METHOD AND APPARATUS FOR SHRINK-FILM WRAPPING A PALLET LOAD

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References Cited

UNITED STATES PATENTS
3,050,402 8/1962 Dreyfus et al. 53/30 UX

ABSTRACT

A pallet-load of product is secured onto a pallet by forming a sleeve of heat shrinkable film around the pallet-load with its open top extending above the pallet-load and its open bottom extending below the pallet. The bottom and the top portions of the sleeve are initially shrunk to lock the sleeve onto the pallet-load and the pallet, and subsequently the intermediate portion of the sleeve is shrunk to unitize the assembly.

7 Claims, 7 Drawing Figures
1. FIELD OF THE INVENTION
This invention relates to wrapping and securing of a load to a pallet.

2. DESCRIPTION OF THE PRIOR ART
The customary system for moving and storing products is to wrap them individually or in groups, and to secure the product or group of products on a pallet. For example, small products are packed in closed cartons, these cartons are stacked on a pallet as a 4 x 5 x 7 foot pallet load, and the load is strapped to the pallet by steel or plastic straps. The products require the closed cartons to hold the products in place and to protect them from the atmosphere. The cartons must be opened to ascertain the contents thereof. Each column of cartons must have a strap retaining it to the pallet, or an intermediate wrapper of some sort must be provided to unitize the pallet load.

3. BACKGROUND OF THE INVENTION
It is an object of this invention to provide a system which will permit products to be grouped in open containers, which will readily unitize the containers into a pallet-load, which will secure the pallet load to the pallet, which will protect the products from the atmosphere, and which will permit visual inspection of the contents of the pallet-load.

4. SUMMARY OF THE INVENTION
A feature of this invention is the initial wrapping of the pallet-load in a vertical sleeve of heat-shrinkable film whose bottom overhangs the underside, or horizontal projections, of the pallet and whose top overlaps the upper side of the pallet-load, and the subsequent shrinking of the sleeve so that its bottom underlies the pallet, its top overlaps the pallet-load, and its intermediate portion tightly encompasses the pallet-load, whereby the pallet-load is unitized vertically and horizontally and is secured to the pallet.

5. BRIEF DESCRIPTION OF THE DRAWING
These and other objects, features and advantages of the invention will be apparent from the following specification thereof, taken in conjunction with the accompanying drawings in which:

- FIG. 1 is a schematic perspective view of an embodiment of the invention;
- FIG. 2 is a cross-sectional view in elevation of the system of FIG. 1 taken along the plane 2—2;
- FIG. 3 is a schematic perspective view of a first modification of the embodiment of FIG. 1;
- FIG. 4 is a schematic perspective view of a second modification of the embodiment of FIG. 1;
- FIG. 5 is a schematic perspective view of a third modification of the embodiment of FIG. 1;
- FIG. 6 is a schematic perspective view of a fourth modification of the embodiment of FIG. 1; and
- FIG. 7 is a schematic perspective view of a fifth modification of the embodiment of FIG. 1.

6. DESCRIPTION OF THE INVENTION
As seen in FIGS. 1 and 2, a pallet 10 supports a pallet-load 12. The pallet 10 may be of the customary construction of an upper plywood panel 14, a lower plywood panel 16 and intermediate, spaced apart members 18. Advantageously, the pallet may be provided with skid members 19 under and spaced in from the periphery of the lower panel 14, to raise the underside of the panel 14 above ground level. Alternately, but not shown, the upper panel may be made slightly larger in periphery than the intermediate members, to provide an undersurface which is above ground level, and above the spaces 20 between the intermediate members which receive the tynes of a fork lift.

7. THE Pallet-Load 12 may comprise columns and rows of individual cartons 22. The cartons may be rectangular solids and open or closed at the top. It is only necessary that lower cartons, with products, be able to support the weight of the upper cartons. In the case of a strong product, like bottles, a compartmented tray may be used. Shapes other than rectangular solids may be advantageously used, such as cylinders, e.g., paint cans. The pallet-load need only be capable of being stacked and holding its shape under very low accelerations.

8. The loaded pallet 10/12 is conveyed through the system by suitable means, here shown as a double row 24 of rollers. Conveyor belts, or individual dollys may be utilized, so long as a marginal, peripheral undersurface of the pallet extends above and beyond the conveyor.

9. The loaded pallet is advanced in the direction shown by the arrow A through the system, to a first wrapping station 26 and a second shrinking station 28.

10. The wrapping station 26 provides a vertical sleeve of heat-shrinkable film about the loaded pallet having a bottom part which overhangs a marginal peripheral surface of the pallet, here shown as the lower panel 16. The wrapping station may be of the type shown in U.S. Pat. No. 3,191,356, issued to S. Zelnick, et al. on June 25, 1965, but vertically oriented. Briefly described, the station includes a pair of film supply rolls 30 straddling the conveyor, a pair of guide rollers 32, and a pair of heat sealing and cutting members 34 mounted from an overhead guide 36 for movement together and apart. The running ends respectively of the webs of the film from the supply rolls are initially joined together, so that a continuous web of film stretches across the conveyor in a vertical plane. The heat sealing and cutting members are spaced apart. The loaded pallet advances along the conveyor, against the web of film, and carries the web along downstream, unwinding film from the supply rolls. When the loaded pallet has passed immediately downstream of the sealing and cutting members, it is halted and the members are brought together. The members clamp the two web-portions of the film together closely behind the loaded pallet, and melt a gap into the web-portions to weld a sleeve around the loaded pallet and to weld the two running ends of the film from the supply rolls together for the succeeding loaded pallet. The height of the film is greater than the loaded pallet so that the top of the sleeve overarches the top of the loaded pallet, and the bottom of the sleeve overarches a horizontally extending marginal peripheral surface of the pallet. A lacuna may be provided in the conveyor to permit the transverse passage of the lower portions of the film and the sealing-cutting members.

11. The loosely sleeve wrapped loaded pallet is now advanced downstream to the shrinking station 28.

12. The shrinking station shown in FIG. 1 includes a rectangular air duct 40 with a series of orifices 42 disposed through the inner wall of the duct. The duct is supported and is raised and lowered by four synchronously driven chains 44 respectively mounted on four columns 46. Alternatively, the duct may be driven by any suitable driver means such as four screw columns. A hot air blower 48 is coupled to the duct 40 by a flexible conduit 50 to blow hot air into the duct and through the orifices 42. Alternatively, or additionally, the duct may contain a series of heating elements to heat the air provided by the blower. Yet alternatively, a four sided-ring support for any suitable source of heat, such as infra-red electrical or gas heaters, may be utilized. The purpose of the duct or support is to provide a peripheral zone of heat around the loaded pallet to heat shrink the adjacent peripheral zone of the sleeve. The duct is lowered around the loaded pallet to its lowest position adjacent the pallet, and the supply of heat to the sleeve is commenced. The bottom of the sleeve is initially heat-shrunk about the pallet and under the horizontal marginal peripheral surface, locking the sleeve to the pallet. The duct is then progressively raised, progressively heat-shrinking the sleeve around the pallet-load and finally shrinking the top sleeve over the marginal upper surface of the pallet load. If it is desired, prior to shrinking, a paper or film dust cover 52...
may be laid onto the top of the pallet-load, to be secured thereto by the overlying top part of the sleeve. When its sleeve is fully shrunk, the loaded pallet is discharged from the shrinking station.

A modification of the embodiment of FIG. 1 is shown in FIG. 3 to include an auxiliary air duct 60 or other peripheral heat source disposed in a fixed position underneath the conveyer. With this system, the top and the bottom of the sleeve may be conveniently shrunk to lock the sleeve to the pallet and to the top of the load before the intermediate portion of the sleeve is shrunk.

The modification shown in FIG. 4 includes a hood 70 attached to the duct 40 and large enough to enclose the loaded pallet when the duct 40 is in its lowestmost position. A recirculating blower supplies hot air to a plenum 72 at the top of the load, and this plenum is connected to the shrink ring by means of four feeder ducts 74. By this arrangement, hot air rising within the hood is captured at the intake of the recirculating blower and is recirculated back to the duct 40 by the feeder ducts.

Another modification is shown in FIG. 5. Here the blower and the blower plenum 80 are mounted in a fixed position on a support 82 and are coupled to the duct 40 by a collapsible accordion type hood 84 and four flexible feeder ducts 86.

The modification shown in FIG. 6 will accommodate oversize pallets. The duct 90 is formed of four corner segments 92 which are joined with collapsible accordion type ducting 94. The collapsible ducting contains orifices also. By this arrangement, the horizontal diameter of the duct 90 can be adjusted to fit the pallet. The columns 46 are adjustable mounted on diagonal tracks 26, to accommodate their spacing to the size of the duct 90.

In some applications, it is desirable to maintain the pallet-load under compression along the vertical axis while the sleeve is being shrunk thereabout. As shown in FIG. 7, a compression ram 100, which may be ratchet or hydraulically driven, is supported by a mount 102 over the duct 40 and descends coaxially through the duct to compress the load.

While the method of locking the sleeve of heat shrinkable film below the pallet and on top of the load has been illustrated with a peripheral, zone heating air duct 40, it may be accomplished with other apparatus. For example, in U.S. Pat. No. 3,200,561 issued to M. Siegel, et al. on Aug. 17, 1965, there is shown a rotary platform for rotating a package in front of an adjustable heat source. A sleeve wrapped, loaded pallet may be disposed on the rotary platform, with the heat source initially aimed to direct heat to the bottom of the sleeve. The platform is progressively rotated while the heat of the source is progressively raised to helically shrink the sleeve. As an additional example, in U.S. Pat. No. 3,316,653 issued to S. Zelnick on May 2, 1967, there is shown a heating tunnel through which a loaded pallet may be conveyed. The hot air outlets to the heating tunnel may be arranged to provide up-stream an upper and a lower heating zone, and downstream an intermediate heating zone.

It will be appreciated that if it is desired to utilize the pallet-load with the pallet by other means, such as strapping, the progressively heat shrunk sleeve has utility in stabilizing the pallet-load. In other words, a sleeve may be provided which does not extend below the pallet-load, and then the sleeve may be shrunk around the pallet-load to utilize or stabilize it. The stabilized pallet-load is then strapped to the pallet.

It will also be appreciated that while the embodiments of this invention have been described with a sleeve which has been automatically formed, this invention comprehends the use of manually formed sleeves, and the use of preformed bags which are slipped onto and over the pallet-load.

While there has been shown and described the preferred embodiments of the invention, it will be understood that the invention may be embodied in other forms. Therefore, the appended claims are intended to cover the scope of the appended claims.

I claim:

1. Apparatus for stabilizing a pallet load comprising: means for supporting the pallet load wrapped in a sleeve of heat shrinkable film having a vertical axis; heating means for heating an annular zone of the sleeve; movable means for providing relative movement between said wrapped pallet load and said heating means along a vertical axis; and means for moving said moveable means; said heating means comprising an annular duct enclosing a central passageway on a vertical axis large enough to pass the pallet load therethrough; said duct having an inlet for the receipt of hot gas; and a plurality of outlets opening on said central passageway for the discharge of hot gas into said central passageway.

2. Apparatus according to claim 1 wherein said duct includes expansible portions whereby the diameter of the central passageway may be varied.

3. Apparatus according to claim 1, further including a hood, secured to and overlying said duct, having an internal height great enough to accommodate the height of the pallet load, and having a recirculating blower therein.

4. Apparatus according to claim 3 wherein said hood includes a vertically expansible portion.

5. A method of shrink-filming wrapping a pallet load comprising a group of containers on a pallet, said method comprising stacking said containers on a pallet of conventional type which comprises upper and lower spaced confronting pallet members each having a peripheral edge, encircling said load and the pallet with a vertical sleeve of heat-shrinkable film by disposing the film withinwise in a vertical plane inwards from a roll of the film, and moving the loaded pallet against said film in said vertical plane and thereby unwinding sufficient film to encircle the load and the pallet, and heat-shrinking the sleeve about the load and around the pallet edges, thereby stabilizing the load on said pallet.

6. Apparatus for shrink-film wrapping a pallet carrying load, said apparatus comprising a conveyor for said pallet carrying load, means for supplying heat-shrinkable film in a vertical plane transversely of the path of movement of said pallet carrying load on said conveyor, whereby movement of said pallet carrying load on said conveyor against the film in said vertical plane withdraws film from said supply means in an amount sufficient to encircle the pallet carrying load, and vertically disposed heat sealing means movable parallel to said film plane for sealing the encircling film along a vertical line upstream of the movement of the pallet carrying load on said conveyor and for severing the encircling film from the film in said vertical plane.

7. Apparatus according to claim 6, wherein means are disposed in association with said conveyor downstream of said sealing and severing means for heat shrinking said encircling film around said pallet and the load thereon.