

Aug. 17, 1965

M. SIEGEL ETAL

3,200,561

APPARATUS FOR SHRINKING WRAPPERS OF PACKAGES

Filed Feb. 2, 1962

2 Sheets-Sheet 1

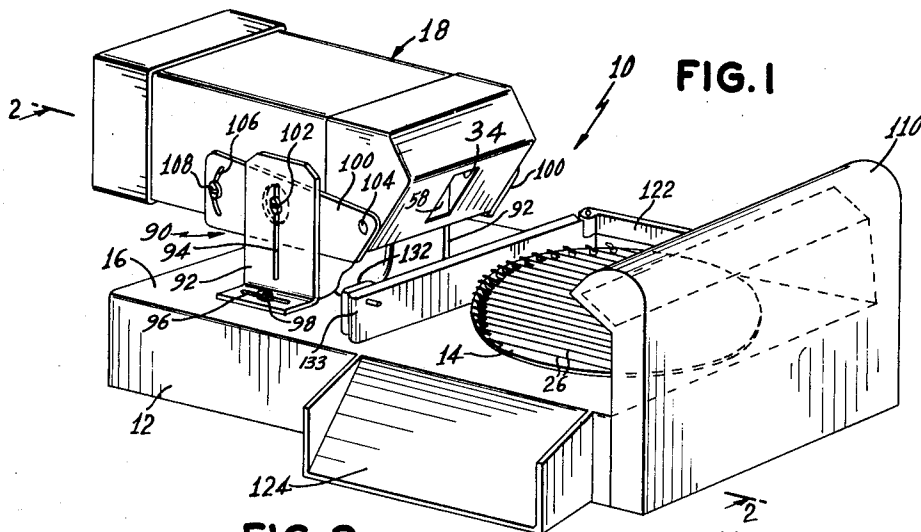


FIG. 1

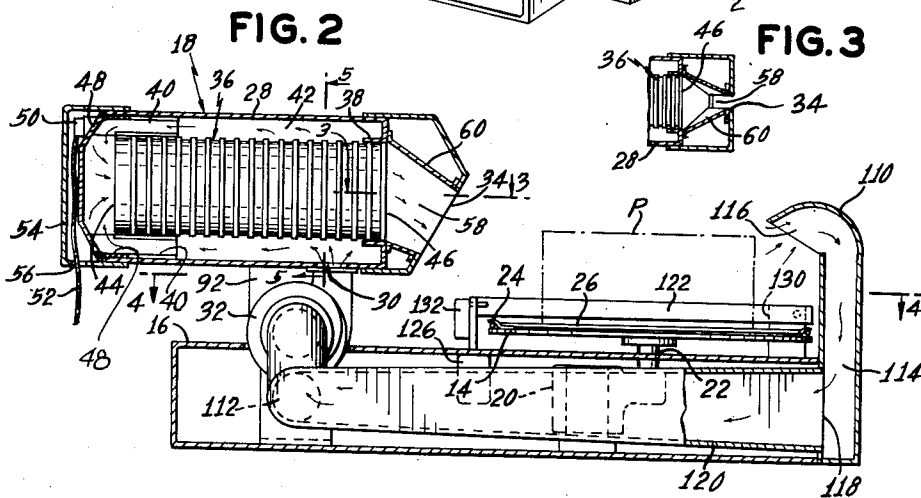


FIG. 2

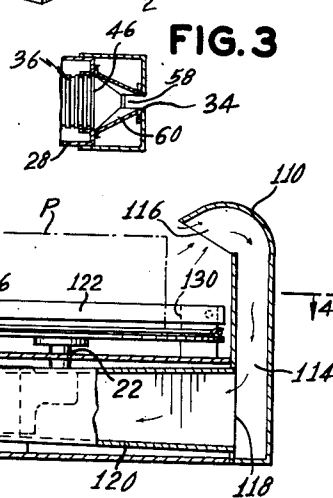


FIG. 3

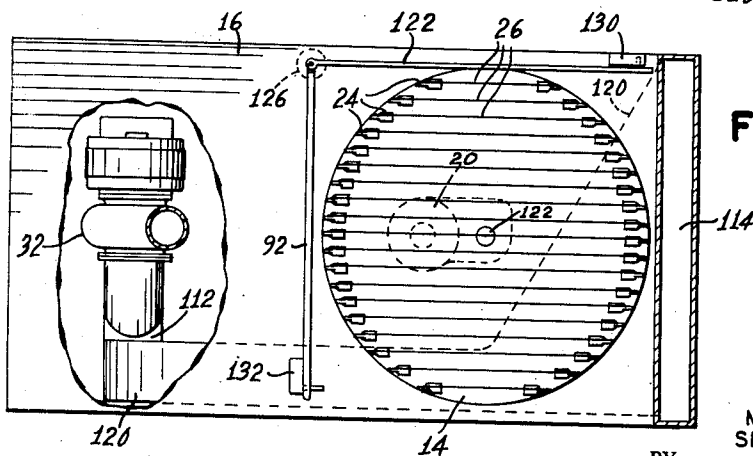


FIG. 4

INVENTORS
MARTIN SIEGEL
SEYMOUR ZELNICK

BY

Hay Co.

ATTORNEY

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M. SIEGEL ETAL

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FIG. 5

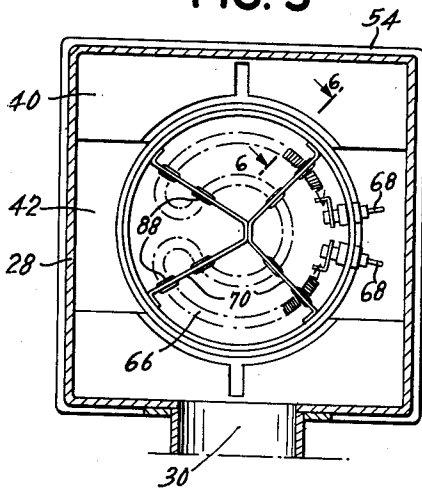


FIG. 6

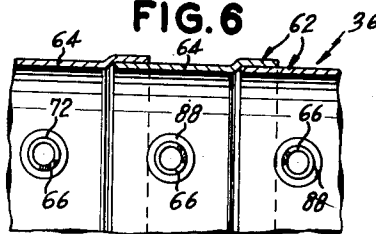


FIG. 7

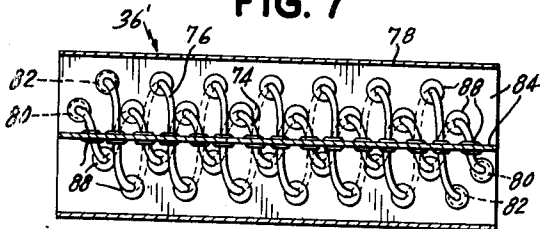


FIG. 8

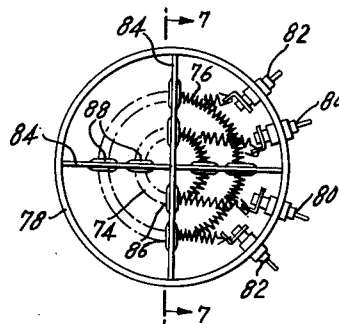
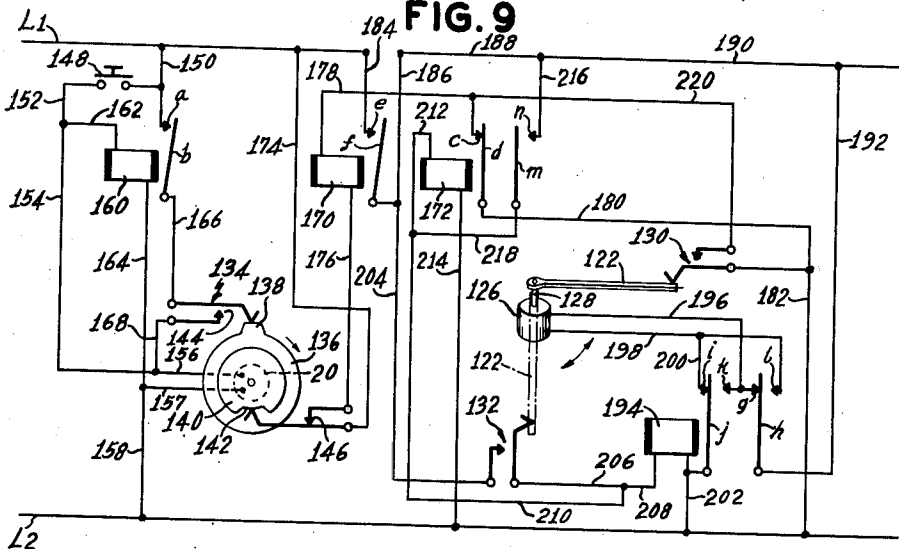


FIG. 9



INVENTORS
MARTIN SIEGEL
SEYMOUR ZELNICK
BY *Harry Col*

ATTORNEY

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APPARATUS FOR SHRINKING WRAPPERS OF PACKAGES

Martin Siegel, Roslyn, N.Y., and Seymour Zelnick, Toms River, N.J., assignors to Weldotron Corporation, Newark, N.J., a corporation of New Jersey
Filed Feb. 2, 1962, Ser. No. 170,629
10 Claims. (Cl. 53-184)

This invention relates to packaging and, more particularly, to a method and apparatus for shrinking heat-shrinkable wrappers of packages.

One of the objects of the present invention is to provide a method and apparatus for shrinking heat-shrinkable wrappers of packages which includes provision for directing a blast of heated air to those parts of the wrapper which require a greater degree of heating for proper shrinking than other parts of the wrapper.

Another object of the invention is to provide apparatus of the indicated type with means for varying the direction of flow of the heated air blast to the package to provide proper shrinking of wrappers of packages which vary in size.

A further object is to provide apparatus of the indicated type with means to move the package relative to the air blast so that the sides of the package are successively exposed to the air for the shrinking thereof. More particularly, pursuant to this object of the invention and in accordance with a further object of the invention, the air blast is preferably directed to successive sides of the package at a position below the top surface of the package which results in the provision of greater amounts of heat for those parts of the package which require more heat for proper shrinking, for example the corners of the package. This is especially important with packages which are relatively high because the material at the corners of these packages did not heretofore shrink properly because of the improper distribution of the air blast.

Another object is to provide apparatus of the indicated type with means to automatically stop the operation of the apparatus after the heat-shrinking period and thereafter automatically remove the package from the apparatus.

A further object is to provide a method and apparatus for shrinking heat-shrinkable wrappers of packages which is cheaper than methods and apparatus provided heretofore and which provides a package having a neat and taut wrapper which is properly shrunk on all sides of the package with little or no excess material provided at the corners.

The above and other objects, features and advantages of the invention will be more clearly understood in view of the following description of the invention considered in connection with the accompanying drawings which are to be considered as illustrative of the invention and not in limitation thereof.

In the drawings:

FIG. 1 is a perspective view of an apparatus in accordance with the invention;

FIG. 2 is a vertical sectional view taken on line 2-2 of FIG. 1;

FIG. 3 is a horizontal sectional view taken on line 3-3 of FIG. 2;

FIG. 4 is a horizontal sectional view taken on line 4-4 of FIG. 2;

FIG. 5 is a vertical sectional view, on a larger scale, taken on line 5-5 of FIG. 2;

FIG. 6 is a sectional view taken on line 6-6 of FIG. 5;

FIG. 7 is a longitudinal sectional view illustrating another form of a heater for the apparatus taken on line 7-7 of FIG. 8;

FIG. 8 is an end view, on a larger scale, of the heater of FIG. 7; and

FIG. 9 is an electric circuit diagram illustrating the controls for the apparatus.

Referring now to the drawings in detail, the apparatus 10 comprises a hollow base 12, a horizontal rotary turntable 14 spaced above the top surface 16 of the base and a heating device 18 mounted above the top surface of the base adjacent the turntable at one side thereof for supplying a continuous blast of heated air to the package P during the rotation thereof on the turntable. The motor 20 for rotating the turntable is mounted in the hollow base 12 and is connected by suitable means to the drive shaft 22 of the turntable. As herein shown, the turntable is circular and a series of wire retaining members 24 is spaced along the circumference of the turntable and the members support a length of wire 26 which extends back and forth across the top of the turntable and is spaced vertically therefrom. The package whose wrapper is to be heat-shrunk is placed on top of the wire so that the bottom surface of the package is spaced above the top surface of the turntable to permit heated air to flow under the raised package and it is to be noted that adjacent portions of the wire are spaced laterally from each other to permit a large portion of the bottom surface of the package to be exposed to the heated air.

The heating device 18 comprises an elongated hollow housing 28, generally rectangular in cross section, which is provided with an inlet opening 30 for air which is delivered to it by a blower 32. A rectangular shaped outlet opening 34 is provided for the outflowing heated air and the outlet opening is positioned at the same end of the heating device 18 as the inlet opening 30. A cylindrically shaped hollow tubular heater 36 is supported at its ends in housing 28 by brackets 38 and 40 with the outer surface of the heater spaced from the side walls of housing 28 so that the heater is surrounded by an air pre-heating space 42. The heater is open at its opposite ends which provide an inlet 44 and an outlet 46 for the air. A shield 48 encloses the inlet end 44 of the heater and is spaced therefrom. The heater includes electrical resistance heaters (FIGS. 5 to 8) and the shield is provided with a connector 50 for the power supply wires 52. The shield 48 and the wires 52 are covered by an enclosure 54 which is provided with an opening 56 for the wires.

During operation of the blower 32, the air which is to be heated enters the heating device 18 through inlet 30 and flows through the pre-heating space 42 toward the inlet 44 of the heater 36. During this flow, the incoming air is heated by the heat transmitted from the heater 36 as well as by the heat which may be contained in the side walls of housing 28. This pre-heating of the air is not only an efficient and economical method of heating the incoming air but, in addition, helps maintain the side walls of the housing cool thereby eliminating the necessity of providing insulation therefor. The pre-heated air enters heater 36 through inlet 44 and flows longitudinally thereof over the electrical resistance wires provided therein where it is raised to the proper temperature and is discharged from the heater through outlet 46 and flows through passage 58, formed by the transition member 60, and from the heating device 18 through outlet 34 in the form of a continuous blast of heated air. It will be observed that the flow of air through device 18 is counter-flow.

Referring now more specifically to FIGS. 5 and 6, the heater 36 comprises a series of heating elements 62 which are nested together in stacked relation. Each heating element comprises a hollow cylindrical member 64 which is open at its opposite ends. One end of member 64 has

an internal diameter which is slightly larger than the outside diameter of its opposite end so that the smaller end of a member may be readily inserted in the opposite larger end of the adjacent member to form a heater 36 of any number of heating elements 62 whereby the heating capacity of the heater may be readily changed over a wide range to provide various quantities of heat for shrinking the wrappers of packages of various sizes.

Each heating element includes a helically wound electric resistance wire 66 which is in the form of a reflexed loop shown in FIG. 5. The ends of the wire are connected to the insulated terminals 68 which are mounted on the cylindrical member 64. A pair of frame members 70 are suitably connected to each other and cylindrical member 64 and support wire 66 in its looped form. The wire extends through apertures 72 which are provided with insulating bushings 88 for insulating wire 66 from the frame members.

The heating wire 66 may be electrically connected in any suitable manner. For example, in the case where three heating elements 62 are provided, the wires 66 may be connected to a three-phase power supply by connecting each wire 66 across one pair of power lines. In the case where six heating elements 62 are provided, each pair of wires 66 from a pair of heating elements may be connected in parallel across one pair of power lines from the three-phase system. Obviously, the heating wires can be electrically connected in any suitable manner.

FIGS. 7 and 8 disclose another form of heater 36' which comprises a pair of helically wound electric resistance wires 74 and 76 which are in the form of a helix which extends longitudinally in the hollow open ended tubular housing 78. Heating wire 76 surrounds wire 74 and the ends of the wires 74 and 76 are connected to suitable terminals 80 and 82, respectively, which are suitably mounted on housing 78 and are insulated therefrom. The wires are supported in the housing on frame members 84 which are suitably connected to the housing and which are provided with apertures 86. The apertures are provided with insulating bushings 88 which insulate the wires from the other parts of the heater.

The heating device 18 is adjustably mounted on base 12 so that the direction of the heated air blast may be readily varied to accommodate various sizes of packages. Preferably, the air blast should be directed so that it impinges on the side of the package, at a position slightly below the top surface thereof, and successive portions of the side of the package are heated because of the rotation of the package on the turntable 14. By providing a concentrated blast of heated air which is directed at the side of the package, slightly below the top surface thereof, the corners and top edges of the package receive the greatest amount of heat and the material of the wrapper at these positions shrinks to a greater degree than the other portions of the wrapper which receive less heat. The greater shrinkage at the corners and top edges of the package draws in the material of the wrapper at the other portions of the package whereby little or no gathering of material occurs at the corners of the packages resulting in a taut and neat wrapper for the package.

The mounting means 90 for the heating device 18 permits adjusting the position of the outlet opening 34 of the device with respect to the turntable 14 and the package thereon both longitudinally and vertically of the turntable as well as permitting rotation of the device 18 in a vertical plane. More particularly, the mounting means 90 which are provided at each side of the device 18 comprises an L-shaped bracket 92 having a vertical leg provided with a vertical slot 94 and having a horizontal leg provided with a longitudinally extending slot 96. A stud (not shown) extends upwardly from the top surface 16 of base 12 through slot 96 and a clamping nut 98 is operable to clamp bracket 92 to the base. A stud (not shown) extends through slot 94 and the end thereof is secured to a mounting plate 100. The other end of the

stud is provided with a clamping nut 102. The heating device 18 is pivotally connected at 104 to one end of mounting plate 100 and the opposite end of the mounting plate is provided with an arcuate slot 106 through which extends a stud (not shown) which is connected to heating device 18. The stud is provided with a clamping nut 108. It will be observed that the L-shaped brackets 92 support the mounting plates 100 which in turn support the heating device 18.

In order to move the heating device 18 and opening 34 longitudinally of turntable 14, it is only necessary to loosen clamping nut 98 which permits the brackets 92 and consequently the device 18 to be moved longitudinally toward or away from the turntable. To move heating device 18 vertically with respect to the turntable it is only necessary to loosen clamping nut 102 whereby the heating device and plates 100 are free to move vertically. Of course, during vertical and longitudinal adjustable movement, clamping nut 108 remains in locked position. If it is desired to rotate heating device 18 in a vertical plane, clamping nut 108 is loosened so that the device can pivot on pivots 104. During this pivoting movement, mounting plates 100 remain stationary since they are clamped to brackets 92.

An air scoop 110 is provided opposite heating device 18 laterally of the turntable in the path of flow of the heated air so that the latter may be collected after it has passed over the package and transmitted back to the inlet 112 of the blower 32. The suction provided by the blower aids in pulling the air from outlet 34 over the package P and into the scoop. In this manner little or no heated air is lost after it passes over the package. The scoop 110 extends laterally across the turntable and extends downwardly toward the base 12 of the apparatus. The scoop is hollow to provide a passage 114 which connects the inlet opening 116 of the scoop with the open end 118 of a duct 120 provided in the base 12 of the apparatus. The other end of the duct is connected to the inlet 112 of the blower 32.

Provision is made for automatically removing a package after the wrapper thereof has been shrunk. More particularly, an arm 122 is pivotally mounted adjacent the turntable 14, slightly above the passage supporting wire 26, and is pivotally movable from the position shown in FIGS. 1 and 4 in a clockwise direction through a 90° arc across the turntable for engaging the package and moving it from the turntable into the chute 124 and, thereafter, in an opposite counterclockwise direction through a 90° arc back across the turntable for return to its initial position. This package removal operation occurs automatically after a predetermined rotation of the turntable for the heat-shrinking operation. The foregoing automatic operation will now be described more specifically with respect to FIG. 9.

The arm 122 is driven by a reversible motor 126 which is suitably mounted in the base 12 of the apparatus and one end of the arm is suitably connected to the drive shaft 128 of the motor. In the normal position of the arm which is that shown in FIGS. 1 and 4, the opposite end of the arm engages the actuating member of a limit switch 130 so that in this engaged position the contacts of switch 130 are open, as shown in FIG. 9. Another limit switch 132, with normally open contacts, is positioned on a fence 133 in the path of movement of arm 122 so that it is engaged by said arm when the latter completes a 90° clockwise movement to close the contacts of switch 132. Another limit switch 134 is provided which is responsive to the rotation of the turntable 14. More particularly, the drive shaft of motor 20, which rotates the turntable, is provided with a cam 136 which has a high point 138 and another cam 140 which has a low point 142 oppositely positioned from high point 138. Cam 136 controls the operation of the actuating member for contacts 144 of switch 134 and cam 140 controls the actuating member for contacts 146 of switch 134. In the stationary position

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of the turntable, contacts 144 are open and contacts 146 are closed, as shown in FIG. 9. The control and operation of the apparatus will now be described in detail.

The package whose wrapper is to be heat-shrunk is placed on the stationary turntable 14 and start button 148 is pressed. Current flows from line L₁, through lead 150, start button 148, leads 152, 154 and 156, motor 20, leads 157 and 158 and line L₂. The motor is energized and the turntable starts to rotate. Relay 160 is also energized by current flowing from line L₁, lead 150, push button 148, lead 152, lead 162, relay 160, leads 164 and 158 and line L₂. As soon as the turntable 14 begins to rotate, contacts 144 of switch 134 close and contacts 146 of said switch open. Closing of contacts 144 completes a holding circuit for relay 160 so that said relay remains energized even though start button 148 is released. The holding circuit can be traced as follows: line L₁, lead 150, now closed contacts *ab* of relay 160, lead 166, closed contacts 144 of switch 134, leads 168, 154 and 162, relay 160, leads 164 and 158 and line L₂.

After the turntable 14 has completed a predetermined amount of rotation, as herein shown one revolution, contacts 144 of switch 134 are opened, opening the energization circuit to motor 20 to stop the rotation of the turntable and simultaneously contacts 146 of switch 134 are closed which results in the energization of relay 170 through the normally closed contacts *cd* of relay 172. The energization circuit for relay 170 may be traced as follows: line L₁, lead 174, closed contacts 146 of switch 134, lead 176, relay 170, lead 178, closed contacts *cd* of relay 172, leads 180 and 182 and line L₂. Energization of relay 170 closes the normally open contacts *ef* of said relay which energizes motor 126 to operate arm 122 for the package removal operation. The energization circuit for motor 126 can be traced as follows: line L₁, lead 184, the now closed contacts *ef* of relay 170, leads 186, 188, 190 and 192, through the normally closed contacts *gh* of relay 194, lead 196, motor 126, leads 198 and 200, the normally closed contacts *ij* of relay 194, lead 202 and line L₂.

Arm 122 rotates in a clockwise direction, as viewed in FIGS. 1 and 4, and sweeps across the turntable pushing the package thereon from the turntable into chute 124. At the end of its stroke, it closes the contacts of limit switch 132 which energizes relays 172 and 194. The energization circuit for these relays can be traced as follows: Line L₁, lead 184, closed contacts *ef* of relay 170, lead 204, the now closed contacts of limit switch 132, lead 206, and from said lead through relay 194 via leads 208 and 202 to line L₂ and through relay 172 via leads 210, 212 and 214 to line L₂. Energization of relay 194 reverses the positions of its movable contacts *j* and *h* which closes contacts *k* and *l* of relay 194 reversing the direction of flow of the current through motor 126 which reverses the rotation of the motor and arm 122 rotates in a counter-clockwise direction, as viewed in FIGS. 1 and 4, and returns to its starting point. The return movement of arm 122 releases switch 132 so that its contacts open but relay 194 is not de-energized because of the holding circuit provided by the now closed contacts *mn* of relay 172. This holding circuit can be traced as follows: line L₁, lead 184, closed contacts *ef* of relay 170, leads 186 and 188, lead 216, the closed contacts *mn* of relay 172, leads 218, 210 and 208, relay 194, lead 202 and line L₂. The contacts *ef* of relay 170 remain closed because said relay is energized through the closed contacts of switch 130. The circuit can be traced as follows: line L₁, lead 174, the closed contacts 146 of switch 134, lead 176, relay 170, leads 178 and 220, the closed contacts of switch 130, lead 182 and line L₂. When arm 122 returns to its initial starting position, the actuating member of switch 130 is operated by the arm and the contacts of said switch open to de-energize relay 170 so that contacts *ef* of said relay open and motor 126 stops. The apparatus is now in condition for another operating cycle.

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The heater 36 illustrated by FIGS. 2, 3, 5 and 6 is not claimed herein as it is not per se part of our invention, said heater being the invention of Lloyd Barton whose application for United States Letters Patent therefor is about to be filed with an assignment of said invention and application to our present assignee.

While we have shown and described the preferred embodiment of our invention, it will be understood that the invention may be embodied otherwise than as herein specifically illustrated or described and that certain changes in the form and arrangement of parts and in the specific manner of practicing the invention may be made without departing from the underlying idea or principles of this invention within the scope of the appended claims.

We claim:

1. Apparatus for shrinking heat-shrinkable wrappers of packages, comprising:

- (a) a horizontal rotary support for the package,
- (b) means positioned laterally of said rotary support at one side thereof for heating a supply of air,
- (c) said heating means having an opening for directing a supply of heated air on said package during the rotation thereof on said support, and
- (d) scoop means positioned diametrically opposite said heating means at the other side of said rotary support in the path of flow of said heated air for directing the latter back toward said heating means for reheating said scoop means having an inlet disposed vertically above said rotary support and a downwardly extending passage communicating with said inlet to receive the air for its return flow to the heating means.

2. Apparatus for shrinking heat-shrinkable wrappers of packages, comprising:

- (a) a horizontal movable support for the package,
- (b) means for heating a supply of air, said heating means having an outlet opening for supplying the heated air to the package,
- (c) means mounting said heating means laterally of said support at one side thereof for adjustable rotation in a vertical plane and for adjustable movement both vertically and longitudinally of said support so that the position of said outlet opening with respect to said package can be varied according to the size of the package,
- (d) means for moving said support relative said heating means so that different portions of said package are exposed successively to said heated air, and
- (e) scoop means positioned diametrically opposite said heating means at the other side of said support in the path of flow of said heated air for directing the latter back toward said heating means for reheating, said scoop means having an inlet disposed vertically above said rotary support and a downwardly extending passage communicating with said inlet to receive the air for its return flow to the heating means.

3. Apparatus for shrinking heat-shrinkable wrappers of packages, comprising:

- (a) a rotary support for the package,
- (b) means positioned laterally of said rotary support at one side thereof for heating a supply of air,
- (c) said heating means having an opening for directing a supply of heated air on said package during the rotation thereof on said support,
- (d) scoop means positioned opposite said heating means at the other side of said rotary support in the path of flow of said heated air for directing the latter back toward said heating means for reheating, said scoop means having an inlet disposed vertically above said rotary support and a downwardly extending passage communicating with said inlet to receive the air for its return flow to the heating means and
- (e) a blower having its inlet in fluid flow communi-

tion with said vertical passage of said scoop means for receiving said heated air and having its outlet in fluid flow communication with said heating means for transmitting said heated air thereto for reheating.

4. Apparatus for shrinking heat-shrinkable wrappers of packages, comprising:
 - (a) a horizontal rotary support for the package,
 - (b) means for heating a supply of air,
 - (c) means for directing said supply of heated air on said package downwardly towards said support during the rotation thereof on said support,
 - (d) said heating means comprising an elongated hollow chamber, closed at its opposite ends, having side walls and an inlet for air, said inlet being located at a point remote from one of said ends,
 - (e) another elongated hollow chamber positioned in said first mentioned chamber and extending longitudinally thereof and having side walls spaced from said side walls of said first mentioned chamber to form an air preheating space surrounding said other chamber,
 - (f) said other chamber having an electric heater positioned therein and being open at its opposite ends to provide an inlet for the preheated air and an outlet for the heated air, said inlet of said other chamber being in communication with said first mentioned chamber near said one of said ends of said first mentioned chamber,
 - (g) said outlet of said other chamber being positioned at the other end of said first mentioned chamber so that the incoming air flows in one direction through said preheating space from the inlet therefor to said inlet of said other chamber and flows in an opposite direction through said other chamber toward the outlet thereof, and
 - (h) scoop means positioned opposite said heating means at the other side of said rotary support in the path of flow of said heated air for directing the latter back toward said heating means for reheating.
5. Apparatus for shrinking heat-shrinkable wrappers of packages, comprising:
 - (a) a horizontal support mounted to a base for rotation about a vertical axis for the package,
 - (b) an elongated strip of wire positioned above said member and extending back and forth across said support to provide a supporting surface for the bottom surface of the package,
 - (c) said strip of wire having parts which are spaced laterally of each other to expose relatively large areas of said bottom surface of the package, and
 - (d) means for supplying a continuous blast of heated air to said package to the side of said package and to said bottom surface between the spaced parts of said wire during the rotation of said member and said package thereon.
6. Apparatus for shrinking heat-shrinkable wrappers of packages, comprising:
 - (a) a movable horizontal support for the package,
 - (b) means positioned adjacent said support for supplying a stream of heated air to the package during the movement of said support,
 - (c) means for removing said package from said support after a predetermined movement of said support comprising a member mounted adjacent said support for movement in a horizontal plane over said support to engage said package and push it from said support, and
 - (d) means operable in response to the movement of said support for controlling the operation of said member,
 - (e) said controlling means comprising means to stop the movement of said support after said predetermined movement thereof and to initiate movement of said member first in one direction over said support

and thereafter in an opposite direction to return said member to its starting position.

7. Apparatus for shrinking heat-shrinkable wrappers of packages, comprising:
 - (a) a horizontal rotary support for the package,
 - (b) means positioned adjacent said support for supplying a continuous blast of heated air to said package during the rotation of said member and said heated package thereon,
 - (c) a member mounted adjacent said support for movement in a horizontal plane from an initial position in one direction across said support for engaging the package and pushing it from said support and thereafter in an opposite direction in a horizontal plane back across said support for return to said initial position, and
 - (d) means responsive to the rotation of said support for stopping said rotation after a predetermined period and for operating said member to move it from said initial position in one direction across said support to remove said package therefrom and thereafter in an opposite direction for return to said initial position.
8. Apparatus for shrinking heat-shrinkable wrappers of packages, comprising:
 - (a) a horizontal rotary support for the package,
 - (b) means positioned adjacent said support for supplying a continuous blast of heated air to said package during the rotation of said member and said heated package thereon,
 - (c) a member mounted adjacent said support for movement from an initial position in a horizontal plane in one direction across said support for engaging the package and pushing it from said support and thereafter in an opposite direction in a horizontal plane back across said support for return to said initial position,
 - (d) means responsive to the rotation of said support for stopping said rotation after a predetermined period and for operating said member to move it from said initial position in one direction across said support to remove said package therefrom and thereafter in an opposite direction for return to said initial position,
 - (e) said last mentioned means comprising a reversible motor operatively connected to said member,
 - (f) a motor operatively connected to said support,
 - (g) electric control means responsive to the position of said support for stopping the operation of said motor for said support and for starting the operation of said reversible motor, and
 - (h) other electric control means responsive to the position of said member for reversing the operation of said reversible motor and thereby returning said member to said initial position.
9. Apparatus for shrinking heat-shrinkable wrappers of packages, comprising:
 - (a) a horizontal rotary support for the package,
 - (b) means positioned adjacent said support and including a tubular member and a heater therein for directing a blast of heated air to the package during the rotation thereof on said support,
 - (c) an air blower having an air inlet and an air outlet which is connected to said tubular member for supplying air to said tubular member to be heated by said heater,
 - (d) a conduit positioned below said rotary support for the passage of air to said inlet of the blower, and
 - (e) passage means having an inlet above said rotary support and leading to said conduit below said support for the return flow of heated air to said conduit.
10. Apparatus for shrinking heat-shrinkable wrappers of packages, comprising: a base; a horizontal support for the package mounted for rotation with respect to said base; means mounted to said base for supplying hot air

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to the package, including an elongated chamber having sidewalls, an outlet for heated air disposed adjacent and above said horizontal support for directing heated air at the package downwardly onto said platform, and an inlet in one of said side walls for air to be heated, and a heater assembly having a tubular support and a heating element disposed within the interior space of said support, said tubular support being spaced inwardly of said side walls of said chamber and having an inlet spaced from said inlet of said chamber and an outlet coupled to said outlet of said chamber, whereby air passes through said inlet of said chamber, between said sidewalls of said chamber and the exterior of said support, through said inlet of said support, through said interior of said support, out said outlets of said support and said chamber and against the package; said horizontal support including an imperforate member, and fixed thereabove and thereto, spaced apart elements for supporting the bottom of the package above said imperforate member, whereby the air from said outlet of said elongated chamber is passed above said imperforate member and below the bottom of said package.

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FRANK E. BAILEY, *Primary Examiner.*

ROBERT A. LEIGHEY, BERNARD STICKNEY,
Examiners.