

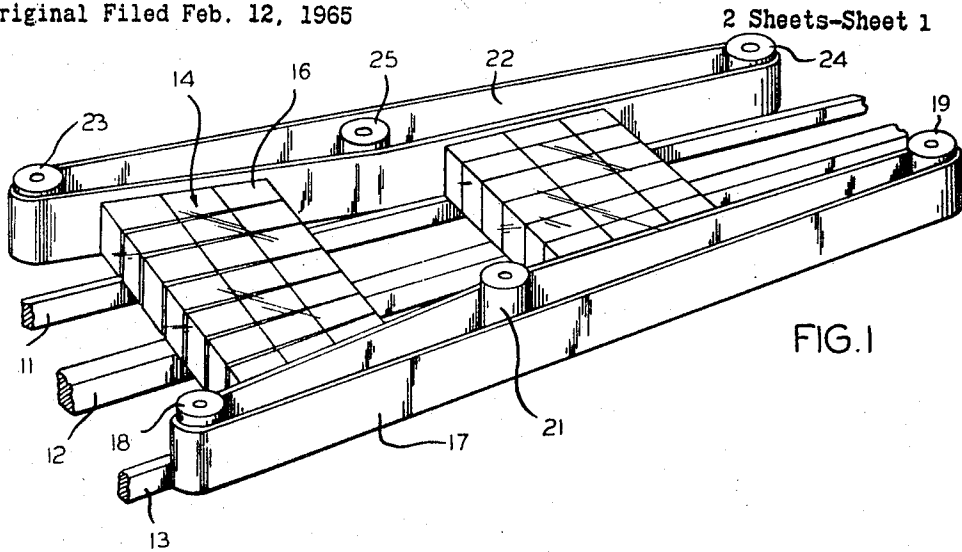
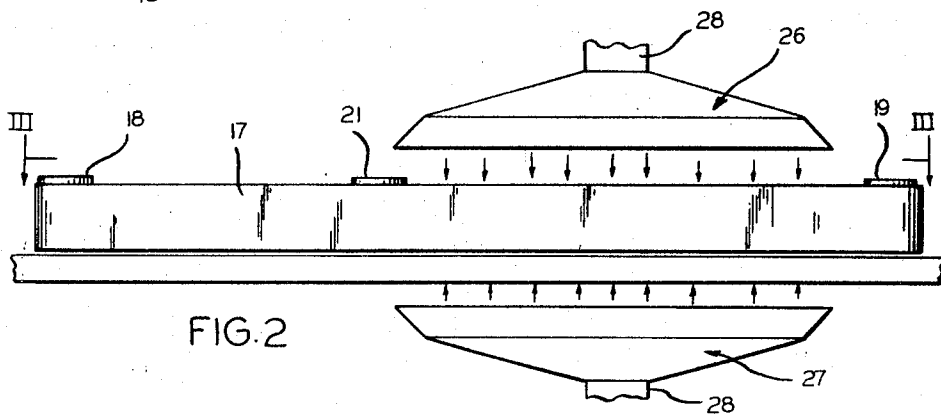
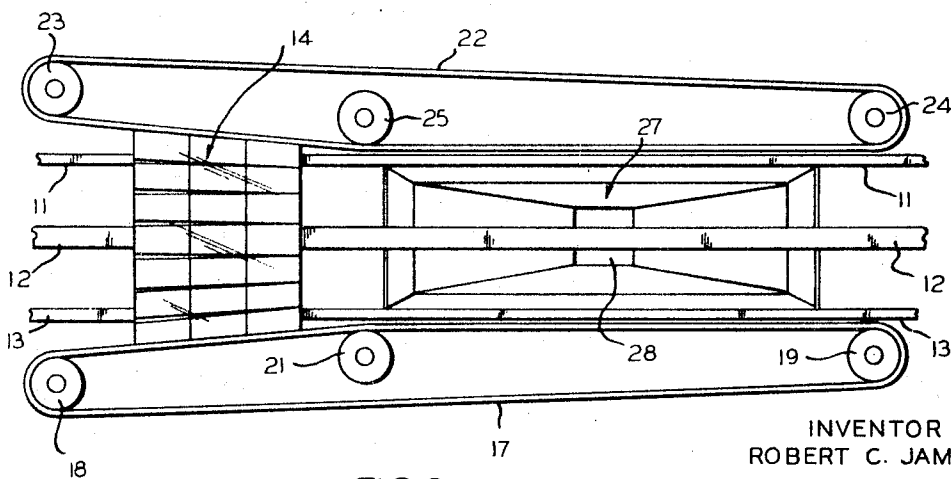
July 29, 1969

R. C. JAMES

3,458,036

COMPRESSED HEAT SHRUNK PACKAGE

Original Filed Feb. 12, 1965



INVENTOR
ROBERT C. JAMES

BY

Sheb, Sherman, Morris, Cross & Simpson
ATTORNEYS

July 29, 1969

R. C. JAMES

3,458,036

COMPRESSED HEAT SHRUNK PACKAGE

Original Filed Feb. 12, 1965

2 Sheets-Sheet 2

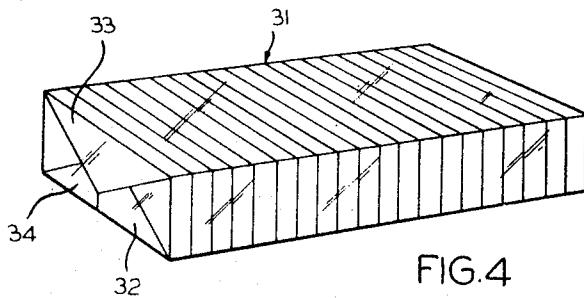


FIG. 4

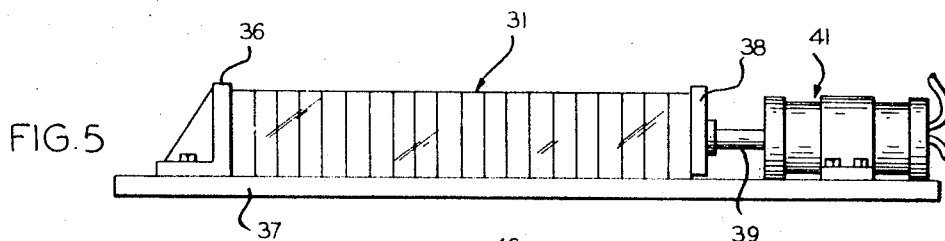


FIG. 5

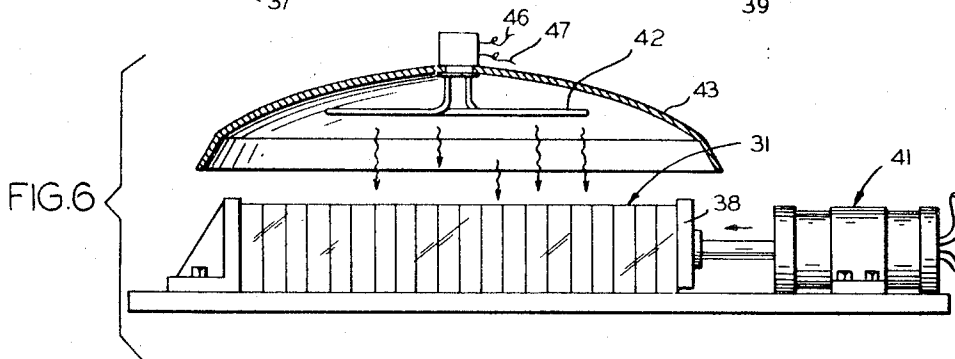


FIG. 6

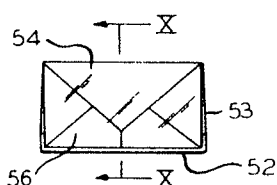


FIG. 9

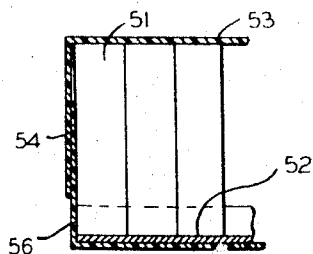


FIG. 10

FIG. 7

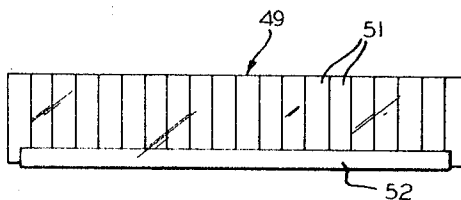
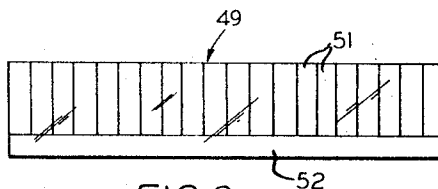


FIG. 8

INVENTOR
ROBERT C. JAMES

BY

Hill, Sherman, Morris, Chase & Simpson
ATTORNEYS

1

3,458,036

COMPRESSED HEAT SHRUNK PACKAGE

Robert C. James, Sheboygan, Wis., assignor, by mesne assignments, to Hayssen Manufacturing Company, Sheboygan, Wis., a corporation of Delaware
Original application Feb. 12, 1965, Ser. No. 432,307, now Patent No. 3,362,128, dated Jan. 9, 1968. Divided and this application Oct. 3, 1967, Ser. No. 684,086

Int. Cl. B65d 75/00, 65/16

U.S. Cl. 206—65

9 Claims

ABSTRACT OF THE DISCLOSURE

The disclosure involves an article comprising a rigid pre-stressed bundle of individual packages which have been wrapped in a shrinkable film, compressed and are held in compression by the shrunk wrapper. A tray may be included in the package to guide application of compression and to provide additional structure.

This is a division of application Ser. No. 432,307 filed Feb. 12, 1965 now U.S. Patent No. 3,362,128 issued on Jan. 9, 1968.

The present invention relates to a method and apparatus for packaging or consolidating individually packaged articles, particularly food articles. It also relates to an improved package or bundle of substantially greater rigidity and load bearing capabilities than presently available.

Many types of products are currently being sold in multi-unit packages, such as individual boxes of breakfast cereals. Heretofore, some means has had to be provided for rigidifying such a package, since the outer wrapper itself could not be drawn about the assembled units sufficiently tightly so that a rigid package or bundle would result.

The method and apparatus of the present invention overcome these difficulties and provide a consolidated composite package or bundle of improved rigidity, and composed of a compressed stack of aligned individual packages which are held in compressed relationship by a heat shrinkable film about the periphery of the packages.

In general, the method of the present invention involves wrapping a heat shrinkable film about an aligned stack of the packaged articles, compressing the resulting wrapped stack to rigidify the same, but short of the point where crushing of the packages might occur, and heating the resulting wrapped stack while the stack is under compression to shrink the film into conformity with the stack and hold it in its compressed condition.

An object of the present invention is to provide an improved method for consolidating a plurality of individually packed articles into a package or bundle which is quite rigid and therefore has substantially greater load bearing properties.

Another object of the invention is to provide a method for economically consolidating a number of individual packages or bundle into a rigidified stack.

Still another object of the invention is to provide an apparatus for compressing a stack of aligned packaged articles and then shrinking a heat shrinkable film about the same to conform to the stack and hold the stack in compressed relation.

Still another object of the invention is to provide an improved consolidated package or bundle containing a plurality of individually packaged articles.

The present invention makes use of the technique of compression bundling and, to that extent, it is similar to the subject matter of Wilson U.S. Patent No. 2,962,848, owned by the assignee of the present application. In the

2

forementioned patent, there is described a method and apparatus for compression bundling which was designed to eliminate the need for providing heavy corrugated or fiberboard cartons of shipping cases for small product packages. Generally, the method involved conveying a group of individual packages and compacting the same into tight rows to thereby form a tight block, projecting the compacted block of unit packages adjacent a flexible wrapping sheet, draping the wrapping sheet over the block, and folding and securing the wrapping sheet about the block while the block was still being maintained in a compacted condition.

The method and apparatus of the present invention make use of some of the techniques and equipment which are described in the aforementioned Wilson patent, but differ substantially therefrom in the nature of the wrapper used to hold the individual units in compressed condition.

The wrapping materials used in accordance with the present invention are heat shrinkable films, normally composed of a thermoplastic resinous material which has been oriented at least in one direction by stretching during its process of manufacture to render it shrinkable by heat. A cast or extruded film can be stretched to align the molecules into a more orderly pattern, giving the film increased strength and toughness as well as shrinkability. In some cases, the film may be biaxially oriented to provide equal shrink in both the longitudinal and transverse dimension of the film. The orientation also serves to increase the resistance to cold cracking of the film, so that it retains its flexibility at low temperatures.

One of the particularly preferred materials for use in accordance with the present invention is a biaxially oriented polyvinyl chloride film. This material will shrink a maximum of about 60% at 325° F. With a source of hot air as the heating medium, the film is normally heated to 300 to 310° F. with a dwell time of about 2 to 5 seconds.

While polyvinyl chloride represents the preferred embodiment of the present invention, other heat shrinkable polymers can also be employed, such as oriented polyvinylidene polymers, vinyl-vinylidene copolymers, rubber hydrochloride, polyethylene, polypropylene, and polyester films such as "Mylar" (polyethylene terephthalate).

The wrapping of the multi-unit package or bundle can be accomplished in several different ways. For one, a plurality of stacked individual units may be first wrapped in the heat shrinkable film, and then subjected to compression to rigidify the rows of packages, after which the compressed array can be subjected to heat which causes the overlying film wrapper to shrink and conform to the compressed package units. Alternatively, the compression and heating may be accomplished as part of a substantially simultaneous operation. Other features of apparatus and method will be described in conjunction with the attached sheets of drawings in which:

FIGURE 1 is a fragmentary view in perspective of a conveying mechanism which may be used to compress the articles;

FIGURE 2 is a view in elevation, partly schematic, of a heating means which may be used in conjunction with the conveying means of FIGURE 1;

FIGURE 3 is a plan view of the conveyor and heating mechanism taken substantially along the lines III—III of FIGURE 2;

FIGURE 4 is a view in perspective of a wrapped stack or bundle of unit packages prior to compression;

FIGURE 5 is a view in elevation of a compression mechanism which can be employed with the type of stack or bundle shown in FIGURE 4;

FIGURE 6 is a view of the compression mechanism in

operation in conjunction with a heater which shrinks the wrapper about the stack or bundle;

FIGURE 7 is a view in elevation of a modified form of the invention, with the unit packages being supported within a tray prior to compression;

FIGURE 8 is a view similar to FIGURE 7 but illustrating the articles after compression;

FIGURE 9 is an end elevational view of the completed package or bundle; and

FIGURE 10 is a fragmentary enlarged cross-sectional view taken substantially along the line X—X of FIGURE 9.

AS SHOWN IN THE DRAWINGS

In FIGURE 1, there is illustrated a conveying mechanism including a plurality of bottom rails 11, 12 and 13 for slidably supporting the wrapped packages for movement therealong. The packages in the specific illustration shown in FIGURE 1, and identified at reference numeral 14, include three rows of unit or individual packages 16, with seven packages in a row. The entire bundle of packages, 21 in all, were wrapped with an overwrap of a heat shrinkable film conforming as tightly as possible to the contour of the package. A compression belt 17 is trained about a pair of rollers 18 and 19 supported on vertical axes, with an intermediate roller 21 engaging the belt 17 intermediate the rollers 18 and 19. Similarly, a compression belt 22 is mounted for movement on the other side of the conveying means, the belt 22 being driven from vertically supported rollers 23 and 24 with an intermediate roller 25 being positioned to engage the inner surface of the belt 22 intermediate the rollers 23 and 24. The spatial arrangement is such that the belts 17 and 22 provide a relatively wide gap at the inlet end, the left side of the showing of FIGURE 1, but the positioning of the rollers 19, 21, 24 and 25 is such that the gap narrows as the belts propel the packages in the forward direction, whereupon the belts 17 and 22 exert a substantial compressive force on both sides of the package 14, causing a significant amount of compression to take place. This compression, of course, is short of the force which would crush or mutilate the packages, but is sufficient to rigidify the units substantially, thereby making the composite package or bundle of the individual units considerably more resistant to buckling. The heat shrinkable wrapper film, being relatively limp, does not compress to a significant degree in this stage, but, as illustrated in FIGURE 2, it is thereupon subjected to a heat treatment by means of hot air distributors 26 and 27 located above and below the conveyor system, respectively. Each of the heating means includes an inlet conduit 28 which directs a stream of hot air at the heat shrinkable film on the conveyor as best illustrated in FIGURE 2 of the drawings. Normally, only a few seconds dwell time is required for the heat shrinkable film to shrink into conformity with the compressed individual packages. The shrink fit thus provided effectively holds the compressed unit packages in their compressed form.

Most heat shrinkable materials are also inherently heat sealable. Thus, it is advisable to provide the initial wrap of the film over the packages with overlapping edges which can be heat sealed together simultaneously with the shrinkage of the film about the compressed packages. Alternatively, of course, the package or bundle can be sealed by the use of adhesives, solvents, or the like. With some types of shrinkable films, it is desirable to maintain the compression on the packages until all of the heat has been dissipated from the film, to render the film stable enough to withstand the forces within the package.

The package or bundle 31 illustrated in FIGURE 4 includes 20 units or individual packages, wrapped in a heat shrinkable film 32 provided with overlapping end flaps 33 and 34. As illustrated in FIGURE 5, this aligned stack of unit packages is positioned with one end abutting against

a fixed stop 36 on a platform 37, and being compressed by means of a piston 38 disposed on a shaft 39 which is operated by an air cylinder 41 or similar device for moving the piston 38 to compress the package 31, and retract it after sealing.

As shown in FIGURE 6, while the package or bundle 31 is being compressed by the piston 38, the package or bundle 31 is being simultaneously heated by means of an electrical heating element 42 disposed within a reflector 43 and energized from a suitable source of power by means of conductors 46 and 47. The heat radiated by the electrical heating element 42 is sufficient to shrink the film 34 into close conformity with the package or bundle 31 which is still under compression. The end flaps 33 and 34 may simultaneously be heat sealed together or adhesively secured in a subsequent operation.

In the form of the invention illustrated in FIGURES 7 through 10 inclusive, a package or bundle 49 is made up consisting of the individual unit packages 51 slidably mounted along an open ended tray 52, the entire package consisting of the unit packages 51 and the tray 52 being wrapped with a heat shrinkable film 53 having end flaps 54 and 56 thereon. The package is then put into a suitable compression mechanism, such as the type illustrated in FIGURES 5 and 6, to compress the packages 51 so that they are flush with the end of the tray 52, as illustrated in FIGURE 8. Then, or simultaneously therewith, the film 53 is subjected to a shrinking operation by the application of heat, whereupon it shrinks to conform to the tray and package combination, and holds it in compressed relation. At the same time, the end flaps 54 and 56 may be heat sealed together. Then, when the package is opened by the user, individual packages 51 may be removed therefrom while still leaving a receptacle for holding the remaining packages.

Since the articles in the package or bundle of the present invention are snugly fitted together, bowing of the package is prevented, thereby increasing the load carrying capacity of the packaged units.

Physical testing of packages or bundle produced according to the present invention showed that they will take a higher maximum load with lower deflection than packages or bundle produced by other means. To illustrate, 48 individual packages of gelatin in their regular paper cartons were packaged with a heat shrinkable polyvinyl chloride film of 1 and ½ mils in thickness, and the outer wrap was thereupon shrunk by means of hot air, but no compression of the contents was employed. Additional samples were made using the identical number of gelatin packages of the same orientation, and wrapped in a 47 pound glue sealed linerboard material under compression as described in Wilson Patent No. 2,962,848. Still other samples were made using the same orientation of packages, wrapped in the 1 and ½ mil heat shrinkable polyvinyl chloride, but having the packages compressed prior to shrinking of the film onto the packages. The compression was accomplished in a compression machine having a movable upper platen travelling at a constant rate of ½ inch per minute, and the packages were compressed until maximum bearing load had been achieved.

The samples which had been packaged with the shrink film alone evidenced an average deflection of 0.165 inch. The packages which were compressed, but which did not employ the heat shrinkable film also evidenced an average deflection of 0.165 inch. The materials produced according to the present invention, and produced by compression of the contents and shrinking of the plastic film evidenced an average deflection of 0.145 inch. Projecting these figures based upon the deflection data, the maximum load for the packages or bundle of the present invention would be in the area of about 3500 to 3700 pounds, whereas the maximum load for the other samples averaged about 3230 pounds for the units packaged in the shrink film without compression, and 3025 pounds for

5

those compressed but not wrapped with the shrinkable film.

From the foregoing, it should be understood that the process of the present invention provides a substantially improved consolidation of unit packages which can withstand more load than packages or bundles produced with other techniques.

It should also be understood that various modifications can be made to the described embodiments without departing from the scope of the present invention.

I claim as my invention:

1. A rigid pre-stressed bundle comprising a plurality of individual abutting packages wrapped in a heat shrunk material, said individual packages being rigidly held together by said material under a package deforming compressive force applied prior to shrinking of the material.

2. A rigid pre-stressed bundle according to claim 1, wherein said packages are aligned in a row and abut each other over a substantial portion of their surface.

3. A rigid pre-stressed bundle comprising a plurality of individual abutting packages wrapped in a heat shrunk material, said individual packages being rigidly held together by said material under a package deforming compressive force applied prior to shrinking of the material and wherein said packages are arranged in abutting longitudinally and transverse rows, and wherein said heat shrunk material is biaxially oriented to provide shrink along the direction of both the longitudinal and transverse rows.

4. A rigid pre-stressed bundle comprising a plurality of individual abutting packages wrapped in a heat shrunk material, said individual packages being rigidly held together by said material under a package deforming compressive force applied prior to shrinking of the material and wherein said packages have outer uncompressed di-

6

mensions and outer compressed dimensions and wherein said bundle further includes within said wrap a tray of dimensions substantially equal to said compressed dimensions, but less than that of said uncompressed dimensions whereby said tray acts as a guide in compression and upon removal of a package from the bundle provides a receptacle for the remaining packages.

5. A rigid pre-stressed bundle according to claim 4, wherein said individual packages have a substantially planar lower surface and wherein said tray is positioned below and in contact with said planar lower surface.

6. A rigid pre-stressed bundle according to claim 1, wherein said wrapping material is composed of an oriented polyvinyl chloride.

7. A rigid pre-stressed bundle according to claim 1, in which said material is composed of an oriented polyvinylidene chloride.

8. A rigid pre-stressed bundle according to claim 1, in which said material is composed of an oriented rubber hydrochloride.

9. A rigid pre-stressed bundle according to claim 1, in which said material is composed of an oriented polyester resin.

References Cited

UNITED STATES PATENTS

Re. 25,624	7/1964	Stahl.	
2,962,848	12/1960	Wilson	53—124
3,001,644	9/1961	Fourness et al.	229—51
3,231,083	1/1966	Rumsey	206—45.33
3,263,807	8/1966	Fingerhut	206—65

WILLIAM T. DIXSON, Jr., Primary Examiner

U.S. Cl. X.R.

206—45.33