal supplied from the detector 27, a counter provided in the controller 23 starts to count after having been reset. Then, when the counter has reached a count which has been previously determined in accordance with a required distance X_0 between the registration mark 26 on the label sheet 2 and a severing position where the label sheet 2 should be cut by the rotary cutter 7 (Fig. 3), the controller 23 causes the feed roller 5 to stop rotating. The controller 23 controls the feeding of label sheet 2 in the manner shown in the graph of Fig. 3, the abscissa representing distance X or time T, and the ordinate representing the velocity of the label sheet 2. Thus, when the feed roller 5 starts to be driven, the label sheet 2 is accelerated linearly to a predetermined feeding velocity which is then maintained during the supply of label sheet 2. On the other hand, when the supply of label sheet 2 is to be stopped, the feeding velocity of label sheet 2 is decelerated linearly. As an alternative, as soon as the controller 23 receives a detection signal supplied from the detector 27, the predetermined count as mentioned above is set in the counter and the count is gradually decreased to zero; at which point the feed roller 5 is deactivated.

With the above-described construction, the feed roller 5 is inoperative when the rotary cutter 7 has just severed the label sheet 2, whereas the other components such as the rotary cutter 7 and the mechanism for transporting containers 10, which are driven by the first motor 21, are still in operation so that the cut sheet of label is transported and glued to the corresponding container 10. By this time, the detector 25 has already detected whether or not the next container 10 to be labelled is present or absent, so that its detection signal has already been passed to the controller 23.

As soon as the detector 24 detects the fact that the rotary cutter 7 has severed the label sheet 2, the detector 24 supplies a detection signal to the controller 23 which then causes the feed roller 5 to initiate its operation to start feeding more label sheet 2. As described above, when the controller 23 stops the feed roller 5 in response to a detection signal supplied from the detector 27 which detects the registration mark 26 on the label sheet 2, a predetermined length of label sheet 2 has been supplied beyond the rotary cutter 7. Thereafter, the rotary cutter 7 is rotated continuously, thereby cutting the continuous label sheet 2 into a cut sheet of label having a desired length. Then, the same process follows in a cyclic manner.

In accordance with the present invention as described above, the labelling machine is so structured that the feed roller 5 supplies the label sheet 2 to the rotary cutter 7 at an arbitrarily determined velocity independently of the operating speed of the rotary cutter 7 and that even if the rotary cutter 7 is operated at its maximum speed, a predetermined length of label sheet 2 will be supplied beyond the rotary cutter 7 during the time period between the two consecutive cutting operations of the rotary cutter 7. As a result, the feed roller 5 may supply a predetermined length of label sheet 2 to the rotary cutter 7 at all times without being adversely affected by the operating parameters of the other components such as the rotary cutter 7 and the mechanism for transporting the containers 10.

The illustrated embodiment is also advantageous in that the desired length of cut label sheet may be easily and securely changed just by altering the value of the count to be set in the controller 23 in correspondence with the desired length X_0.

In the illustrated embodiment, the drive for the rotary cutter 7 is associated with the mechanism for transporting containers 10. Alternatively, the drive for the rotary cutter 7 may be associated with the feed roller 5 and thus the second motor 22. In such an alternative construction, the rotary cutter 7 is driven intermittently in synchronism with the feed roller 5 so that upon cutting of the label sheet 2 by the rotary cutter 7, after the feed roller 5 has supplied a predetermined length of label sheet 2 beyond the rotary cutter 7, both the rotary cutter 7 and the feed roller 5 are stopped.

While the above provides a full and complete disclosure of the preferred embodiments of the present invention, various modifications, alternate constructions and equivalents may be employed without departing from the scope of the present invention. Therefore, the above description and illustration should not be construed as limiting the scope of the invention, which is defined by the appended claims.

CLAIMS

1. A labelling machine for labelling containers one by one, comprising container transporting means for transporting containers to be labelled along a predetermined container transportation path, supplying means for intermittently supplying predetermined lengths of continuous label sheet to cutting means to thereby produce a cut sheet of label of desired length, and application means for applying said cut sheet of label to one of said containers, a first driving means being arranged to drive at least said container transporting means and a second driving means, independent of said first driving means, being arranged to drive said supplying means.

2. A labelling machine as claimed in claim 1, further comprising a first detector for detecting a registration mark provided on said label sheet and a controller responsive to a first detection signal supplied from said first detector for stopping the operation of said supplying means upon counting of a predetermined count.

3. A labelling machine as claimed in claim 2, further comprising a second detector disposed adjacent to said cutting means for supplying a second detection signal indicative of the operating condition of said cutting means, to said controller.

4. A labelling machine as claimed in claim 3, further comprising a third detector disposed at an appropriate position along said predetermined container transportation path for supplying a third detection signal indicative of the presence or absence of said containers, to said controller.

5. A labelling machine as claimed in claim 4, further comprising a printing device disposed to print desired data on said label sheet as supplied from said storage.

6. A labelling machine as claimed in claim 4, in which said label sheet is stored in a continuous length in the form of a roll.

7. A labelling machine as claimed in claim 1, in which said container transporting means includes a conveyor belt extending along said container transportation path and a star wheel rotatably supported and disposed at an appropriate position along said container transportation path, said star wheel being provided with notches along its periphery at predetermined intervals whereby said notches come into engagement with the containers standing on said conveyor belt to place them spaced apart one from another at a predetermined pitch.

8. A labelling machine as claimed in claim 7, in

which said supplying means includes a feed roller which is rotatable intermittently by said second driving source to intermittently supply predetermined lengths of said label sheet to said cutting means.

9. A labelling machine as claimed in claim 8, in which said application means includes an application drum which is rotatably supported and driven by said first driving means, said application drum being adapted to attach by suction said cut sheet of label so that said cut sheet of label is held on the peripheral surface of the drum with its front surface facing the peripheral surface of the drum.

10. A labelling machine as claimed in claim 9, in which said application means further includes a glue applying device disposed adjacent to said application drum for applying glue to the rear surface of said cut sheet of label after it has been attracted to said application drum by suction.

11. A labelling machine as claimed in claim 10, further comprising a first pressure pad disposed downstream of said star wheel and spaced from said application drum by a predetermined distance so that said containers can be transported through this portion of said container transportation path by being rolled along said first pressure pad.

12. A labelling machine as claimed in claim 11, further comprising a second pressure pad disposed downstream of said first pressure pad and extending along one side of said conveyor belt, and an endless belt disposed along the other side of said conveyor belt and opposed to said second pressure pad, so that said containers can be transported through this portion of said container transportation path by being rolled along said second pressure pad.

13. A labelling machine as claimed in claim 1, in which said first driving means is arranged to drive said cutting means as well as said application means.

14. A labelling machine as claimed in claim 1, in which said first driving means is arranged to additionally drive said application means and said second driving means is arranged to additionally drive said cutting means.

15. A labelling machine as claimed in claim 1, in which said second driving means includes a motor selected from the group consisting of a stepping motor, servo motor and a pulse motor.

16. A labelling machine for labelling containers one by one, constructed and arranged substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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