Jan. 25, 1966 C. A. FLOOD 3,231,448

APPARATUS FOR APPLYING HEAT-TRANSFER LABELS TO ARTICLES

Filed Dec. 20, 1962 5 Sheets-Sheet 1

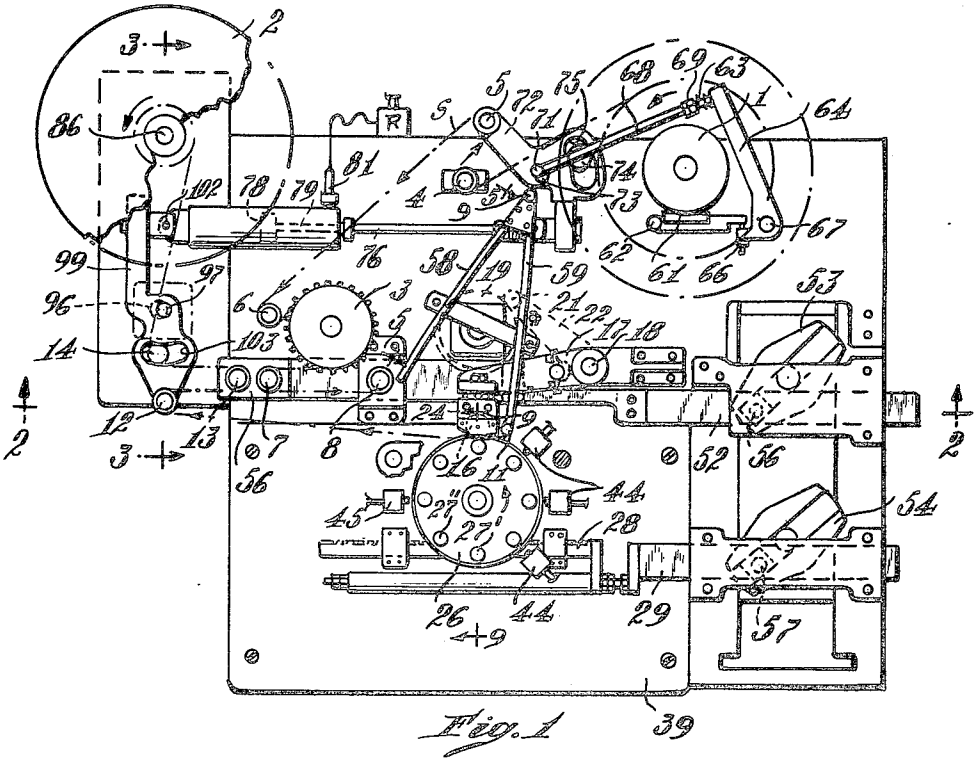


Fig. 1

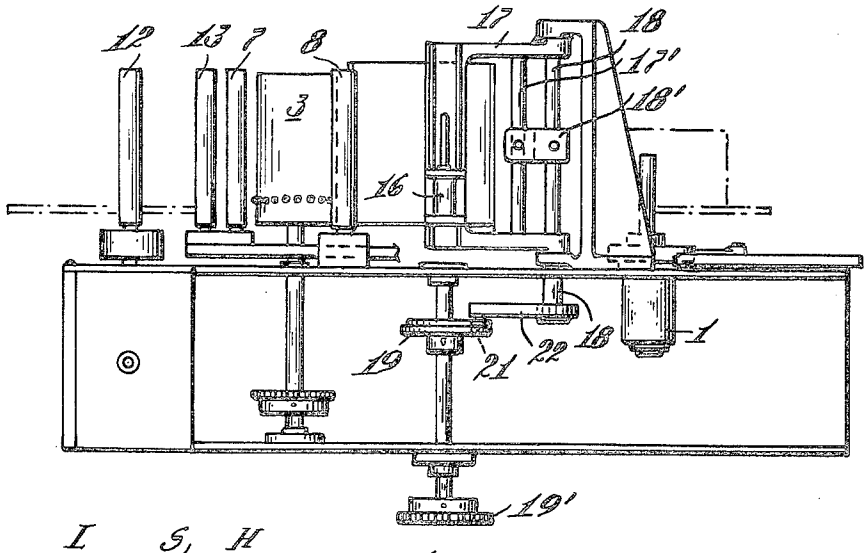


Fig. 2

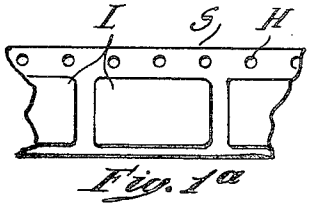


Fig. 1a

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Filed Dec. 20, 1962 5 Sheets-Sheet 2

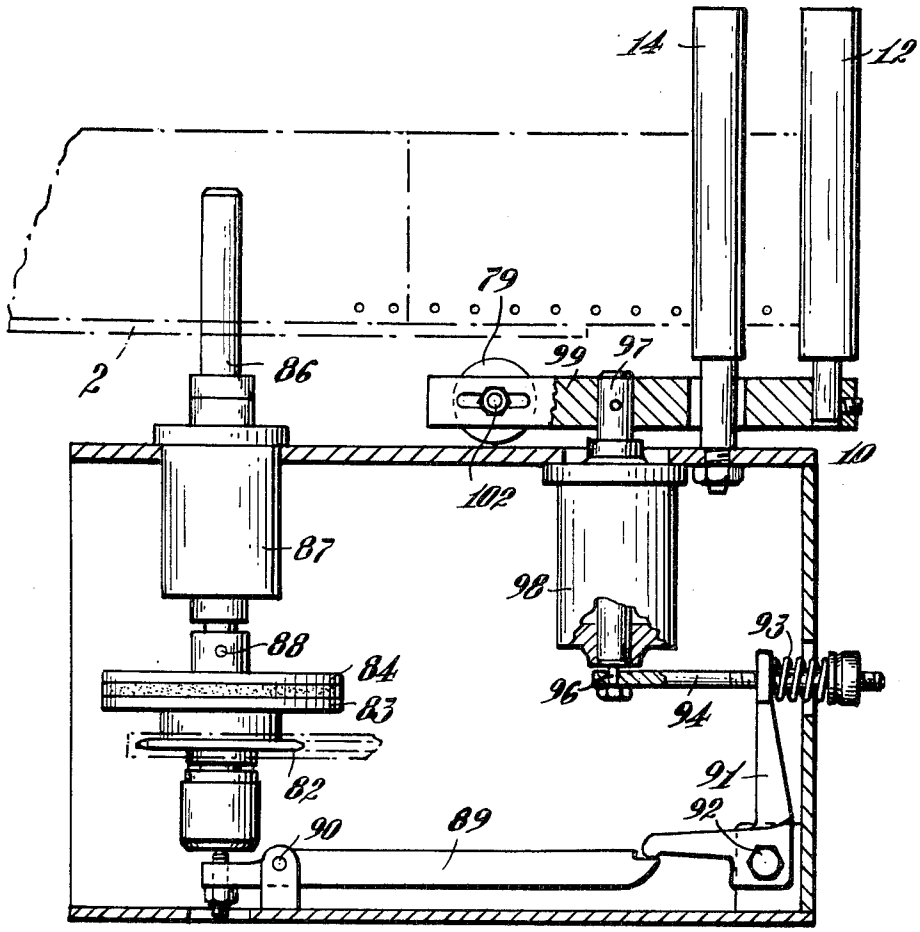


Fig. 3

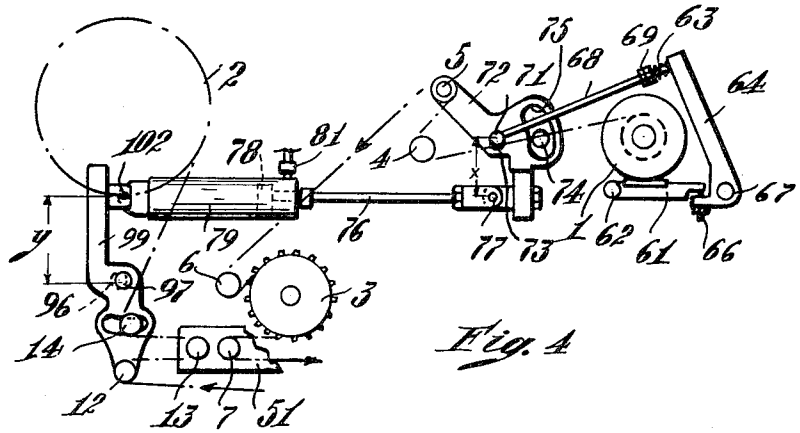


Fig. 4

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APPARATUS FOR APPLYING HEAT-TRANSFER LABELS TO ARTICLES

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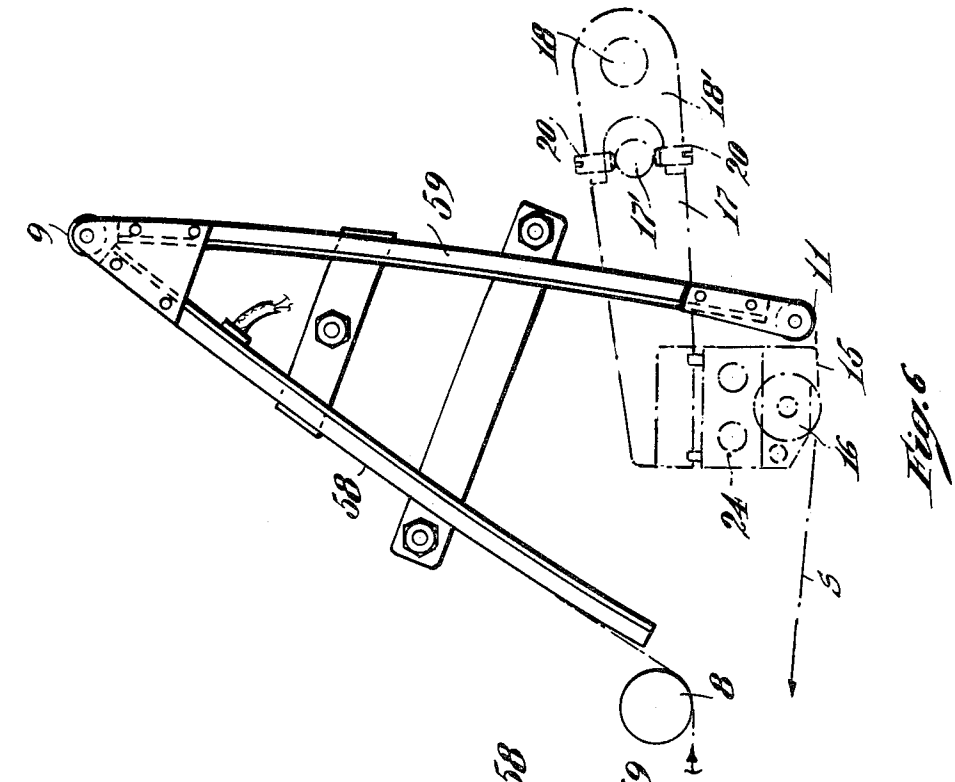


Fig. 6

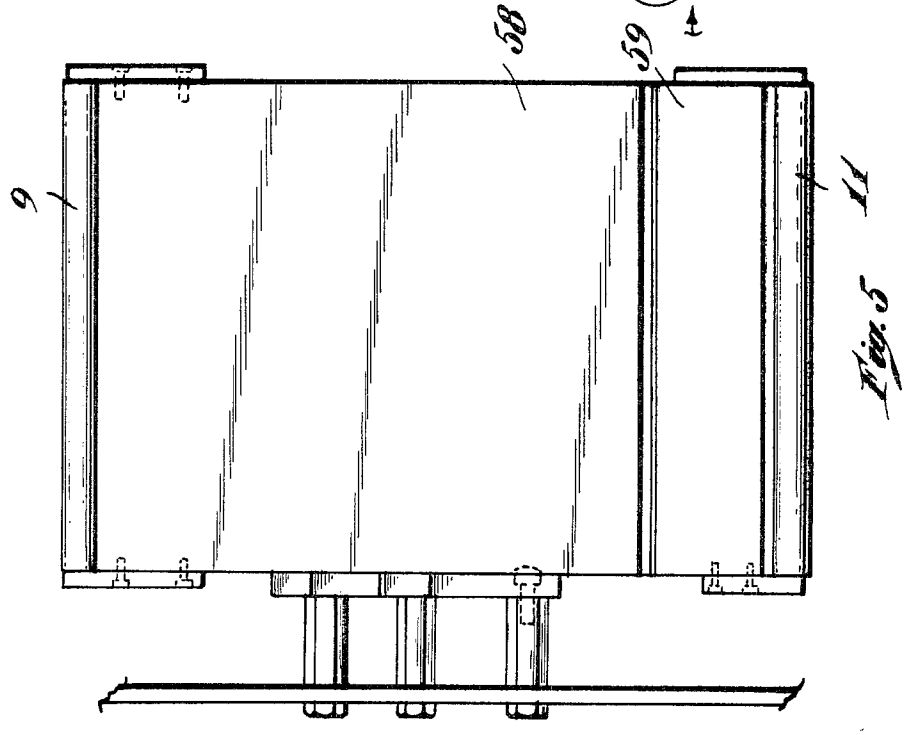


Fig. 5

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APPARATUS FOR APPLYING HEAT-TRANSFER LABELS TO ARTICLES

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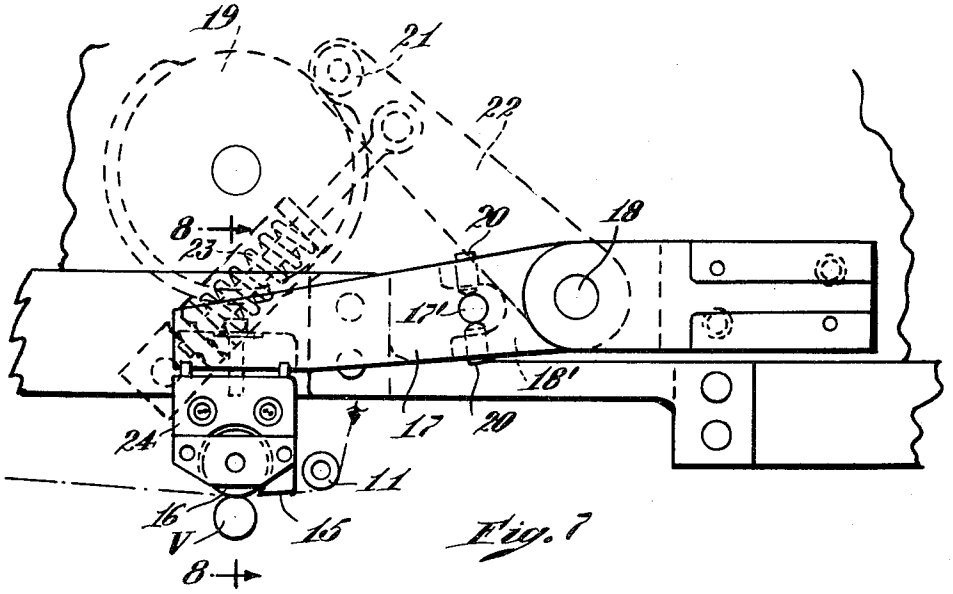


Fig. 7

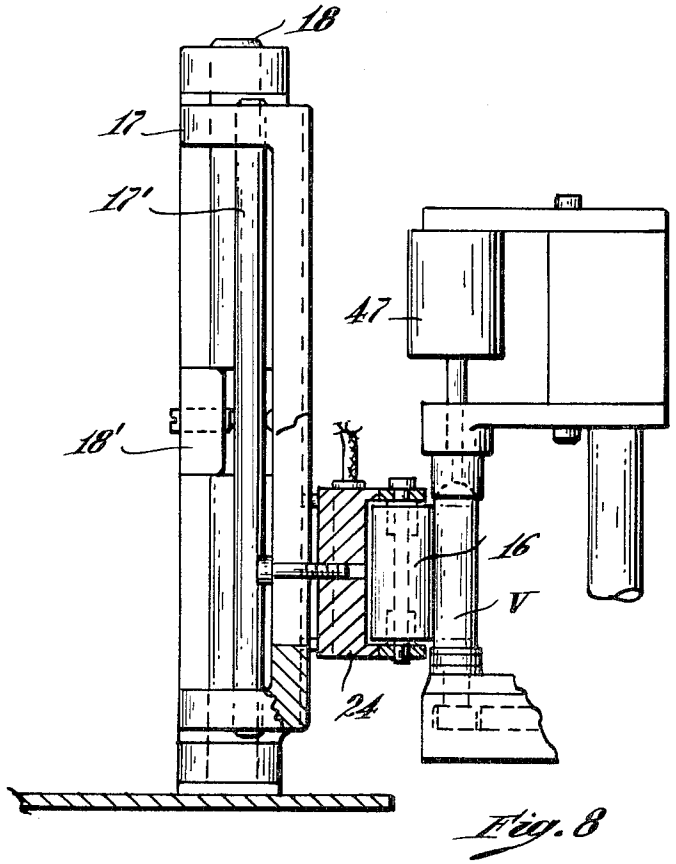


Fig. 8

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APPARATUS FOR APPLYING HEAT-TRANSFER LABELS TO ARTICLES

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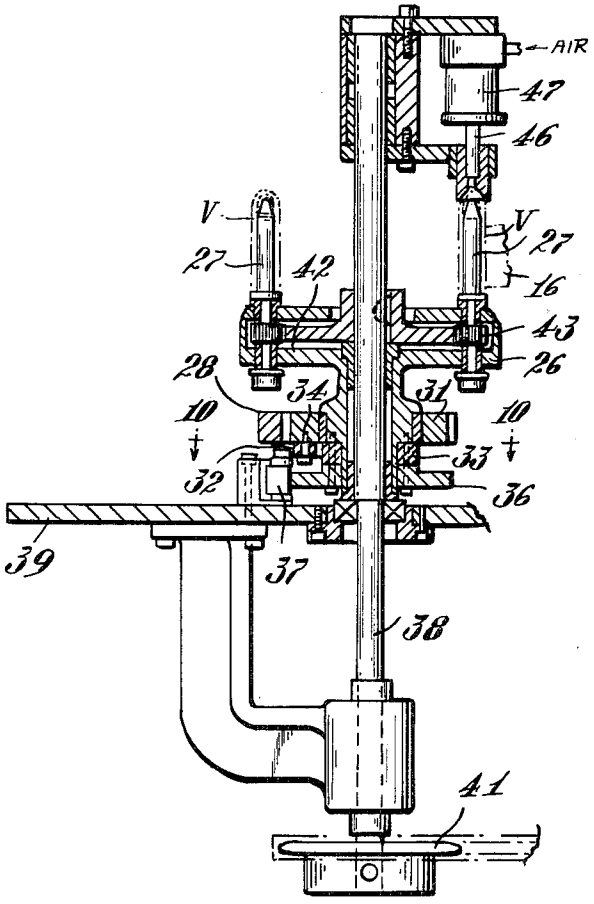


Fig. 9

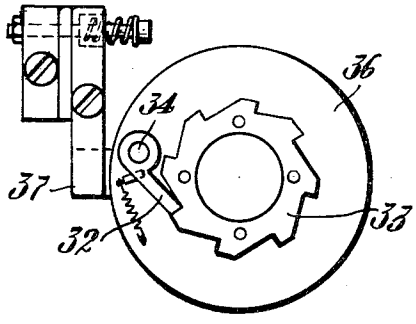


Fig. 10

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Patented Jan. 25, 1966

3,231,448

APPARATUS FOR APPLYING HEAT-TRANSFER LABELS TO ARTICLES

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Filed Dec. 20, 1962, Ser. No. 246,066
8 Claims. (Cl. 156—542)

This invention relates to heat-transfer labels and more particularly to heat-transfer labels mounted on a backing strip in a row extending lengthwise of the strip. While any heat-transfer label strip may be employed, the strip is preferably made as disclosed in Patent 2,862,832 of Ridgley G. Shepherd, Jr. dated December 2, 1958, where the label strip comprises a paper backing having a marginal row of sprocket holes, the backing being coated with oxidized wax adhesively to hold the labels printed on the wax coating with ink which is heat-activatable so that when a label is pressed against a bottle or other article by means of a hot iron engaging the back of the strip the label is transferred from the strip to the article.

Objects of the invention are to increase the rate of transfer of the labels from the aforesaid strip to articles such as bottles or vials, to increase the adhesion of the labels to the articles, and generally to improve the art of applying heat-transfer labels to articles.

In one aspect the present invention involves apparatus comprising means for feeding a label-carrier strip at a predetermined speed along a predetermined path past a label-applying station, means for recurrently presenting articles to said station on one side of said path, means at said station on the other side of said path for pressing said strip against an article, said last means including an ironer for pressing a label on the strip against the article, means for heating the ironer, means to move the surface of an article past said station at said predetermined speed, said ironer being movable back and forth toward and from said path between operative and inoperative positions, and an actuator to move the ironer to inoperative position while each article is brought to said station. Preferably the apparatus comprises a spring for moving the ironer from inoperative to operative position and then yieldingly compressing the strip between the article and ironer. While the ironer may be nonmovably mounted on the actuator, preferably it comprises a roller which is freely rotatable by frictional contact with said strip.

The preferred embodiment comprises a heater movable back and forth with the roller for heating the roller, the heater being mounted on the actuator outside the roller so as to apply heat to the periphery of the roller. Preferably the heater has a cylindrical radiating surface approximately parallel to the aforesaid periphery. The heater may have a surface bearing on the aforesaid strip immediately in advance of the label-applying station while the roller is in said operative position. Preferably the aforesaid roller and surface disengage the strip when in inoperative position. In the preferred embodiment the apparatus comprises means for heating the labels before they reach the aforesaid heater. Preferably the aforesaid heating means has an elongate surface extending along the aforesaid path, the surface having longitudinal convexity so as to maintain contact with the strip throughout the length of the surface and the convexity being slight so as to minimize friction. The heating means may comprise a second elongate surface extending along the aforesaid path in advance of the first elongate surface and also having longitudinal convexity, the two surfaces being disposed at an angle to each other, and a roller between the two surfaces for guiding the strip from one surface to the other with a minimum of friction.

For the purpose of illustration a typical embodiment of the invention is shown in the accompanying drawings in which

FIG. 1 is a plan view of the apparatus;

FIG. 1*a* is a plan view of a label strip;

FIG. 2 is a section on line 2—2 of FIG. 1;

FIG. 3 is a section on line 3—3 of FIG. 1;

FIG. 4 is a diagrammatic plan view of parts of the apparatus;

FIG. 5 is a section on line 5—5 of FIG. 1;

FIG. 6 is a plan view of the parts shown in FIG. 5;

FIG. 7 is an enlarged plan view of a part of the apparatus;

FIG. 8 is a section on line 8—8 of FIG. 7;

FIG. 9 is a section on line 9—9 of FIG. 1; and

FIG. 10 is a section on line 10—10 of FIG. 9.

The particular embodiment of the invention chosen for the purpose of illustration comprises a feed reel **1**, a take-up reel **2** and a sprocket wheel **3** for feeding the label strip S from the feed reel to the take-up reel over rollers **4**, **5**, **6**, **7**, **8**, **9**, **11**, **12**, **13** and **14**, the strip S having sprocket holes H and carrying labels L. Between the rollers **11** and **12** is an applicator roll **16** which is mounted on a bracket **17** pivoted on shaft **18**. The roll **16** is preferably covered with a resilient layer to accommodate irregularities in the surface of the article to be labeled. For example the roll may be covered with a layer of soft silicone rubber 3/16" thick. The applicator roll is moved back and forth between operative and inoperative positions by means of a cam **19** driven by sprocket **19'** (FIG. 2) and a cam follower **21** on the arm **22** fast to the shaft **18**, the cam follower **21** being held against the cam **19** by means of a spring **23** (FIG. 7). Bridging the two arms of the U-shaped bracket **17** is a rod **17'** (FIG. 2) and fast to the shaft **18** is a U-shaped actuator **18'** which straddles the rod **17'** (FIGS. 1, 6 and 7) with adjusting screws **20** to adjust the location of the applicataor roll **16** in its advanced and retracted positions. The applicator roll **16** is surrounded throughout most of its periphery by a heater **24** containing a heating coil which heats the periphery of the applicator roll by radiation. In traveling from roll **11** to the applicator roll **16** the strip bears against a surface **15** on the heater **24** thereby to apply more heat to each label just before it is applied. To heat the strip to a predetermined temperature, the longer the surface **15** lengthwise of said path the lower the temperature of the surface. Preferably the temperature of heater **24** is higher than that of plates **58** and **59**, for example 450° F. When the roll **16** and heater **24** are retracted to inoperative position they disengage the strip S. Inasmuch as the surface **15** and roll **16** engage the strip S only momentarily while a label is being applied, they may be heated to a temperature high enough to damage the label strip if they contacted the strip while the strip is decelerated between applications of successive labels as hereinafter described. The applicator roll **16** is rotated by frictional engagement with the strip S.

Opposite the applicator roll **16** is a turret **26** carrying a row of upstanding pins **27** around its periphery. The vials V (FIG. 9), to which the labels are to be transferred from the strip S, are placed over the pins **27**. The turret **26** is rotated step by step in the direction of the arrow in FIG. 1 by means of a rack **28** actuated by reciprocating slide **29** as disclosed in my copending application Ser. No. 141,476 filed September 28, 1961. As shown in FIGS. 9 and 10 the rack actuates the turret through a gear **31** rotatable on the turret (FIG. 9), a pawl **32** and ratchet wheel **33**, the pawl being pivotally mounted on the gear **31** by a pin **34** (FIG. 10) and the

ratchet wheel being fast to the turret. Fast to the ratchet wheel is a brake wheel **36** rubbing on a brake **37** to prevent the turret from overthrowing as it is stepped around. The turret **26**, gear **31**, ratchet wheel **33** and brake **36** are rotatable together on shaft **38** journaled in table **39**. The shaft **38** is driven by a sprocket wheel **41** and fast to the shaft within the hollow turret is a gear **42** meshing with pinions **43** on the pins **27** (FIG. 9) continuously to rotate the pins.

At each of the three stations between the loading station **27'** and the applicator roll **16** (FIG. 1) is a gas-flame device **44** for heating the vials as they approach the applicator station in well known manner. Another such device **45** may be located between the applicator station and the unloading station **27''** to set the adhesive holding the labels on the vials. By preheating the vials the labels adhere quicker and better. At the applicator station a plunger **46** operated by an air cyclinder **47** presses the vial against the base rotated by pinion **43** to cause the vial to rotate at the speed of the pinion.

The strip-guide rollers **7** and **13** are mounted on a carriage **51** which is reciprocated back and forth by slide **52** (FIG. 1). While a label is being applied by applicator **16** the carriage reciprocates to the left to propel the strip S past the label-applying station at the same speed as the peripheral velocity of the rotating vial so that a label is transferred to the vial by the applicator roll **16**. After the label is applied and while the next vial is being brought up to the applicator station, the carriage reciprocates to the right so that the strip is not advanced past the applicator station much if any. In this way the labels L on the strip S may be placed close together as shown in FIG. 1*a*, the portion of the strip between rolls **7** and **13** pausing between applications of successive labels to successive vials.

The reciprocation of the slides **29** and **52** is controlled by cams **53** and **54** actuating cam rollers **56** and **57** on the two slides respectively as fully described in my Patent 2,981,432 granted April 25, 1961.

Between rollers **8** and **9** is an electrically heated plate **58** and between rollers **9** and **11** is another such plate **59**, these plates serving to warm the labels L on strip S before they reach the label-applying roller **16**, thereby to facilitate the transfer of the labels to the vials. By making these plates slightly concave lengthwise of the strip path the strip is caused to maintain close contact with the plates as it passes thereover and by providing a roller at each end of each plate the drag on the strip is minimized. By making the plates elongate heat may be applied to the label strip throughout a considerable portion of the length of its path without contacting the exposed surfaces of the labels while heated. The labels may be heated to 160°–180° F. for an indefinite time without damage. Preheating the label strip not only facilitates adhesion to the vials but also prevents wrinkling of the strip between labels by the heated applicator roll.

As shown in FIGS. 1 to 4 the means for equalizing the tension in the strip S on opposite sides of the sprocket wheel **3**, thereby to avoid tearing the sprocket holes, comprises the following mechanism. Bearing on the feed reel **1** is a brake **61** pivotally mounted on a shaft **62**. The brake is pressed against the reel by a spring **63** acting on the brake through an arm **64** and an adjustable screw **66**, the arm being pivotally mounted at **67**. The spring is mounted on a link **68** which extends loosely into the upper end of arm **64** and bears against an adjusting nut **69**. The other end of the link is pivotally connected to a pin **71** fast to a rocker arm **72** which is fast to a shaft **73**. As shown in FIGS. 1 and 4 the axes of the pin **71** and shaft **73** are offset so that brake pressure is increased when the arm **72** rocks clockwise and is decreased when it rocks counterclockwise. A pin **74** extending through a slot **75** in the rocker arm limits the movement of the arm. The aforesaid roller **5** is mounted on one end of the rocker arm and the other end of the arm is pivotally connected to a piston rod **76** by a pin **77**. The rod **76** is connected to a piston **78** in a cylinder **79** which is supplied with fluid under pressure through a conduit **81** and regulator R.

As shown in FIG. 3 the take-up reel **2** is driven by a sprocket wheel **82** through a friction clutch comprising a driving part **83** and driven part **84** mounted on the take-up shaft **86** which is journaled in a bearing **87**. The driven part **84** of the clutch is pinned to the shaft at **88** and the driving part **83** is freely rotatable on the shaft. Part **83** is pressed against part **84** by an arm **89** pivotally mounted at **90**. Arm **89** is actuated by one end of a bell-crank **91** pivotally mounted at **92**. The other end of the bell-crank is actuated by a spring **93** on a rod **94** which is reciprocated lengthwise by a pin **96** eccentrically fast to shaft **97** which is journaled in bearing **98** (FIGS. 1, 3 and 4). An arm **99** is mounted on the end of shaft **97** and is pinned thereto as shown in FIG. 3. The strip guide **12** is mounted on one end of the arm **99** and the other end of the arm is connected with the cylinder **79** at **102**. The end of roller **14** extends through a slot **103** in arm **99** to limit the movement of the arm.

As the tension in the feed portion of the strip S between feed reel **1** and sprocket wheel **3** starts to increase for any reason, the arm **72** is rotated counterclockwise (FIGS. 1 and 4) thereby moving piston **78** to the right. This further compresses the air in cylinder **79**, thereby increasing the tension in the take-up portion of the strip to balance the increase in the feed portion so as to avoid tearing the sprocket holes in the strip. Conversely if the tension in the take-up portion of the strip tends to increase, the tension in the feed portion is increased through the yielding interconnection of the piston and cylinder. Likewise if the tension in either portion starts to decrease, the tension in the other portion is automatically decreased.

In addition to this counterbalancing of tension, the arms **72** and **99** are kept floating by brake **61** and friction clutch **83–84** so that the stops **14** and **74** do not engage either end of their slots respectively (FIGS. 1 and 4). For example, when the arm **72** moves counterclockwise in response to momentary increase of tension in the feed portion, the lower end of slot **75** moves toward the stop **74**, but this counterclockwise movement of the arm relieves the brake **61** to prevent the end of the slot from engaging the stop, thereby keeping the arm floating. Likewise when the arm moves clockwise in response to momentary decrease of tension the braking effect is increased to keep the upper end of the slot from engaging the stop. In the same manner movement of arm **99** varies the friction in clutch **83–84** to prevent the ends of slot **103** from engaging the stop **14**, thereby keeping the arm floating.

The tension of the label strip between the sprocket wheel **3** and the feed reel **1** is determined by the amount of air pressure in the cylinder **79** providing the arm **72** is not against the stop **74**. Initially the arm **72** is adjusted to midposition by adjusting the spring **63** so that when the arm **72** is moved clockwise to the stop position the braking action is heavier than will ever be required and when the arm is moved counterclockwise to the other stop position the braking action is lighter than will ever be required. Likewise the arm **99** is adjusted to midposition by adjusting spring **93**. When the feed reel **1** is full the arm **72** swings to the exact position that will cause the brake to counterbalance the strip tension as determined by the air cylinder. As the feed reel is reduced in size the roll **5** moves counterclockwise to reduce the braking action accordingly. The same is true of the take-up reel. By adjusting the distances *x* and *y* (FIG. 4) relatively to each other for initial balance in tension on opposite sides of sprocket **3**, the balance is automatically maintained notwithstanding variations in friction or other factors tending to unbalance the tension.

From the foregoing it will be evident that the labels are warmed by the plates **58** and **59** and by the surface **15**

of the heater **24** (FIGS. 6 and 7) and as the vials approach the label-applying station they are warmed by the gas-flame devices **44**. As above explained the portion of the strip S between rollers **7** and **13** is caused to travel at the same linear velocity as that of the rotating vial at the applicator station while the label is being applied, and then to pause while the next vial is stepped up to the label-applying station. When a vial reaches the applicator station the applicator roll **16** presses the strip S against the rotating vial and while another vial is being stepped up to the applicator station the applicator roll and heater surface **15** are retracted by the cam **19** out of contact with the strip S. The moving parts are interconnected to operate in synchronism as described in the aforesaid patent and when the machine stops the roll **16** should be in retracted position so as not to overheat the strip S and the vials V should be between stations so as not to be overheated by the gas-flame devices.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. In the art of heat-transfer labels printed on a backing strip with ink which is heat-activatable, apparatus comprising means to pull a strip along a predetermined path during recurrent intervals, an ironer engageable with the back of a strip at one location along said path to press labels against articles during said intervals respectively, a heater engageable with the back of the strip in advance of said location for rendering the labels adhesive as they approach the ironer, and means to move the heater into contact with the strip only during said intervals.

2. In the art of heat-transfer labels printed on a backing strip with ink which is heat-activatable, apparatus comprising means to pull a strip along a predetermined path during recurrent intervals, an ironer engageable with the back of a strip at one location along said path to press labels against articles during said intervals respectively, a heater engageable with the back of the strip in advance of said location for rendering the heat-transfer labels adhesive as they approach the ironer, and means to move the ironer and heater into contact with the strip only during said intervals.

3. Apparatus according to claim **2** wherein said heater is in heat transfer relation to the ironer so that it also heats the ironer.

4. Apparatus according to claim **3** further characterized by means in advance of said heater for warming the labels and means engageable only with the back of the strip for guiding the strip past said warming means, heater and ironer so that the labels contact nothing after being warmed.

5. Apparatus according to claim **4** wherein said guiding means comprises an elongate stationary surface extending lengthwise of said path, the surface being convex lengthwise of the path so that the strip is held in contact with the surface by tension in the strip produced by said pulling means.

6. Apparatus according to claim **4** wherein said guiding means comprises two elongate stationary surfaces extending lengthwise of said path with juxtaposed ends meeting at an angle, and a roller between said ends for guiding the strip from one surface to the other, each surface being convex lengthwise of the path so that the strip is held in contact with the surfaces by tension in the strip produced by said pulling means.

7. In the art of heat-transfer labels printed on a backing strip with ink which is heat-activatable, apparatus comprising means to pull a strip along a predetermined path during recurrent intervals, an ironer engageable with the back of a strip at one location along said path to press labels against articles during said intervals respectively, means in advance of said ironer for warming the labels, means engageable only with the back of the strip for guiding the strip past the warming means and ironer so that the labels contact nothing after being warmed, the guiding means comprising an elongate stationary surface extending lengthwise of said path, the surface being convex lengthwise of the path so that the strip is held in contact with the surface by tension in the strip produced by said pulling means.

8. Apparatus according to claim **7** further characterized in that the guiding means comprises a second elongate stationary surface extending lengthwise of said path with juxtaposed ends of the two surfaces meeting at an angle, and a roller between the said ends for guiding the strip from one surface to the other, the second surface also being convex lengthwise of the path so that the strip is held in contact with the surfaces by tension in the strip produced by said pulling means.

References Cited by the Examiner

UNITED STATES PATENTS

2,538,520	1/1951	Holt et al.	156—82
2,981,432	4/1961	Flood	156—542 XR
3,054,715	9/1962	White	156—540 XR

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