AUTOMATIC LABELING MACHINE

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This invention relates to labeling machines and more particularly to an improved fully automatic mechanism for applying a gummed label to an article as it reaches a labeling station, a new label being advanced to an affixing position in readiness for the next article upon its arrival at the labeling station.

Labeling machines heretofore proposed are subject to numerous disadvantages and shortcomings obviated by the present invention. For example, much difficulty has been experienced in the operation of feed control mechanisms of prior labeling machines and attempts to utilize the advance of the next label to deactivate the label feed have proven unreliable with the result that a package misses the machine unlabeled, or in other cases, with several labels affixed thereto. Certain mechanisms rely on control air openings in the carrier ribbon employed to advance labels from a supply reservoir, the uncovering of an air port of the control mechanism being utilized to control the feeding mechanism. However, the high speed operation of such equipment requires extremely sensitive and reliable control mechanisms and requires expensive air compressor auxiliary units adding appreciably to the initial cost as well as to the cost of operation.

Additionally, mechanisms heretofore proposed for transferring a new label to the package at the proper time and with the required certainty and speed are inherently so slow acting as to impose objectionable speed limitations on the mechanism as a whole.

According to the present invention a fully automatic labeling machine is provided featuring mechanism for feeding accurately aligned labels to a labeling station and for affixing an individual label to an article, the affixing operation proper being governed by the arrival of an article in a predetermined position at the labeling station. A following label is then advanced in readiness for transfer to the next article upon its arrival, this portion of the operating cycle being utilized to condition the label-applying mechanism for exceedingly fast operation immediately upon arrival of the next article.

A feature of the design is the utilization of the forward movement of articles being labeled to initiate resumed advance of the label as well as activation of the label-applying mechanism. A feeler device in contact with the advancing labels acts to discontinue label feed as the advancing labels reach a predetermined position at the labeling station. 

Accordingly, it is a primary object of the invention to provide an improved automatic labeling machine operable to apply a label to an article upon its arrival at a labeling station.

Another object of the invention is the provision of a labeling machine the operation of which is governed solely by the arrival of an article at the labeling station.

Still another object of the invention is the provision of a labeling machine utilizing improved label position sensing means for discontinuing the label feed when the foremost label reaches a predetermined position adjacent the labeling station and for resuming label feed as an incident to the transfer of a label to an article.

Another object is the provision of a labeling mechanism having improved fast-acting label transfer mechanism operable from energy stored within the apparatus during a preceding portion of the operating cycle.

Still another object of the invention is the provision of an automatic labeling mechanism in which the label to be affixed to an article is advanced in a transversely arched condition thereby greatly adding to its strength during the application operation and providing maximum assurance that the label will be applied to the article un-wrinkled.

These and other objects and advantages of the invention will be fully set forth in the following specification and claims considered in connection with the attached drawings to which they relate.

In the drawings:

Figure 1 is a side elevational view of the apparatus in readiness for the application of a label;

Figure 1a is a view similar to Figure 1 but showing the apparatus in an operating position to one side of a conveyor for transporting articles to be labeled past the labeling station;

Figure 2 is a top plan view of the apparatus shown in Figure 1;

Figure 3 is a fragmentary view partially in section of the feeding mechanism positioned in retracted position to initial label feed and label transfer operations;

Figure 4 is a view similar to Figure 3 but showing the parts positioned in a stationary condition awaiting arrival of an article to be labeled;

Figure 5 is a fragmentary view in section showing one position of parts during application of the label to an article;

Figures 5a and 5b are fragmentary side views showing the label-applying arm applying labels to the convex and concave surfaces, respectively, of different articles;

Figure 6 is a fragmentary transverse sectional view taken along 6—6 of Figure 4 and showing operating positions of the article-position-sensing mechanism;

Figure 7 is a transverse sectional view taken along line 7—7 of Figure 4; and

Figure 8 is a schematic diagram of the electrical control circuit.

Referring to the drawings, there is shown a labeling mechanism designated generally at 10 comprising a base plate 11 supported on suitable legs 12, or on a pedestal 12a having an inclined upper end as is best indicated in Figure 1a. Although the labeling mechanism is illustrated in Figure 1 as supported in a generally horizontal plane, it will be understood that in a preferred mode of installation base plate 11 is located at an angle of approximately twenty-five degrees to the horizontal as is shown in Figure 1a, the right-hand end of the base being uppermost. An electric motor 13 having suitable gear reduction means housed therewithin is mounted in the central portion of the base plate and connected through a positive drive, such as link chain 14, with a wide, smooth-surfaced label feed wheel 15 suitably journaled beneath base plate 11.

A thin, glossy-surfaced paper tape 16 to which labels are affixed in a manner to be described presently is held in tight frictional contact with the underside of feed pulley 15 by means of a clutching mechanism designated generally at 17 pivotally supported on the underside of base 11 by a pivot pin 18. Clutch mechanism 17 comprises a pair of rigid arms 19, fixed at one end to pin
3 and pivotally supporting a cradle 21 therebetween on a pivot pin 20. Cradle 21 is of generally U-shape and supports a pair of wide rollers 22 between the ends of its arms, these rollers bearing against the opposite lower sides of the main drive pulley 15 in the manner clearly illustrated in Figure 1. Cradle 21 is, along with arms 25, strongly biased clockwise about the axis of pin 18 by a stiff spring 24 having one end anchored to the outer end of an arm 25 keyed to pin 18 and its opposite end anchored to the apparatus frame. It will therefore be evident that the clutch mechanism normally acts to hold ribbon 16 in snug frictional engagement with drive wheel 15 whereby counterclockwise rotation of the drive wheel is effective to feed ribbon 16 from left to right across the underside of base plate 11 from a magazine supply roll 16a carried in spool 29.

A supply of gummed labels is coiled on a roll 16a mounted in a magazine spool 29 mounted on a pin 30 fixed to a bracket 31 projecting upwardly from base plate 11. A large knurled knob 32 is threaded to the outer end of pin 30 and can be adjusted to compress a sponge rubber gasket 33 against the outer face of magazine spool 29 in a manner to provide an adjustable drag on the magazine spool thereby preventing unreeeling of the labels except in accordance with the marking needs.

Assisting in feeding the ribbon and in compactly storing the portion thereof from which the labels have been detached is a take-up spool 29b suitably mounted behind supply reel 29 on a rotating pin 36a. Pin 36a may be driven from motor 36 by means of a belt 63 and a slip clutch secured to the rear face of spool 29a, the belt and clutch acting to maintain ribbon 16 taut but slipping as required to avoid placing the ribbon under tension in excess of a certain value appreciably below its tensile strength.

It will be understood that the labels 44 may be of any suitable size and shape, those here illustrated by way of example being of rectangular configuration and their width corresponding to that of ribbon 16. However, they may be of widely varying dimensions other than those here illustrated, it being desirable in all instances that the labels and ribbon be uniform generally with that of the labels. If the dimensions vary widely from those shown, it may be necessary to make certain adjustments in the mechanism as will be readily understood by those skilled in this art.

The labels are preferably provided with a temperature-sensitive coating of adhesive on their underside suitable for securing the same to an article. Adhesives are mounted end-to-end relation on one side of carrier ribbon 16. Preferably there is a slight spacing between the ends of adjacent labels for a purpose which will become evident presently. The labels may be held in a desired position on the glossy surface of the carrier ribbon in any well known manner such as by a suitable adhesive easily severed or by lightly tacking the labels to the carrier ribbon by adhesive particles which shear or separate readily when the carrier ribbon is bent sharply as by passing over a sharp edge in a manner to be described below.

As is most clearly shown in Figures 1, 3 and 4 the carrier ribbon 16 passes from a coil mounted on reel 29 beneath a spring guide roller 23 carried on an arm 23c journaled in frame 11 and resiliently biased counterclockwise by spring means not shown and serving to hold the upper face of the leading edge of the label against the upper surface of platen 26. The rounded forward edge 27 of the platen provides a rather sharp return bend support for ribbon 16 assisting materially in separating a label from the ribbon for transfer to an article as the ribbon passes rearwardly over idle roller 28 and about the lower face of feed roller 15, it being understood that the ribbon is held clutched firmly to this roll by rollers 22 of clutching mechanism 17.

The means for separating the labels from the carrier ribbon includes an elongated specially shaped shoe 49 having its upwardly humped rear end 36 anchored to bracket 35 secured to frame 11. Humped portion 36 of the shoe overlaps a half-round finger 37 extending crosswise of the shoe with its flat side bearing against platen 26. The flat central portion of shoe 49 cooperates with roller 23 and with a leaf spring 52 in holding the carrier ribbon depressed against the platen with an intermediate portion of the ribbon bearing firmly against the rounded upper side of finger 37 in the manner illustrated in Figures 3, 4 and 5. In consequence of the relatively sharp bend imposed on the ribbon by the finger and by the end of spring 52 as the ribbon passes over finger 37 the leading edge or lip 38 of the label separates from the carrier ribbon for a purpose which will become apparent presently.

The straight central portion of shoe 49 forwardly of humped rear end 36 holds the ribbon pressed against the hot platen but the heat-softened adhesive beneath lip 38 does not readhere to the ribbon.

The forward end of shoe 49 has a long narrow slot 39 shaped as best shown in Figure 7 providing a pair of fingers 40—40 positioned to either side of a pawl 41 having a hook 43 cooperating within the slot and engageable with lip 38 of the label in the manner described above.

The ends of fingers 40—40 are bent upwardly sufficiently to provide free space for a relatively flat finger 42 adjustably secured to platen 26 and having several purposes including one similar to that described in connection with finger 37. It is pointed out that finger 42 may be thicker at a point between fingers 40—40 than elsewhere along its length as an aid in arching the advancing labels upwardly crosswise of its path of travel as well as for insuring the separation of lip 38 from the underlying ribbon. Moreover, the upward arching of the label provides greater assurance that hook 43 of pawl 41 will engage the label lip in a positive manner.

Further assisting in arching the label upwardly crosswise of its path of travel and in maintaining this arched condition as the label is dispensed is a guide shoe 45 formed from copper or other good heat-conducting material and having its rounded upper end 46 bearing against the underside of the label in an area between and close to the ends of fingers 40. The other end of guide shoe 45 is brazed or otherwise secured in good heat-conducting relation to the heater enclosed by housing 61 whereby outward end 46 of the shoe is maintained warm thereby safeguarding against the adhesive on the labels coming in contact with the shoe and adhering to the shoe as a label is being dispensed.

It is emphasized that the upward arching of the label produced by the protrusion of end 46 of shoe 45 appreciably above the lower surface of fingers 40—40 (Figures 3 and 4) provides for several reasons. Firstly, the arching greatly stiffens the label and keeps the arching going, which is essential. Secondly, the length of the arching is equal to the full length of the label. In consequence, the arched labels readily fit the tendency of the label to fold over transversely of its path of advance as it is being pressed against the underling article, nor is there any tendency for the label to push...
The means for transferring and affixing the labels to the opposite end of shaft 54 as by screw 56 is a bifurcated arm 57 pivotally supporting a dog 58 between two inner ends on a pin 59. Dog 58 is normally held generally parallel to arm 57 by a tension spring 60 one end of which is hooked through an opening of dog 58 and the other end of which is hooked through an opening near the fixed end of arm 57 in the manner made clear by Figures 6 and 7. It will be understood that normally the weight of arms 53 and 57 biases shaft 54 to rotate counterclockwise as viewed in Figure 6 until dog 58 rests against the adjacent finger 40 of shoe 49 with the free end of feeler arm 61 positioned in the path of an advancing label 65 to be labeled. As is indicated in Figure 1a, articles to be labeled may be supported on a belt conveyor indicated generally at 66, although it will be understood that the articles may advance in any other conventional manner such as along an inclined gravity chute underlying article-feeder 53.

Label-feeler mechanism 51 is best illustrated in Figures 3, 4 and 5 wherein it is seen to comprise a shaft 67 extending transversely of the direction of label feed and rotatably mounted in bearings 68 carried by the main frame of the apparatus. Fixed to the end of shaft 67 near the label-carrying ribbon is an arm 68 to the free lower end of which is fixed a shoudered screw pin 69 for pivotally supporting hook pawl 41. The longer arm of pawl 41 carries a hook 43 projecting downwardly and having a limited path of movement in slot 39 between fingers 48 of shoe 49. The opposite shorter end of the pawl is connected to one end of a light tension spring 70 having its upper end supported by an adjustable screw 71 supported in an upright bracket 64a. Fixed to the longer end of pawl 41 is an L-shaped detent 72 having its shorter leg 73 positioned in the path of pivoting dog 58 of the above described mechanism by an idler roller 100 mounted on the end of a downturned bracket 73 fixed to the end of shelf 83, the force exerted by spring 99 being selected to urge roller 92 against an article with sufficient force to press the label firmly thereagain.

The control circuit for the labeling machine, shown in Figure 8, comprises a pair of power leads 103, 104 connectable through the usual supply cord to a suitable power supply such as 110 volts, 60 cycle. Heater 62 for platen 26 is connected directly across the power supply leads through a snap switch 105, and the label-advancing motor 13 is seen to be connected across the power leads through the normally open micro-switch 79. The coil of solenoid 84 has one end connected to power lead 103 and its other end connected to the normally open contacts 110 of relay switch 106, this relay being energized momentarily by a 40 microfarad condenser 107 connected in series with the relay and switch 80 in the manner shown in Figure 9.

Condenser 107 is arranged to be charged between cycles of the labeling operation, that is between periods of label feed, through a rectifier 108 having one end connected to power lead 104 and the other end connected to one contact of switch 80. It will therefore be understood that condenser 107 charges through rectifier 108 between feeding cycles of labels 44. During a portion of the label-feeding cycle, switch 80 is closed against its second contact thereby allowing condenser 107 to discharge through relay 106 activating the same to close the circuit of solenoid 84 across power leads 103 and 104. Since condenser 107 discharges very quickly, relay 106 remains energized only during a very brief interval thereof by controlling the period solenoid 84 is energized. A pilot light 111 may be connected as in the manner shown to indicate when switch 105 is closed and the circuit is energized.

**Operation**

The operation of the described labeling machine will be apparent from the foregoing detailed description of its components. To place the machine in operation switch 105 is closed to energize heater 62 and to charge condenser 107, the latter then being connected in series circuit.
with rectifier 108 and the left-hand contact of switch 80 across power leads 103 and 104. Upon arrival of an article 65 (Figure 1a) at the labeling station, feeler arm 53 is rotated by the article thereby rotating shaft 54 along with arm 57 and dog 58 against detent 73 to disengage hook 43 of pawl 41 from lip 38 of the foremost label 44. The disengagement of hook 43 from the label lip allows spring 70 to rotate pawl 41, arm 68 and shaft 67 counterclockwise as viewed in Figures 3 and 4 until arm 68 contacts stop 64. The rotation of shaft 67 and of cammed discs 75, 76 fixed thereto affects closure of switches 79 and 80 in fast sequence to energize label-feeding motor 13 and to discharge condenser 107 through relay switch 106.

The closing of switches 79 and 80 initiates two independent actions, namely the dispensing of a single label, and the pressing of the dispensed label against an article. Regarding the first of these operations it will be understood that motor 13 operates through drive and clutch mechanism 17 to advance carrier ribbon 16 past the labeling station. As the ribbon is peeled spherically about the rounded edge 27 of plate 26 the advancing detached lip 38 of the transversely arched label feeds forwardly over the warm rounded end 46 of guide shoe 45. This arching serves to stiffen the label against longitudinal bending and assures that it will remain straight throughout its dispensing length. Furthermore, and of particular importance, this bending of the label as the applicating roller 92 strikes its foremost end thereby preventing the label from folding or wrinkling crosswise as the roller passes rearwardly along its length.

Feed control pawl 41 and switches 79, 80 controlled thereto remain in the position shown in Figure 3 and motor 13 continues to rotate the label feed until the forward label is substantially fully dispensed and the following label reaches a position such that its forward lip 38 is positioned as shown in Figure 5. During the forward feed of the labels, pawl 41 engages the lip 38 of the following label and is carried forwardly in opposition to spring 70 until the pawl is positioned as shown in Figures 4 and 5. Just prior to reaching this position, cam discs 75, 76 have been rotated clockwise along with arm 68 and shaft 67 sufficiently to reverse the position of switches 79, 80 and thereby de-energizing label feed motor 13. Owing to the gear reduction through which motor 13 operates, the motor stops substantially instantaneously but does cause pawl 41 forward through the slight are required to safeguard against accidental closing of the switches between operating cycles. At this stage it will be evident that the advance label is fully dispensed and that the following label is then in immediate readiness for dispensing with its forward lip 38 lifted clear of the condenser and with its full length overlying the heated platen 26.

During the above-described portion of the cycle, switch 80 has been closed in its right-hand position as shown in Figure 8 so as to discharge the charge on condenser 107 through switch relay 106 energizing the same to close its contacts 110 and activate solenoid 84 for the brief instant that the charge on the condenser is effective to hold contacts 110 closed. Activating the solenoid pulls armature 85 within coil 84 in opposition to spring 86 to swing arms 93 and 97 carrying applicator roll 92 counterclockwise about pivot 94. As arm 97 rides off idler roll 100, spring 99 depresses roller 93 against the extended label switch 80 and firmly pressing it against the underlying article 65. During this operation the remote end of the label remains lightly gripped between fingers 40 and the underlying portion 46 of the guide shoe, these elements cooperating to provide the slight restraint so important in the accurate positioning of the label particularly during the later stages of its forward feed against article 65.

Owing to the rapid discharge of condenser 107 through relay 106, its contacts remained closed only for the brief instant required to attract armature 85 fully within the core of the solenoid, this position assuring that roller 92 passes over the full length of the label. Once solenoid 84 is de-energized spring 86 shifts pivot 88 toward the label feed end and the arm 97 foreclosing the air outlet through restricted vent 89 thereby slowing down the retraction of roller 92, particularly at the end of its withdrawal stroke. As roller 92 approaches full retraction arm 97 contacts idler 100 to pivot arm 97 counterclockwise about pivot 98 lifting the roller appreciably above the path of the next label.

During the described portion of the operating cycle, the article may continue to move forward since the actual application of the label occurs substantially instantaneously. The presence of the article beneath feeler arm 53 prevents the return of detent 73 of pawl 41. However, upon the passage of the article from beneath the feeler, arm 53 rotates by gravity allowing detent 58 to pivot to the extent necessary to by-pass the detent and come to rest against the top side of finger 40.

It is important that feeler 53 be so positioned relative to the article being labeled as to elevate dog 58 above detent 73 as the article arrives at the labeling station. If dog 58 does not override the detent, pawl 41 is necessary to rotate counterclockwise and into contact with the advancing strip of labels under the influence of spring 70. These essential conditions can be assured by the proper adjustment of feeler 53 on shaft 54 in accordance with the height above the label of the particular article being labeled. It will also be appreciated from the foregoing that the spacing between the ends of adjacent labels permits the lowest end of hook 43 to rotate into contact with ribbon 16 as the labels advance.

It is also pointed out that the upwardly arched portion 36 of hook 43 is cooperated with the underlying spring 52, performs an important function made clear by Figures 3, 4 and 5 of the drawings. Normally with the label feed at rest, spring 52 is sufficiently stiff to depress the ribbon and label directly rearward of transverse finger 37. The sharp bending of ribbon 16 thereby produced effects the severance of the label lip 38 from the ribbon. The fact that the label thereafter is depressed against the ribbon by shoe 49 is not harmful since the tacky condition of the adhesive caused by the heat of heater 62 prevents resticking of the lip to the ribbon. The passage of loosened lip 38 over the hump of forward finger 42 adjacent edge 27 of plate 26 reduces the repeated severing action on the label lip causing it to flex upwardly to engage hook 43 of pawl 41. The described lifting of lip 38 not only assures firm engagement of the label with hook 43 but acts to guide the label over the rounded end 46 of guide shoe 45 and to aid in the transverse arching of the label. Of particular importance is the fact that the separation of lip 38 safeguards against the label following ribbon 16 about the edge of plate 26.

By reference to Figures 5a and 5b it is to be noted that the machine herein described acts to apply labels with equal facility and effectiveness irrespective of the shape of the surface to which the label is applied. Preferably, however, the articles being labeled should be arranged on the conveyor or other feeding device with the axis of a curved surface lying parallel to the axis of the smoothening roller 92. This arrangement is illustrated in Figures 5a and 5b, the former showing the applicator mechanism pressing a label 44 onto the convex surface of an article 65; and Figure 5b showing a similar operation for an article 65' having a concave label-receiving surface. In both instances the articles being labeled arrive at the labeling station with the axis of their label-receiving surfaces parallel to the axis of roller 92. In this manner the label is fed outwardly over the curved end 46 of guide shoe 45, the continued forward feed of the label serving to shear the label off from the ribbon. During label feeding, ribbon 16 is tensioned resulting in spring 52 being deflected upwardly as shown in Figure 3. As feed-
of the type having an electric label feeding drive and a fast-acting label transfer mechanism driven by an electromagnet, said control circuit being adapted for energizing from an A.C. power source and comprising, electric motor-driven means for feeding labels from a supply source to a labeling station, means governed by the advance of a label to a predetermined position for discontinuing the feeding of labels, means to initiate registration of said label feed actuating the article to be labeled, an electric pulse forming means, and means for discharging said pulse through said electromagnet upon the reactivation of said label feed.

8. A control circuit as defined in claim 7 including electric means for heating advancing labels to soften temperature-responsive adhesive material carried by said labels.

9. A control circuit as defined in claim 7 including a pair of switches, one of said switches being connected to control the energization of said label feeding means, and the other of said switches being operable to control energization of said pulse forming means, said switches being operatively interconnected so that one is open so long as the other is closed.

10. A control circuit as defined in claim 7 wherein said pulse-forming means includes a capacitor and a semiconductor connected in circuits with the pulse-forming means, a normally de-energized relay in circuit with said power supply, and switch means operable to de-activate said semiconductor and to energize said relay thereby placing said capacitor in circuit with said electromagnet to energize the same by the momentary pulse discharge of said capacitor.

11. A power-driven labeling machine comprising means for advancing a series of articles for labeling consecutively past a labeling station, a strip of connected labels arranged end to end, power means for advancing said strip to said labeling station at a rate determined by the advance of said articles with an individual label scheduled to arrive substantially simultaneously with an article to be labeled, means operable by the advance of the article to detach the foremost label from the strip and affix the same to the article, control means for controlling the advance of the labels including a feeler element engageable with the forward end of an advancing label and movable therewith through a limited path, said feeler element being operable to discontinue the advance of said strip of labels at a predetermined point with the forward label in readiness for transfer to an article, and means governed by the advancement of the labels including a feeler element and initiate the operation of the label-advancing means.

12. A power-driven labeling machine comprising means for advancing a series of articles for labeling consecutively past a labeling station, a strip of connected labels arranged end to end, power means for advancing said strip to said labeling station at a rate determined by the advance of said articles with an individual label scheduled to arrive substantially simultaneously with an article to be labeled, means including a movably mounted member operable by the advance of the article to detach the foremost label from the strip and affix the same to the article, said label-detaching and -affixing means including electromagnetic fast-action mechanism for depressing the foremost label into firm contact with an underlying article, and pulse-generating means for energizing said mechanism including a capacitor operable to discharge through said electromagnetic mechanism.

13. A labeling machine comprising supporting means for a roll of labels, means for feeding labels therefrom, each of said labels having an adhesive affixed to one side thereof, said labels each having a portion engageable with a feed-control feeler positioned to engage the same as the labels advance, means controlled by said feeler for discontinuing the feed of labels when the leading label is at the labeling station, article position-sensing means
operative as an article advances to said labeling station to affix the leading label to the article and to condition said label-feeding means to bring a succeeding label into position for transfer to the next article, said label-affixing means comprising a presser member normally biased to a retracted position, and pulse-energized solenoid means connected to said presser member and operative to depress said leading label against an article as the article reaches a predetermined position at said labeling station.

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