

March 21, 1967

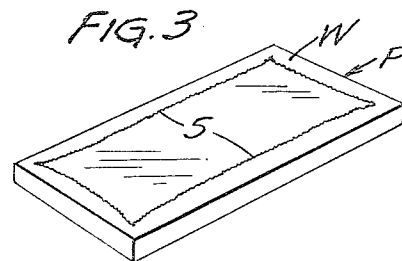
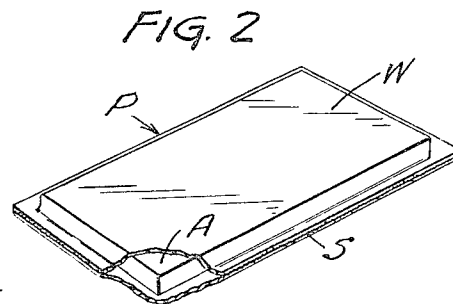
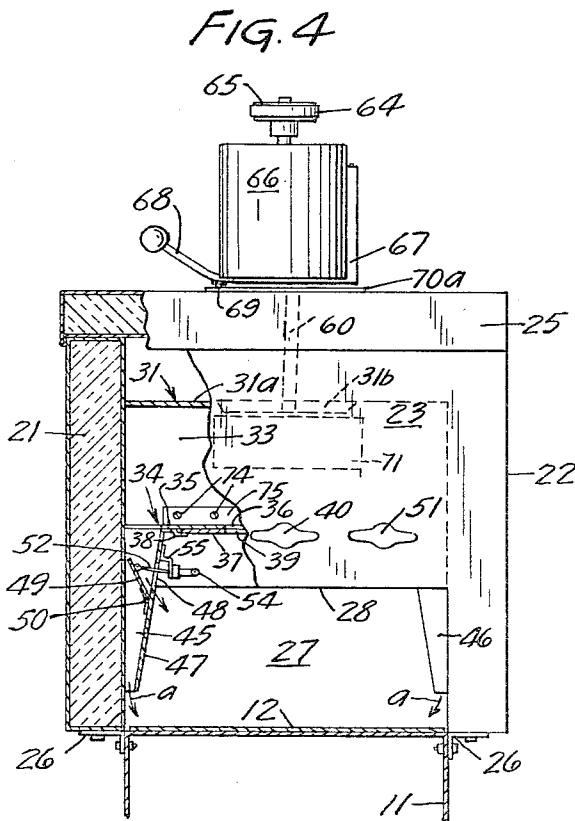
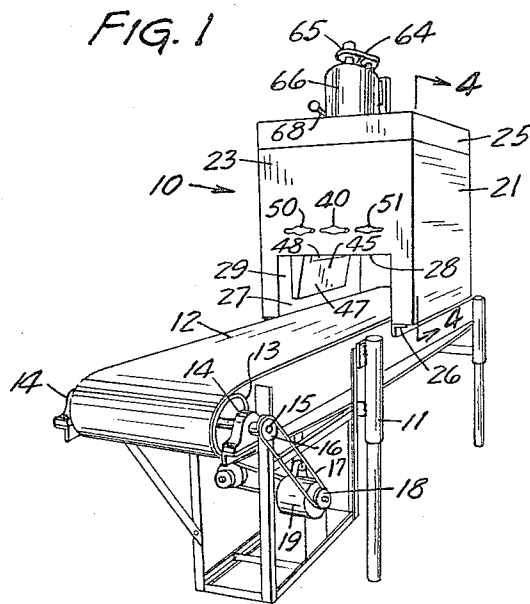
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3,309,789

PACKAGE TREATING APPARATUS

Filed Jan. 9, 1964

2 Sheets-Sheet 1



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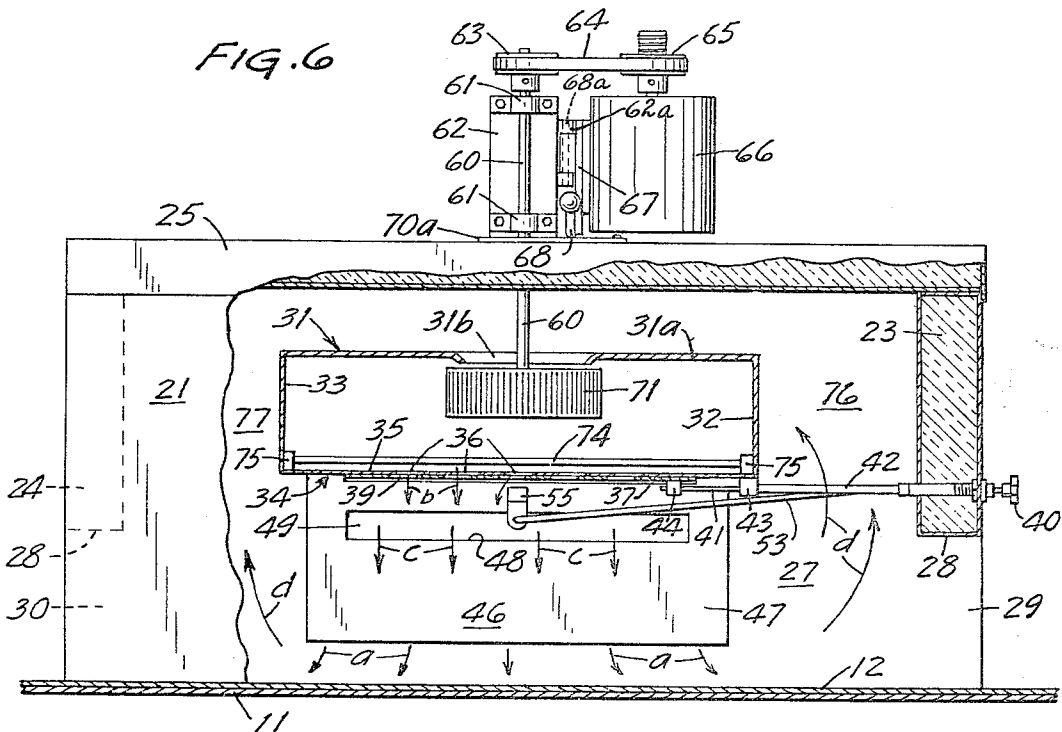
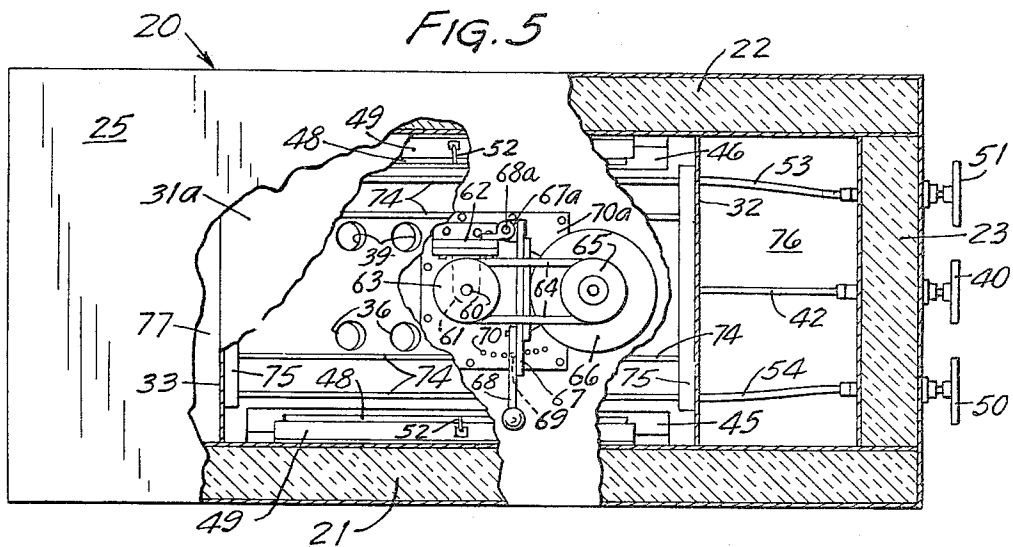
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PACKAGE TREATING APPARATUS

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2 Sheets-Sheet 2



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3,309,789

PACKAGE TREATING APPARATUS

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8 Claims. (Cl. 34-225)

This invention relates to apparatus effecting shrinkage of a film material package wrapper or cover to the exterior configuration of the object contained therein.

Apparatus for the purpose of shrinking a film material wrapper to the configuration of the object contained therein has been known before, however, many distinct disadvantages have been encountered in the use of such previous apparatus. For instance, the package wrappers in the past have been frequently mutilated or damaged because such previously known apparatus necessitated a physical engagement between the heated and softened film type cover or wrapper and closure apparatus at the exit port through which the package moves out of the heat area. In addition, improper shrinkage of the wrapper or cover has been effected in such prior art apparatus and results in badly weakened wrappers or labels which are aesthetically unappealing, thereby detracting from the salability of the object packaged therein.

With these comments in mind, it is to the elimination of these and other disadvantages to which the present invention is directed along with the inclusion therein of other novel and desirable features.

An object of my invention is to provide a new and improved apparatus for directing and confining circulated heated air around a package with a film material cover or wrapper encompassing an object so as to shrink the cover into conformity with the exterior configuration of the object.

Another object of my invention is to provide a novel shrink tunnel constructed so as to eliminate any possibility of deforming or mutilating a film material wrapper or cover encompassing an object while the cover is in a softened and plastic state, and also taking the full utilization of the heat applied and without wastage of heat.

A further object of my invention is to provide a shrink tunnel which is readily and easily adaptable for handling packages of various sizes and configurations so as to produce a uniform and desired shrinking of the film material wrapper or cover confining the object therein by applying the prescribed quantity of heat to substantially all portions of the wrapper.

These and other objects and advantages of my invention will more fully appear from the following description made in connection with the accompanying drawings, wherein like reference characters refer to the same or similar parts throughout the several views, and in which:

FIGURE 1 is a perspective view of the invention;

FIG. 2 is a perspective view of a package with the cover being partly broken away illustrating the cover in its relationship with the object prior to being shrunk;

FIG. 3 is a perspective view similar to FIG. 2, but showing the film material cover or wrapper after being shrunk into conformity with the exterior configuration of the object contained therein;

FIG. 4 is a transverse section view taken approximately at 4-4 in FIG. 1 and having portions thereof broken away for clarity of detail;

FIG. 5 is a detail top plan view with portions thereof broken away and shown in section for clarity of detail;

FIG. 6 is a detail side elevation view with portions thereof broken away and shown in section for clarity of detail.

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One form of the invention is shown in the drawings and is described herein. The shrink tunnel is indicated, in general, by numeral 10 and includes a frame 11.

Means are provided for supporting and conveying packages P consisting in articles A confined by a sheet material wrapper W of the type of material that will shrink in dimensions when subjected to heat, such as polyethylene sheet material and other of the known modern day plastic materials. The article A is shown in the shape of a rectangular box, but may have any desired configuration. The package supporting means consists in an elongate endless belt type conveyor 12 of substantially impervious nature so as to provide a substantially imperforate surface upon which the package P is carried. The belt conveyor 12 is supported on rollers or drums 13 which are journaled in bearings 14 affixed on the frame 11. One of the belt mounting rollers 13 has a drive shaft 15 affixed thereto which carries a sprocket 16 around which drive chain 17 is trained. The drive chain is driven from a sprocket 18 on the output shaft of the geared low speed output from motor 19.

The shrink tunnel 10 also includes a hood 20 having side walls 21 and 22, front and rear walls 23 and 24 respectively, and a removable top 25. It will be seen that the sidewalls 21 and 22 extend downwardly to the belt conveyor 12 and are affixed as by brackets 26 to the frame 11. The belt conveyor 12 forms the bottom of the air circulating chamber 27 in the hood 20. It will be seen that each of the sidewalls 21 and 22, front and rear walls and top 23, 24, and 25 are of hollow construction filled with heat insulating material so as to minimize heat loss through the walls and top.

The front and rear endwalls 23 and 24 have lower edges 28 which are spaced upwardly from the belt conveyor 12 by a substantial distance so as to cooperate with the sidewalls 21 and 22 in defining entrance and exit ports 29 and 30 which are continuously open and unobstructed as to accommodate entrance and exit of packages P of substantially any shape or configuration into and out of the air circulating chamber 27 of the hood 20.

The hood 20 has means defining a heated air plenum chamber 31 within the hood 20 and in the form shown such means includes endwalls 32 and 33 extending entirely across the interior of the hood 20 into engagement with the opposite sidewalls 21 and 22 thereof and in widely spaced relation with the front and rear walls 23 and 24. The endwalls 32 and 33 are affixed to the sidewalls 21 and 22 of the hood as by spot welding so that the sidewalls 21 and 22 of the hood define the sides of the plenum chamber 31.

The top wall 31a of the plenum chamber 31 is spaced downwardly from the top 25 of the hood so as to cooperate therewith in defining an air conduit or passage communicating with the air passage 76 between the endwalls of the plenum chamber and the front and rear walls 23 and 24 of the hood. The top 31a of the plenum chamber also has an air inlet opening 31b therein through which air is supplied into the interior of the plenum chamber.

The bottom of the plenum chamber 31 is indicated, in general, by numeral 34 and includes a substantially horizontal panel 35 spaced well above the belt conveyor 12, a distance at least equal to and preferably exceeding the height of the edges 28 of the hood endwalls so as to permit unobstructed passage of the packages P through the hood and permit unobstructed air circulation around said packages to perform the wrapper-shrinking operation. The panel 35 is provided with a plurality of enlarged air outlet openings or ports 36 therein for directing air under pressure and with substantial velocity in a downward direction in the air circulating chamber 27 and to-

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ward the belt conveyor 12 and the package supported thereon.

Means are provided for regulating the air flowing downwardly through the ports 36, and in the form shown, such means include an air valve or gate panel 37 underlying the panel 35 and slidably mounted in channels 38 adjacent opposite sides of panel 35. The gate panel 37 is also provided with a plurality of apertures 39 arranged in the same physical pattern as the apertures 36 in panel 35 so that the apertures 39 may be aligned with apertures 36 or may be moved out of alignment therewith, for closing the apertures 36 in the event that the gate panel 37 is moved longitudinally.

Means are provided for slidably adjusting the location of gate panel 37, and in the form shown, such means include control handle 40 connected to an operating cable 41 which is slidably mounted in a cable housing 42. The housing 42 is anchored to the bottom panel 35 of the plenum chamber by clip or bracket 43 and is also anchored to the front wall 23 of the hood adjacent the control handle 40. The control cable 41 is attached to the gate panel 37 by clip or bracket 44. By pulling and/or pushing the control handle 40, the gate panel 37 is longitudinally moved so that the apertures 39 move into and out of alignment with the aperture 36 of panel 35.

The bottom 34 of the plenum chamber 31 also includes a pair of air ducts 45 and 46 respectively disposed adjacent the opposite sidewalls 21 and 22 of the hood and extending downwardly along said sidewalls from the panel 35 into proximity with the belt conveyor 12. It will be noted that the ducts 45 and 46 are in airflow communication with the plenum chamber 31 so as to receive heated air therefrom. The lower ends of ducts 45 and 46 are open and unobstructed so as to direct air in the manner shown by arrows small *a* downwardly toward the belt conveyor 12 for enveloping the package P carried thereon. It will be noted that the ducts 45 and 46 extend substantially throughout the entire length of the plenum chamber 31. The ducts 45 and 46 have inner side panels 47 which are disposed substantially upright, but slightly oblique to the corresponding hood sidewall so that the ducts 45 converge or decrease in cross-sectional area, in a progressive manner from the top to the bottom thereof, thereby producing an increased velocity of air moving therethrough.

The panels 47 of ducts 45 and 46 have air outlet or discharging ports 48 formed in the upper portions thereof and extending substantially throughout the entire length thereof. The ports 48 are substantially rectangular in shape and are controlled by swingable flap valves or closure doors 49 which are hinged at 50 below the openings 48 so as to permit the flap valves 49 to swing outwardly into obstructing relation with respect to downwardly flowing air in the ducts 45 and 46 and cause the air to be diverted through the ports 48. The flap valves 49 may be swung against the panels 47 so as to close the ports 48.

Means are provided for controlling the opening and closing or swinging of the flap valves 49 in each of the ducts 45 and 46, and in the form shown, such means include control handles 50 and 51. Each of the control handles 50 and 51 is connected with a respective control cable 52 which is slidably mounted in a respective cable housing 53 and 54. The cable housings 53 and 54 are anchored at brackets 55 affixed as by rivets to the inner sides of panels 47, and the control cables 52 are attached to the flap valves 49 for swinging the flap valves to open and closed positions.

It will be understood that as a result of the multiple controls provided by control handles 50 and 51 and control handle 40, the air directed and supplied into the air circulating chamber 27 of the hood and toward the belt conveyor 12 and enveloping relation with the package thereon may be carefully controlled as for direction and volume from all the different directions, thereby well

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adapting the apparatus for applying the heat in the proper locations so as to produce proper shrinking of the wrapper on the package. It will be understood that for articles of one shape the airflow and heat applied in the chamber 27 may be entirely different than for articles of other shapes so as to obtain the desired shrinking of the wrapper in order to produce an aesthetically appealing package.

A fan-mounting and driving shaft 60 extends vertically through a suitably provided aperture in the top 25 and is mounted in bearings 61 which are mounted on an upright supporting bracket 62 which is affixed to the top 25 of the hood. The top end of shaft 60 has a pulley 63 mounted thereon, and a driving belt 64 is trained around the pulley 63 and around a variable speed pulley 65 which is on the shaft of motor 66. It will be seen that the motor 66 is mounted on a swingable base plate 67 which is swingably connected to the bracket 62 by a hinge pin 68a and hinge forming ears 67a and 62a which are respectively affixed to the motor mounting plate 67 and the bracket 62. The mounting plate 67 has a handle 68 extending outwardly from one side thereof, and a downwardly extending lug or short pin 69 may be fitted into one of the plurality of apertures 70 in the panel 70a which is affixed to the top 25 of the hood to hold the mounting plate 67 and motor 66 in a predetermined relation with respect to pulley 63 and thereby adjust the tension on the belt 64 so as to obtain the proper and desired speed through adjustment of the variable speed pulley 65.

The shaft 60 extends through the center of air inlet opening 31b in the top 31a of the plenum chamber and mounts a fan 71 which draws air inwardly through the inlet opening 31b and into the interior of the plenum chamber.

Means are provided within the plenum chamber 31 for heating the air passing therethrough, and in the form shown, such means includes the plurality of electrically powered heating elements 74 which are suitably mounted in insulating blocks 75 at the opposite endwalls 32 and 33.

It will further be seen that the endwalls 32 and 33 of the plenum chamber cooperate with the sidewalls 21 and 22 and the endwalls 23 and 24 of the hood to define upwardly extending air passages 76 and 77 through which air is drawn by fan 71, so as to produce sweeping of the air from the belt conveyor 12 upwardly across and inwardly of the entrance and exit ports 29 and 30 and into the upwardly directed air passages 76 and 77, thereby minimizing any loss of air outwardly through the entrance and exit ports 29 and 30 and preventing loss of heat so that the recirculating air in the hood need only have a minimum of heat added to it each time the air is recirculated.

In operation, the heating elements 74 of the shrink tunnel are normally energized to produce preheating of the air in the hood prior to commencing of shrinking of packages P. When the air in the shrink tunnel or hood 20 has come up to the proper temperature while recirculating, the belt conveyor 12 may be set into operation and the packages P in the form illustrated in FIG. 2, are placed upon the belt conveyor and moved slowly along the belt conveyor into and through the hood. It will be particularly noted that there is a complete lack of any interference by any physical structure with the package P, as it moves into, through and out of the hood, and as a result there is and can be no mutilation whatever of the wrapper W, even through during the time while the package is within the hood and is moving outwardly therefrom, the wrapper is in a softened or semi-plastic state so as to be readily and easily damaged. However there is no damage whatever to the wrapper at any time because there is no physical engagement between the wrapper or package and any other physical part with the exception of the belt conveyor upon which the package is carried.

As the package moves through the hood, by movement of the belt conveyor 12, the air from the plenum chamber 31 travels downwardly through the openings 36 of the panel 35 and downwardly through the ducts 45 and 46 through the open lower ends thereof and downwardly in an oblique direction through the ports 48. All of these streams of air are directed downwardly toward the belt conveyor 12 and toward the packages carried thereon so as to completely envelop and apply heat to the wrapper W at the desired portions thereof so as to produce a shrinking of the wrapper. It will be understood that certain articles having a characteristic exterior configuration will require that the air from one direction be minimized and that a greater volume of air be supplied from a different direction so as to obtain the desired and proper heating of the wrapper in order to produce the desired shrinkage of the wrapper. It will be understood that in the operation, the article will rest upon the belt conveyor 12 and of course there can be only a very minimum of shrinking of the wrapper at the areas of engagement by the wrapper with the belt conveyor 12 and therefore the primary shrinking of the wrapper W is at the upper side portions of the wrapper which are exposed to the circulating air in the air circulating chambers 27. As the package P progresses through the hood 20 and towards the exit port 30, the wrapper W will shrink around the article A so as to assume the identical exterior configuration of the article so that when the package approaches the exit port 30, the package P will have substantially the appearance illustrated in FIG. 3. The seam or joint S, shown in FIG. 2, where two separate laminae of heat sealable material have been joined in producing the wrapper, is actually physically moved to a location substantially as indicated in FIG. 3. The portion seen of the package in FIG. 3 is preferably the bottom side of the package in relation to the manner in which the package will be displayed to customers or for advertising when placed on sale in merchandising establishments. The side of the package which had previously rested upon the belt conveyor 12 is completely smooth and tightly wrapped to present an aesthetically appealing package to the consumer for his purchase.

As the air travels downwardly from the aperture 36 in the direction of arrows *b* and travels downwardly from ports 48 in the direction of arrows *c* and downwardly from the ducts 45 and 46 in the direction of arrows *a*, the air will change direction substantially adjacent the package supported on the belt 12 and will go in diverse directions toward the opposite ends of the hood. The air is immediately swept in an upward direction away from the belt conveyor 12, as illustrated by arrows *d* and thence upwardly through the upright air passages 76 and 77 and into the fan 71 again for recirculation and heating. The air as it passes across the inner sides of entrance and exit ports 29 and 30 will remain substantially and entirely within the hood without any material loss of air or heat from the hood. It has been found by applicant that because of the careful control of the air within the hood 20 there is only need to supply a minimum of heat to the recirculating air in the hood during a continuing shrinking operation. Because the exit port 30 is completely open and unobstructed, there can be and actually is no mutilation or damage to the package and to the softened wrapper as the package emerges from the area of substantially extreme heat in the hood 20. Of course it will be understood that various changes may be made in the form, details, arrangement and proportions of the various parts without departing from the scope of my invention.

What is claimed is:

1. Apparatus shrinking a package wrapper into conformity with the exterior configuration of an object therein,

comprising a frame,

elongate means on the frame supporting and convey-

ing such a wrapped package in a predetermined direction and including a package conveying surface upon which such a package is supported,

a hood on the frame and defining a heated air circulating chamber and said hood having front, rear, side and top walls, said hood being disposed in superposed relation with a portion of said surface, and said sidewalls extending along said elongate means and extending downwardly to said surface, said front and rear walls extending transversely across said elongate means and having lower edges spaced above said surface and cooperating with said surface in defining continuously open and unobstructed entrance and exit ports to permit unobstructed movement of the package on the surface and through the chamber,

and air heating, circulating and directing means in the chamber and producing upward sweeping of air across said open and unobstructed ports and within said chamber to minimize loss of heat and heated air at the ports, and also producing heating and shrinking of the package wrapper into conformity with the exterior configuration of the object therein.

2. The wrapper shrinking apparatus set forth in claim 1 wherein said air heating, circulating and directing means defines an air passageway above said entrance and exit ports through which air is drawn and swept upwardly across said ports.

3. Apparatus shrinking a package wrapper into conformity with the exterior configuration of an object therein,

comprising a frame,

elongate means on the frame supporting and conveying such a wrapped package in a predetermined direction and including a package supporting surface upon which such a package is supported,

a hood on the frame and defining a heated air circulating chamber and said hood having front, rear, side and top walls, said hood being disposed in superposed relation with a portion of said surface, and said sidewalls extending in said predetermined direction and along said elongate means and extending downwardly to said surface, said front and rear walls extending transversely across said elongate means and having lower edges spaced above said surface and cooperating with said surface in defining continuously open and unobstructed entrance and exit ports to permit unobstructed movement of the package on the surface and through the chamber,

means defining a plenum chamber within the hood and having a top and a bottom spaced above said surface to permit unobstructed passage of said package therebeneath and along said elongate means and said plenum chamber also having endwalls confronting and widely spaced from said front and rear walls of the hood, said plenum chamber having an enlarged inlet opening adjacent the top therein, fan means within the plenum and rapidly drawing air into said plenum chamber through said inlet openings,

the bottom of said plenum chamber having air discharge openings directing air downwardly toward the elongate means to envelope the package with heated air and produce shrinkage of the wrapper thereon,

means within said plenum chamber and effecting heating of the air directed downwardly toward the package-supporting surface,

and said plenum chamber endwalls cooperating with the side, front, and rear walls of the hood in defining upwardly directed air flow passages above said ports to cause air to upsweep from said surface and upwardly across and inwardly of said ports for return and recirculation to and through said plenum chamber.

4. Apparatus shrinking a package wrapper into conformity with the exterior configuration of an object therein,

comprising a frame,
elongate means on the frame supporting and conveying such a wrapped package in a predetermined direction and including a substantially imperforate surface upon which such a package is supported,
a hood on the frame and defining a heated air circulating chamber and said hood having front, rear, side and top walls, said hood being disposed in superposed relation with a portion of said imperforate surface, and said sidewalls extending along said elongate means and extending downwardly to said surface, said front and rear walls extending transversely across said elongate means and having lower edges spaced above said surface and cooperating with said surface in defining continuously open and unobstructed entrance and exit ports to permit unobstructed movement of the package on the surface and through the chamber,
a heated air plenum chamber within the hood and having a top and also a bottom including a downwardly facing panel spaced above said package-supporting surface to permit unobstructed movement of the package through the hood, said panel having air discharge ports therein and directing air downwardly toward said surface and the package thereon, said heated air plenum also having endwalls confronting and widely spaced from said front and rear walls of the hood, said plenum chamber having air-moving and directing inlet means adjacent the top thereof and producing movement of air into the plenum chamber and also upwardly along said endwalls adjacent the front,
the bottom of the plenum chamber also including a pair of spaced and downwardly extending air ducts communicating with the plenum chamber, each of said ducts lying along a respective hood sidewall and having open lower ends adjacent said surface and directing heated air downwardly toward the surface and the package thereon,
means in said plenum chamber and heating the air moving therethrough to a temperature sufficient to effect shrinking of the wrapper of the package,
whereby to direct heated air toward said surface for enveloping the package thereon and producing recirculation of the heated air without loss of heat or air at said entrance and exit ports.

5. Apparatus shrinking a package wrapper into conformity with the exterior configuration of an object therein,

comprising a frame,
elongate means on the frame supporting and conveying such a wrapped package in a predetermined direction and including a substantially imperforate surface upon which such a package is supported,
a hood on the frame and defining a heated air circulating chamber and said hood having front, rear, side and top walls, said hood being disposed in superposed relation with a portion of said imperforate surface, and said sidewalls extending along said elongate means and extending downwardly to said surface, said front and rear walls extending transversely across said elongate means and having lower edges spaced above said surface and cooperating with said surface in defining continuously open and unobstructed entrance and exit ports to permit unobstructed movement of the package on the surface and through the chamber,
a heated air plenum chamber within the hood and having a bottom including a downwardly facing panel confronting said circuits within the hood and spaced upwardly from said surface to permit unobstructed passage of such packages through the hood, said

panel also having a plurality of air discharge ports therein and directing air downwardly toward said surface and the package thereon,

the bottom of said plenum chamber also including the upright panel means disposed adjacent the opposite hood sidewalls and defining a pair of spaced and downwardly extending air ducts each lying along a respective hood sidewall and said ducts having open lower ends adjacent said surface and directing heated air downwardly toward the surface and the package thereon, said ducts having inner panel shaped sides confronting each other and spaced from the hood sidewalls, the inner sides of said ducts having upper portions with air outlet ports therein, flap valves in said ducts and confronting said outlet ports, means hinging said flap valves below said outlet ports for alternate movement into obstructing relation with said outlet ports and into obstructing relation with air flowing downwardly in the ducts to divert the air through said outlet ports and thereby lessen discharge of air at the open lower ends of the ducts,

means in said plenum chambers and effecting heating of air moving therethrough,

said plenum chamber endwalls cooperating with the side, front, and rear walls of the hood in defining upwardly directed airflow passages above said entrance and exit ports to cause air to sweep from said surface upwardly across and inwardly of said entrance and exit ports,

whereby to direct air from multi-directions as desired toward said surface and around the package thereon to vary the wrapper shrinkage in accordance with the shape of the object therein.

6. The wrapper shrinking apparatus set forth in claim 5 wherein each of said downwardly extending ducts tapers convergently in a downward direction to increase the velocity of air moving therethrough for discharge at said open lower end thereof.

7. The wrapper shrinking apparatus set forth in claim 5 and including a closure movably mounted adjacent said panel and effecting closing and opening of said air discharge ports therein to vary the volume of air moving downwardly through said panel and towards the surface and package thereon.

8. Apparatus shrinking a package wrapper into conformity with the exterior configuration of an object therein,

comprising a frame,
elongate means on the frame supporting and conveying such a wrapped package in a predetermined direction and including a substantially imperforate surface upon which such a package is supported,
a hood on the frame and defining a heated air circulating chamber and said hood having front, rear, side and top walls, said hood being disposed in superposed relation with a portion of said imperforate surface, said sidewalls extending in said predetermined direction and along said elongate means and extending downwardly to said surface, said front and rear walls extending transversely across said elongate means and having lower edges spaced above said surface and cooperating with said surface in defining continuously open and unobstructed entrance and exit ports to permit unobstructed movement of the package on the surface and through the chamber,
means defining a plenum chamber within the hood and having a bottom spaced above said surface to permit unobstructed passage of said package therebeneath and along said elongate means and said plenum chamber also having endwalls confronting and widely spaced from said front and rear walls of the hood, said plenum chamber endwalls cooperating with the front, side and rear walls of the hood in defining

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upwardly directed airflow passages above said ports to cause air to sweep upwardly from said surface and across said ports and at a position inwardly of said ports for return and recirculation to the plenum chamber, said plenum chamber having a top spaced downwardly from the top wall of the hood and cooperating therewith in defining an airflow duct communicating with said airflow passages, said top of the plenum chamber having an enlarged inlet opening therein, 5

and fan means within the plenum and rapidly drawing air into said plenum chamber through said air inlet opening, 10

the bottom of said plenum chamber having air discharge openings directing air downwardly toward 15

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the elongate means to envelope the package with heated air and produce shrinkage of the wrapper thereon,

and means within said plenum chamber and effecting heating of the air directed downwardly toward the package-supporting surface.

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