United States Patent [19]

Amo

[11] **3,801,268**

[45] **Apr. 2, 1974**

[54] **SHRINK-WRAPPING DEVICE**

[76] Inventor: **Donnell J. Amo**, 2003 Nina Ct., Hayward, Calif. 94612

[22] Filed: **Feb. 16, 1973**

[21] Appl. No.: **333,180**

[52] **U.S. Cl.** **432/225**, 34/105

[51] **Int. Cl.** **F27b 9/16**

[58] **Field of Search** 432/225, 226, 227; 34/105

[56] **References Cited**

UNITED STATES PATENTS

1,546,974	7/1925	Faber	34/105 X
2,467,746	4/1949	Hess	432/225 X
2,415,198	2/1947	Webb	34/105

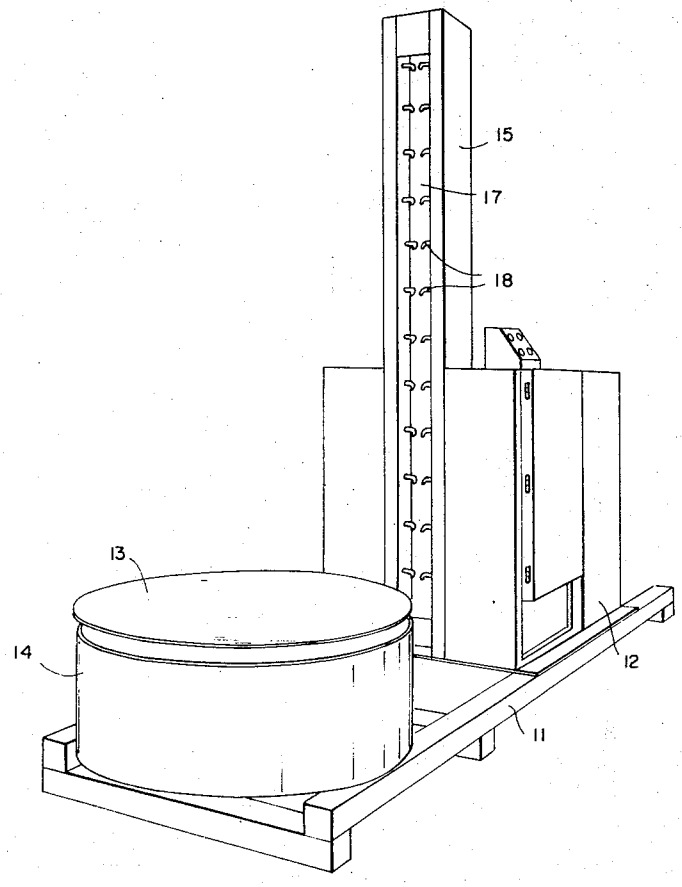
Primary Examiner—John J. Camby

Attorney, Agent, or Firm—Harris Zimmerman

[57] **ABSTRACT**

A shrink-wrapping device for pallet loads includes a turntable for rotating the pallet load, and an adjacent, stationary vertical column. Gas burners spaced along the vertical column are interspersed with cold air jets which mix cold air with hot combustion gases and project the mixture onto a plastic film covering the pallet. The pallet rotates past the column, and the hot air mixture shrinks the film on the top and sides of the pallet. A cam-controlled switch alters the speed of the blower which provides cold air to the jets to ensure uniform heating of the film on the sides and corners of the pallet.

11 Claims, 9 Drawing Figures



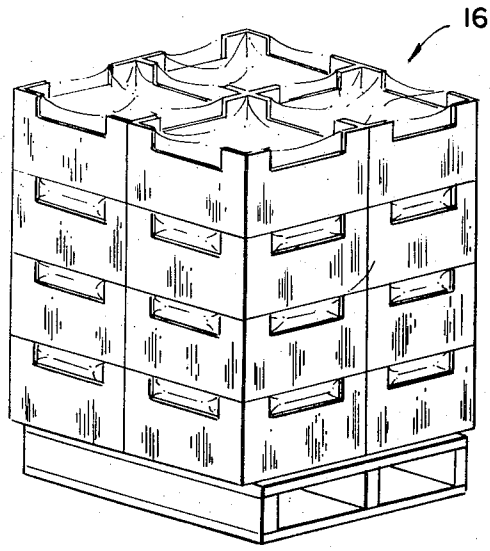


FIG_2

FIG_1

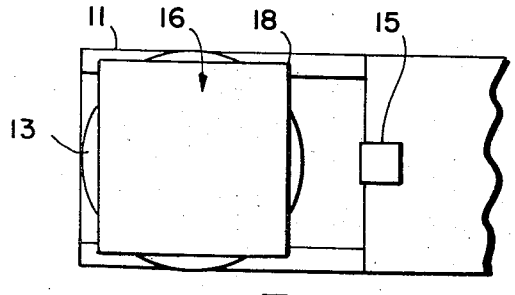


FIG_3

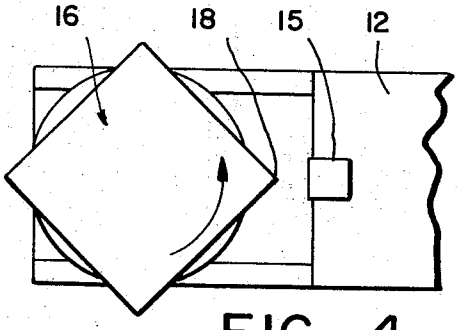


FIG_4

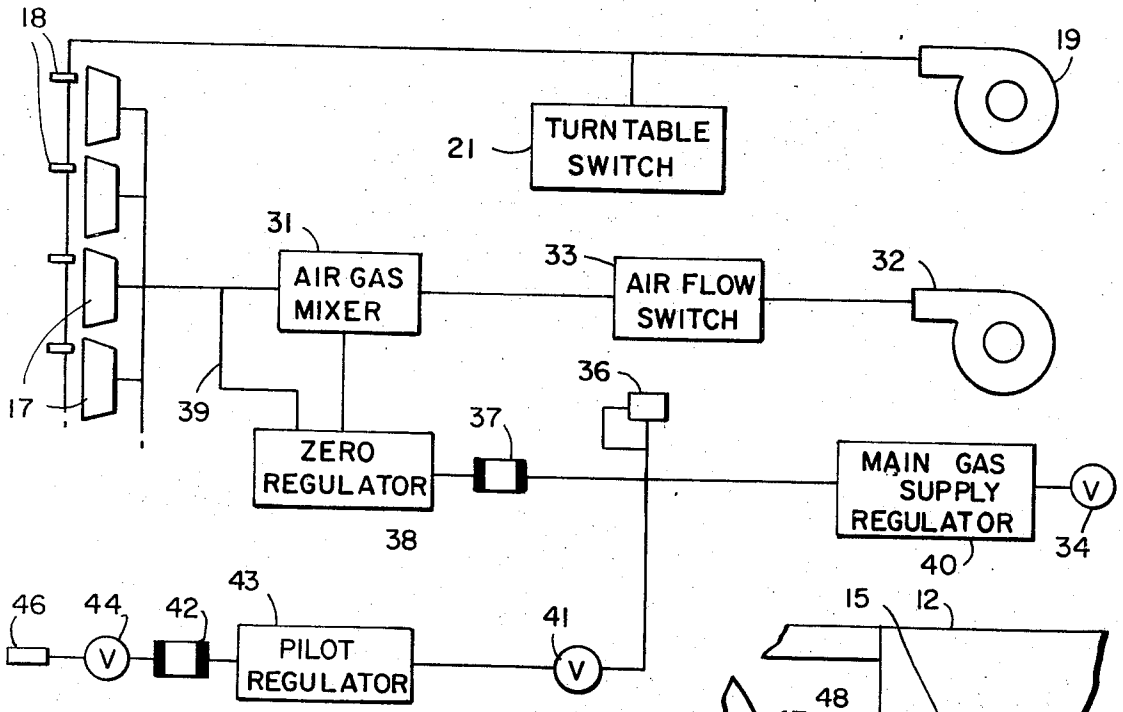


FIG_5

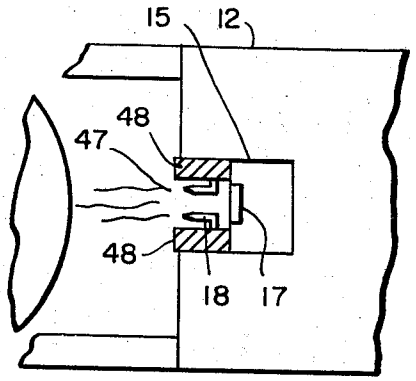


FIG_9

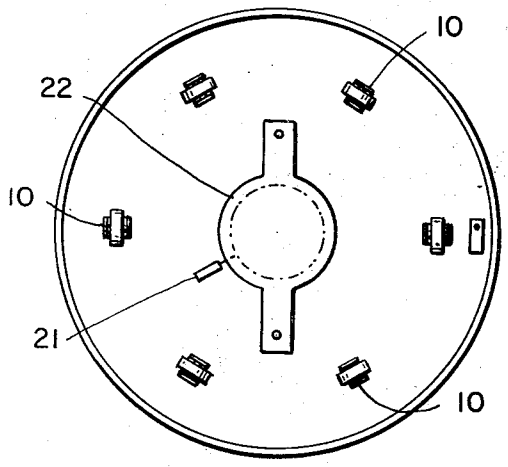


FIG_7

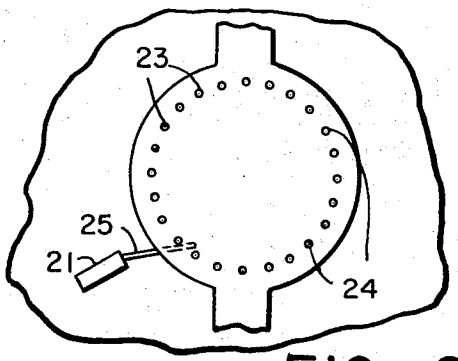


FIG_8

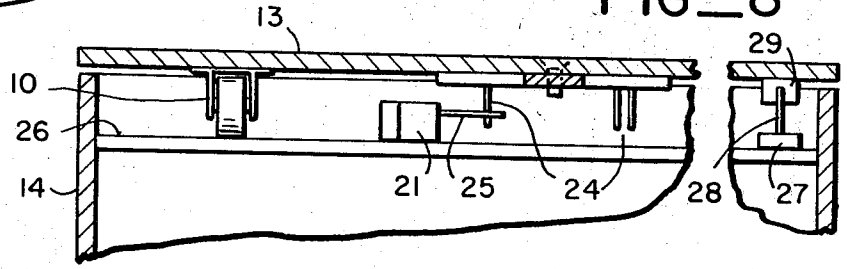


FIG_6

SHRINK-WRAPPING DEVICE

BACKGROUND OF THE INVENTION

Shrink-wrapping large loads has been accomplished, in the prior art, by machines employing tunnels or chambers in which a plastic film is shrunk onto the load by means of heat applied to the film. To provide the required heat, thousands of cubic feet of air are heated in large insulated enclosures, and delivered to the tunnel or chamber. Because of the large masses and volumes involved in these devices, a long preheating time is required before the proper operating temperature is reached. This inherent delay in beginning operation can be inconvenient and costly. And, when these devices are shut down, the great amount of heat energy remaining in them is lost, resulting in a waste of resources and expensive inefficiency. Furthermore, these devices require large floor areas for installation and operation.

SUMMARY OF THE INVENTION

The present invention is directed towards a shrink-wrapping machine for large, palletized loads which overcomes the deficiencies in the prior art. It includes a base on which a rotatable turntable is mounted, with a vertical column secured to the base adjacent to the turntable. Spaced along the column are short flame gas burners, with air jets interspersed between the burners. A blower delivers cold air to the jets, which mix the cold air with the hot flue gases from the burners and direct the mixture onto the pallet load. In the portion of the column extending above the load, the air jets are directed obliquely downward onto the top of the load. As the turntable rotates, the directed stream of hot gases strikes the top and sides of a pallet load placed thereon, causing a plastic film draped on the load to shrink and wrap the entire pallet. A cam-controlled switch in the turntable varies the speed of the blower, so that as a corner of the pallet load rotates into conjunction with the vertical column, the intensity of the stream of hot gases is reduced. Thus the heat delivered to the top, sides and corners is uniform. The present invention requires no delaying warm-up time; it can be used effectively with all thicknesses and types of heat-shrinkable film, and can shrink-wrap the top and sides of pallet loads.

THE DRAWING

FIG. 1 is a perspective view of one embodiment of the present invention.

FIG. 2 is a perspective view of the shrink-wrapped product of the present invention.

FIG. 3 is a top view of a portion of the present invention.

FIG. 4 is a top view of a portion of the present invention.

FIG. 5 is schematic representation of the heating system of the present invention.

FIG. 6 is a side cutaway view of the turntable portion of the present invention.

FIG. 7 is a top view of the turntable portion with the turntable removed.

FIG. 8 is a detailed top view of a portion of the turntable assembly.

FIG. 9 is a top cutaway view of the vertical column shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in FIG. 1, the shrink-wrapping system of the present invention includes a base frame 11, on which a control cabinet 12 is mounted. A turntable 13 is rotatably secured to a cylindrical base 14 which is also mounted on the base frame. Between the cabinet and the turntable, a vertical heating column 15 is secured to the base and to the cabinet. The turntable is driven by a variable speed electric motor to rotate a pallet load placed thereon, allowing a stream of heated air from the vertical heating column to strike all of a plastic film which is draped over the pallet load. The result, as shown in FIG. 2, is a pallet load 16 which is entirely shrink-wrapped in one quick, efficient operation.

Heated air is provided by the vertical heating column by means of short flame gas burners 17 which may be fueled with natural gas or liquefied petroleum gas. The burners are equally spaced along and recessed in one face of the rectangular column, which extends higher than the maximum pallet load. Interspersed between the gas burners are pairs of air jets 18, each of which is individually aimable toward the turntable. The air jets direct streams of air which mix with the hot flue gasses from the burners 17 and strike the pallet load, thus carrying the hot air mixture to the shrink film.

As a square or other rectangular pallet load rotates on the turntable 13, the corners 18 come into increasing proximity with the vertical heating column, as shown in FIGS. 3 and 4, reducing the amount of air flow required to thrust the hot air mixture onto the pallet load. To suitably reduce the air stream intensity, the two-speed blower 19 which pumps air to the jets is switched to its low speed. The speed control switch 21 for the jet blower is located on plate 26 in the base of the turntable, as shown in FIG. 7. The turntable, with a switchplate 22 secured to the underside thereof, is supported on casters 10. The switchplate has holes 23 therethrough centered on a circle concentric about the axis of rotation of the turntable, as shown in FIG. 6 and FIG. 8. The holes 23 receive pins 24 which depend vertically, striking the arm 25 of switch 21 as the turntable rotates to actuate the switch and slow the jet air blower 19 to low speed. The switch arm is spring-biased to the high-speed blower position, and returns to the high-speed position when not actuated by a pin. It should be appreciated that the pins 24 may be placed in holes 23 as required by the shape and vertices of the load to be wrapped, and that multiple pins placed serially in holes 23 will maintain the blower in low-speed operation. Thus the present invention may accommodate a great variety of loads and unusual heat requirements in shrink-wrapping. A limit switch 27 with a switch arm 28 is actuated once during each cycle of the turntable by switch bracket 29, which is affixed to the underside of the turntable. The limit switch terminates each shrink-wrap cycle by stopping the variable speed motor that drives the turntable, and shutting down the heating system.

Instead of using the high-low speed blower arrangement as discussed above, there are other ways of effecting a generally uniform heating of the plastic film, even though portions of the pallet load are at varying distances from the heating column. For example, the speed of rotation of the turntable may be varied, the

speed increasing as the corners come into proximity to the column. Likewise, valve control means can be inserted in the fuel delivery line, with a lesser fuel delivery being made as the corners approach the column.

As shown in FIG. 5, the heating system of the present invention includes jet air blower 19, which pumps air to the air jets 18, and switch 21, which controls the blower speed. The fuel for the burners 17 is provided by the air-gas mixer 31, which mixes air and gas in the correct proportion for proper combustion. Air is pumped to mixture 31 by combustion blower 32 through air flow switch 33, which prevents all gas flow unless the blower 32 is operating. The gas is supplied from the main gas supply regulator 40, which regulates the incoming gas supply to the pressure necessary for proper operation, through the manual main gas shutoff 34, to both the burner supply and the pilot supply. The hi-lo gas switch 36 senses both high gas pressure and low gas pressure to prevent gas flow to the burners if the gas pressure is either too high or too low, and the main gas solenoid 37, an electric valve, controls the gas flow to the burners. The main gas solenoid is operated by the air flow switch 33 and other safety sensors which are not shown. From the solenoid 37 the gas supply for the burners goes through the zero regulator 38, which reduces the gas pressure to near zero before entering the air-gas mixture 31, A balancing line 39 throttles the zero regulator in response to the discharge pressure of the mixer 31, providing constant pressure for the burner air-gas supply.

The supply line for the pilot flame includes the manual shutoff valve 41, the pilot solenoid 42, which is an electric valve for controlling gas supply to the pilot, and pilot regulator 43, which regulates the gas flow to the pilot. The throttle valve 44 is a manual valve for adjusting the pilot flame in the pilot burner 46. The heating system may include safety features such as an ultraviolet pilot flame detector which prevents any gas flow if the pilot flame should go out. As shown in FIG. 9, the burners 17 and the air jets 18 are recessed in a channel 47 in the vertical column 15. To decrease the divergence of the stream of hot gasses from the jets and burners, extensions 48 may be added to the sides of the channel, extending the length of the column. The extensions act to focus the hot air stream in a narrow vertical plane and make the stream more effective in heating the shrink film. Furthermore, the extensions permit the present invention to shrink-wrap loads which are smaller or irregular in surface configuration without special adjustments.

To operate the shrink-wrapper, a pallet load is placed on the turntable, with the corners of the load corresponding to the pins placed in the switch plate 22. This orientation may be facilitated by arrows, corners, or other indicia marked on the turntable. A plastic bag or sleeve of shrink-wrapping material is then placed over the load, and the machine is started. The burners ignite and the air jets operate, producing a hot air stream within one second. The turntable begins to rotate, the hot air stream shrinks the wrapping material on the top and sides as the load turns, decreasing in intensity as a corner approaches the vertical column. In connection with the shrinking of the wrapping material on the top of the load, it will be understood that the same is effected by the column 15 without requiring the use of any adjustable horizontal heater arm or similar mechanism. When the turntable has completed one revolution and the load is completely shrink-wrapped, the limit switch 27 is actuated, stopping the turntable and shutting off the jet air blower and the gas flow to the burners. This stoppage of gas flow results in a substantial saving of fuel, and accordingly, the present apparatus is more economical in operation than other shrink wrap systems. The wrapping pallet is removed and the machine is ready for another cycle.

Thus the present invention provides a shrink-wrapping machine which is virtually automatic, and requires no warm-up period. Furthermore, it can accommodate a great variety of load heights and configurations, and can shrink-wrap using plastic film of any thickness or composition.

I claim:

1. A device for heating and shrink-wrapping a plastic film onto an object, comprising:
   heating means for generating a stream of heated gases in a vertical plane, and
   transparent means for supporting and moving said object through said vertical plane and exposing the top and sides of said object to said stream of heated gases,
   said heating means including vertical column means extending higher than said object when supported on said transport means, and said vertical column means including short-flame gas burners spaced along said vertical column means and directed toward said object supported by said transport means.

2. The shrink-wrapping device of claim 1, wherein said vertical column means includes cold air jets interspersed between said gas burners, said cold air jets emitting a stream of cold air directed toward said top and sides of said object to carry the hot flue gases from said gas burners to said object in said vertical plane.

3. The shrink-wrapping device of claim 2, wherein said vertical column means includes an open vertical channel therein, said channel having parallel vertical sides and a transverse back panel extending between said sides.

4. The shrink-wrapping device of claim 3, wherein said gas burners are mounted on said back panel of said vertical channel.

5. The shrink-wrapping device of claim 4, wherein said vertical channel includes side extension means affixed to said parallel sides for narrowing the vertical opening of said vertical channel to focus said hot gases emanating therefrom in said vertical plane.

6. The shrink-wrapping device of claim 2, wherein said heating means includes variable-speed blower means for pumping air to said cold air jets.

7. The shrink-wrapping device of claim 6, wherein said transport means includes a turntable for rotating said object through said vertical plane.

8. The shrink-wrapping device of claim 7, further including sensing and control means for sensing predetermined rotational positions of said turntable, said sensing means controlling the speed of said variable-speed blower.

9. The shrink-wrapping device of claim 7, including means for intermittently starting and stopping rotation of said turntable.

10. The shrink-wrapping system of claim 9, including means stopping delivery of fuel to said burners upon stopping of turntable rotation.

11. The shrink-wrapping system of claim 1, including means for selectively varying the amount of heat to which portions of said object are subjected.

* * * * *