Dec. 6, 1960 D. A. WILSON 2,962,848

ART OF COMPRESSION BUNDLING

Filed Oct. 23, 1959

2 Sheets-Sheet 1

Fig. 2.

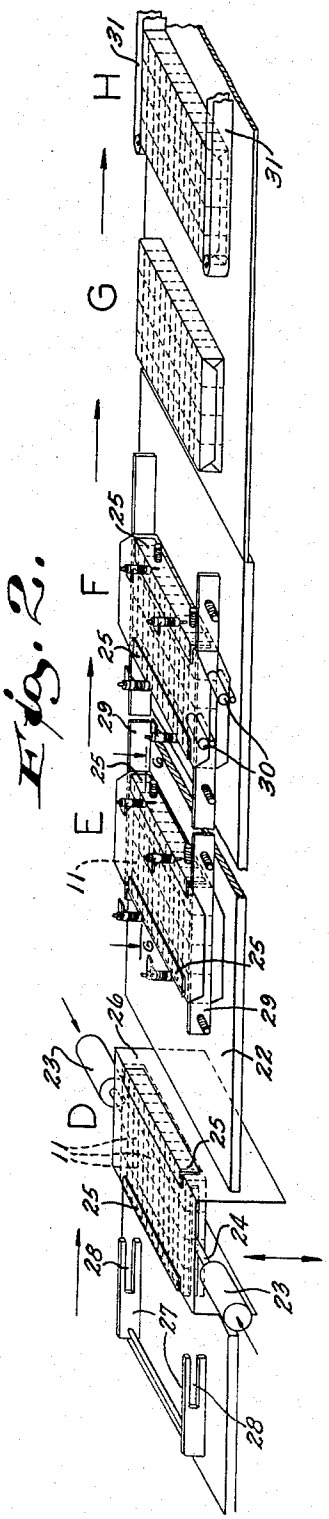
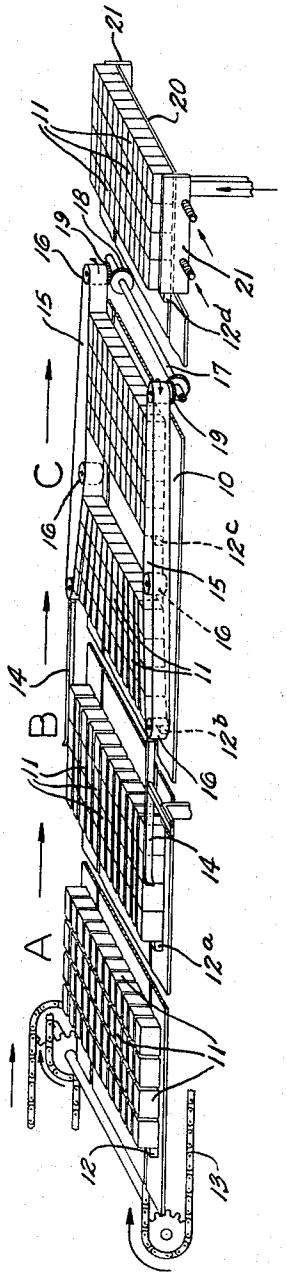


Fig. 1.



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2 Sheets-Sheet 2

Fig. 3.

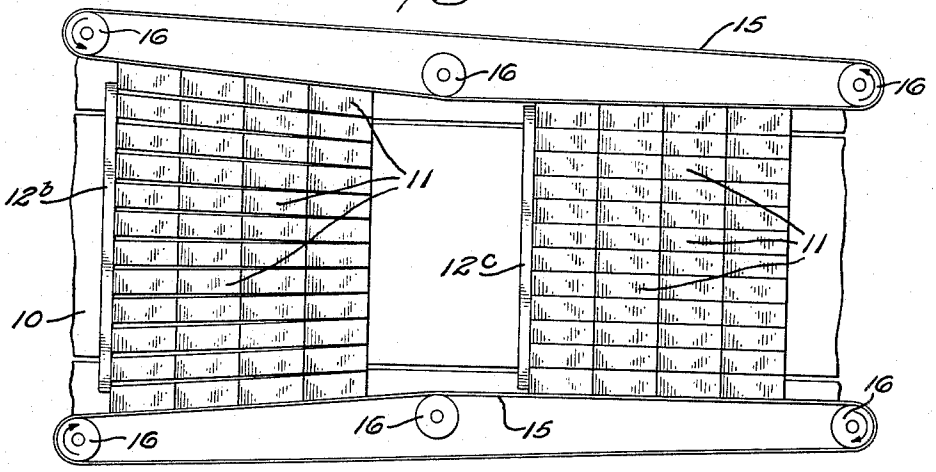


Fig. 4.

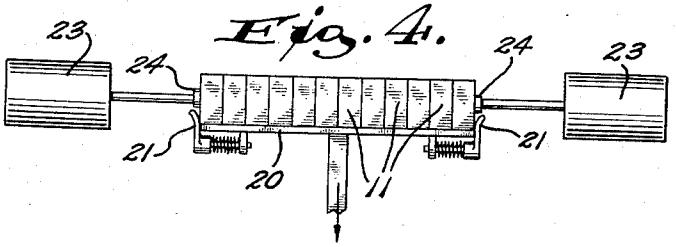


Fig. 5.

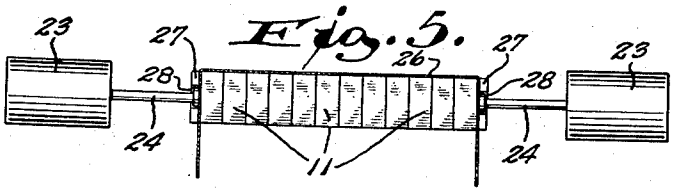


Fig. 7.

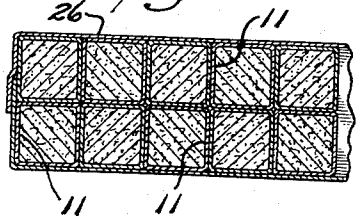
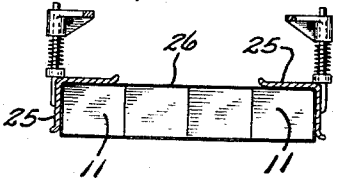


Fig. 6.



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ART OF COMPRESSION BUNDLING

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5 Claims. (Cl. 53—124)

This invention relates to improvements in the art of compression bundling, and more particularly to an improved method of and apparatus for effectively bundling a plurality of uniform small packages or units.

Many commodities are packaged in individual small packages or units for individual sale by the retailer. However, it is customary for the manufacturer or processor to ship a multiple number of the smaller packages, which are identical, in large corrugated or fiberboard cartons, as it was felt that it was necessary to protect the inner packages or units by the heavy walls of the cartons. The retailer, upon receiving a large carton of the product containing a multiple number of the smaller packages, would open the carton, price mark the individual packages, and place a number of the same on his shelves for retail sale. The shipping case or carton in which the smaller packages or units were packed would remain in its original size and form, and storage space would have to be found therefor as some of the packages might remain therein for future display and sale.

Not only was it expensive to provide heavy corrugated or fiberboard cartons or shipping cases for the product packages, but storage space for the same presented a problem. With the above in mind, therefore, it is a primary object of the present invention to provide an improved method of and apparatus for compression bundling whereby a multiple number of identical small commodity packages or units can be wrapped in a heavy sheet of paper or single-faced or double-faced corrugated board, which wrapping material is applied about a predetermined number of the smaller packages or units, while the latter are under compression in all directions, whereby, through the compression applied to the multiple number of smaller packages during the wrapping operation an extremely rigid and strong outer package or bundle is produced which will satisfy shipping, insurance, and Interstate Commerce Commission requirements.

A further object of the invention is to provide a method of and apparatus for compression bundling wherein the wrapped inner packages or units, kept under compression in all directions during the wrapping operation, impart to the completed bundle, cellular or honeycombed characteristics, providing a finished bundle or package of great strength, but of low weight, and which utilizes as its wrapping sheet inexpensive heavy paper or single-faced corrugated board instead of a heavy and expensive carton or shipping case.

A further object of the invention is to provide, in a compression bundling apparatus, conveyor means for advancing a predetermined number of juxtapositioned similar small packages or units, which will constitute the ultimate bundle, together with means for initially compacting the loose packages on the conveyor, followed by means for compressing the units making up the bundle, both widthwise and lengthwise while being advanced.

A further object of the invention is to provide, in a compression bundling apparatus, means on an elevator to hold the individual units or packages making up a bundle, in a compressed condition while being projected adjacent a flexible wrapping sheet to be wrapped therein into bundle formation, all while the individual packages are maintained in a compressed condition.

A further object of the invention is to provide, in an apparatus for compression bundling, means for holding the unit packages making up a bundle under compression while a sheet of wrapping material applied thereto is being folded and sealed about a predetermined number of the unit packages.

A further object of the invention is to provide an improved method of compression bundling a plurality of grouped, unit packages wherein the grouped unit packages are maintained under high compression while being advanced and presented to a sheet of flexible wrapping material, and during the complete application and sealing of the wrapping material, to provide an ultimate bundle which is extremely solid, compact and which possesses great strength and rigidity due to its cellular structure and the fact that the units therein were placed under compression during the packaging operation.

A further object of the invention is to provide, in the art of compression bundling, a compact but strong bundle of a plurality of unit packages in which the wrapping sheet for the bundle is of inexpensive flexible material, susceptible of being easily opened for the removal of any desired number of the unit packages, following which the wrapping sheet may be folded and secured in more compact condition about the remaining unit packages in the bundle for convenience and for the saving of space in storage.

Other objects of the invention are to provide an improved method of and apparatus for compression bundling which are expeditious but simple, and which are well adapted for the purposes described.

With the above and other objects in view, the invention consists of the improvements in the art of compression bundling, including all of its parts, combinations and steps, as set forth in the claims, and all equivalents thereof.

In the acompanying drawings in which the same reference characters indicate the same parts in all of the views:

Fig. 1 is a schematic perspective view of the infeed portion of an improved compression bundling machine pursuant to the present invention, with portions broken away and in section;

Fig. 2 is a schematic perspective view of the wrapper applying portion of the improved compression bundling machine, parts being broken away and in section;

Fig. 3 is an enlarged plan view of a portion of the bed of the infeed part of the machine showing toed-in compression belts which serve to compress the bundle formed by a plurality of unit packages lengthwise while the packages are being advanced by the conveyor;

Fig. 4 is an enlarged fragmentary side view of the elevator portion of the machine in its "up" position with means for holding the unit packages forming a bundle in compression;

Fig. 5 is a detail view similar to Fig. 4, only showing the condition of the bundle after the elevator has been retracted and the rear lappers for the wrapping mechanism are in an overlapping position;

Fig. 6 is a transverse sectional view taken approximately along the line 6—6 in Fig. 2; and

Fig. 7 is a transverse fragmentary sectional view through a completed compressed and wrapped bundle of a two tier type.

Referring now more particularly to the drawings, it will appear that the infeed extent of the improved compression bundling machine is shown in Fig. 1. The numeral 10 designates a flat bed plate whereon, at a station indicated A, a predetermined number of identical unit packages 11 of a commodity are deposited by con-

veyor means in adjacent but loosely arranged rows. During the continuous operation of the machine this deposit of a predetermined number of unit packages upon the bed plate at station A is continuous and each group of the unit packages is advanced horizontally in the direction of the arrows in Fig. 1 by a conventional power driven conveyor which includes spaced apart flight bars **12**, **12**(*a*), **12**(*b*), **12**(*c*), **12**(*d*), etc., the ends of the flight bars being attached to an endless conveyor chain **13**. As the group of unit packages **11** is advanced by a flight bar of the conveyor from station A to station B, the flight bar **12**(*a*) pushing against the group of unit packages causes the same to enter between transversely spaced apart guide rails **14** supported from the upper part of the bed plate **10** which serve to initially compact the loosely arranged group of unit packages **11** both lengthwise and widthwise of the group. At station C there are mounted along opposite margins of the bed plate **10**, driven compression belts **15** which are guided by rollers **16** mounted on upright axes. As is shown more clearly in Fig. 3 the belt engaging rollers **16** are so arranged that the entrance or mouth formed between the pair of belts **15** is relatively wide but the effective space there-between becomes narrower and more restricted so that as the group of unit packages **11**, reaching station C, is advanced by the conveyor flight bar **12**(*b*) the toed-in arrangement of the compression belts **15** forces the unit bundles **11** together and very substantially compresses the group lengthwise. Any suitable means, as a driven shaft **17** carrying gears **18** meshing with gears **19** on certain of the belt-carrying rollers **16**, will cause said rollers to be driven to move the endless compression belts **15**.

With reference to Fig. 1 and adjacent the restricted or toed-in ends of the compression belts **15**, the bed plate **10** aligns with the flat platform portion of a vertically movable elevator **20** and which receives the group of unit packages **11** which have been brought together in tightly compressed condition by the instrumentalities at stations B and C. To maintain the group of packages under compression while on the elevator **20**, the receiving plate portion of the latter, at its side margins, is equipped with spring loaded side plates **21**, wherein the spring arrangement is shown schematically in Fig. 1, but in more detail in Fig. 4.

The elevator **20** is of the type which is conventional in wrapping machinery to move an article to be wrapped into juxtaposition to a sheet of wrapping material and the wrapping instrumentalities. In the present embodiment the wrapping and outfeed extent of the improved compression bundling apparatus has the inner end of its bed plate **22** positioned above and slightly to the right (relative to Fig. 1) of the elevator **20**. The wrapping and outgoing extent of the machine is shown in Fig. 2 and it should be understood that in actual practice the elevator **20**, with a group of compressed unit bundles **11** thereon, maintained in compressed condition by the spring-loaded side plates **21**, moves vertically upwardly from the position of Fig. 1 to a position adjacent the inner end of the bed plate **22** in Fig. 2. However, in Fig. 2 the elevator **20** has been lowered or retracted, but said elevator, before commencing its descent, is shown in Fig. 4.

When the elevator **20** reaches its upward limit of travel so as to align with the inner end of the bed plate **22** of the upper portion of the mechanism the unit packages **11** are still maintained in a state of compression by the spring-loaded plates **21**. The numerals **23** indicate air cylinders which are automatically operated in timed relation to the movements of the elevator **20** to forcefully project pistons **24** against the ends of the compressed unit packages on the elevator platform and as soon as the engagement is made by the pistons **24**, as shown in Fig. 4, the elevator is retracted or lowered so that the situation shown at the left hand end of Fig. 2 attains. In this position the longitudinal margins of the compressed group of unit packages **11** are tightly engaged by angled, spring-loaded ejector buckets **25** which engage the longitudinal margins of the group of unit packages after a sheet **26** of wrapping material has been fed into the mechanism by conventional means to cover the top of the group of unit packages and to drape over the sides and ends thereof. To avoid obscuring portions of the drawing the spring-loading means for said buckets **25** have been omitted at the primary wrapping station D but are shown at the advanced wrapping stations E and F. Also, to prevent obscuring portions of the assemblage the wrapping sheet has been omitted from Figure 4. In Figure 2, the numerals **27** indicate conventional rear folders for a sheet wrapping mechanism and the same, by means common in the art, are projected from the inactive position of Fig. 2 to an advanced position toward the right to cover the entire end portions of the group of unit packages and to hold the wrapping material sheet **26** over the same, while the spring-loaded buckets **25**, when applied aid in folding the sides of the sheet **26** downwardly along the longitudinal margins of the group of unit packages **11**. These wrapper folding operations take place at station D as the elevator **20** descends and the projected operative position of the rear folders **27** is shown in Fig. 5, wherein the slots **28** accommodate the pistons **24**. The pistons **24** of the air cylinders **23** remain in their projected, package-end engaging positions until the rear folders **27** are in the operative package overlapping position shown in Fig. 5.

After the operations are performed at station D the group of compressed unit packages **11** is advanced along the bed plate **22** toward the right relative to Fig. 2 to station E by a conventional conveyor (not shown). At station E the wrapping sheet **26** is rather completely folded about the group of unit packages **11** which are maintained under compression by the buckets **25** and the group of compressed unit packages, as thus wrapped, enters between a pair of transversely spaced apart spring-loaded wrapper folding bars **29**. In advancing from station E to station F the end folds of the wrapping sheet are run through conventional creaser rollers **30** which maintain compression in the completed bundle.

From station F the wrapped bundle, wherein the unit packages are maintained under compression, are advanced to station G which illustrates a completed compressed wrapped bundle of unit packages. Conventional means then advance the fully wrapped bundle from station G to station H where discharge belts **31** are provided which hold the end folds of the wrapping sheet **26** while the glue or adhesive previously applied thereto is setting. The discharge belts operating at station H carry the completely wrapped and compressed bundles to a suitable discharge or collection station.

In the finished bundle all of the unit packages **11** therein are maintained by the folded and sealed wrapping sheet **26** in compressed condition. This gives great strength to the final bundle and prevents buckling or misalignment of any of the unit packages **11** therein so that the surface portions of the wrapped bundle always remain in a flat undented condition.

While Figs. 1 and 2 illustrate a plurality of unit packages **11** wrapped to produce a single tier bundle, it is obvious within the purport of the present invention, that the final bundle may comprise two or more tiers of aligned and compressed unit bundles, as shown in Fig. 7.

In carrying out the improved method of compression bundling, many instrumentalities conventional in wrapping machinery are employed, but the essence of the invention is maintaining the group of unit packages under tight compression in several directions during all of the stages and particularly during presentment of the group of unit packages making up the bundle to the sheet of wrapping material and maintaining the compression on the unit packages while the wrapping sheet is applied

and thereafter during the folding and sealing of the wrapping sheet. By keeping the bundle in compression at all times the unit packages making up a bundle are held in close and compact alignment to produce, in the ultimate bundle, a cellular or honeycombed structure whereby the ultimate bundle, even though wrapped with a paper sheet, possesses great strength and rigidity.

From the foregoing description it will be seen that the improved method of and apparatus for bundling under compression a plurality of uniform small unit packages subjects the unit packages to substantial pressure and compacting in several directions while each group of unit packages is being advanced for presentation to the sheet of wrapping material. The compression is maintained during the application of the wrapping material and the folding and sealing thereof. The completed bundles possess great strength and rigidity and, notwithstanding the fact that relatively light weight wrapping material is used as compared with heavy corrugated board cartons, the bundles will satisfy all requirements.

The apparatus is relatively simple, is expeditious in operation, and the improved method of compression bund'ing is higly practical.

Various changes and modifications may be made in both the method and apparatus described, without departing from the spirit of the invention, and all of such changes are contemplated as may come within the scope of the appended claims.

What is claimed as the invention is:

1. The method of wrapping together a group of similar unit packages which comprises, loosely grouping a predetermined number of similar unit packages on a support, advancing the group of unit packages in a longitudinal horizontal path and compacting the latter into tight longitudinal and transverse rows while advancing to form a tight rectangular block, advancing the block onto an elevator, raising the elevator while maintaining the block in compacted condition thereon to project the compacted block of unit packages adjacent a flexible wrapping sheet, engaging opposite sides of the block by compacting members and lowering the elevator away from the block while the block is engaged and supported only by said compacting members and with the wrapping sheet draped over the block, and finally folding and securing the wrapping sheet about said block while the same is maintained in compacted condition.

2. In a bundling machine, a flat elongated bed plate having a receiving station at its inner end portion for the reception of a group of loosely disposed unit packages, a conveyor operating along said bed plate and having transverse flights thereon to engage and push forwardly along the bed plate successive groups of unit packages, compression belts operatively mounted on opposite sides of an intermediate extent of the bed plate with their planes perpendicular to the plane of the bed plate, the entrance end between said belts being wider than the exit end whereby the group of unit packages is compacted while the conveyor is advancing the group of unit packages adjacent said compression belts, means for moving said compression belts in the direction of travel of the conveyor, an elevator adjacent the outer end of the bed plate to receive the group of compacted unit packages, and means carried by the elevator and engageable with the group of unit packages to retain the same in compacted condition.

3. In a bundling machine, a flat elongated bed plate having a receiving station at its inner end portion for the reception of a group of loosely disposed unit packages, a conveyor operating along said bed plate and having transverse flights thereon to engage and push forwardly along the bed plate successive groups of unit packages, compression members mounted on opposite sides of an intermediate extent of the bed plate to engage and compact a group of unit packages while the same are

being advanced by the conveyor, a vertically movable elevator adjacent the outer end of the bed plate to receive the group of compacted unit packages and elevate them, releasable compression members carried by the elevator and engageable with the group of unit packages deposited thereon to retain the same in compacted condition, wrapper applying mechanism extending adjacent the upper limit of movement of the elevator, and package group engaging and compressing means associated with the wrapper applying mechanism and coordinated with the release of the elevator-carried compression members to permit descent of the elevator after presentation of its compressed load to the wrapper applying mechanism.

4. In a bundling machine, a flat elongated bed plate having a receiving station at its inner end portion for the reception of a group of loosely disposed unit packages, a conveyor operating along said bed plate and having transverse flights thereon to engage and push forwardly along the bed plate successive groups of unit packages, compression members mounted adjacent an extent of the bed plate to engage and compact a group of unit packages while the same are being advanced by the conveyor, a reciprocal transfer member adjacent the outer end of the bed plate to receive the group of compacted unit packages and move them, releasable compression members carried by the transfer member and engageable with the group of unit packages deposited thereon to retain the same in compacted condition, wrapper applying mechanism extending adjacent the advanced path of movement of the transfer member, the wrapper applying mechanism including means for folding a sheet of wrapping material about a group of unit packages and sealing the same in tight over-wrapped condition, and package group engaging and compressing means associated with the wrapper applying mechanism and coordinated with the release of the transfer member carried compression members to hold the unit package group under compression during the application and sealing of a wrapper thereto.

5. In a bundling machine, a flat elongated plate having a receiving station at its inner end portion for the reception of a group of loosely disposed unit packages, a conveyor operating along said plate and having transverse flights thereon to engage and advance along the plate successive groups of unit packages, compression members mounted on opposite sides of an intermediate extent of the plate to engage and compact a group of unit packages while the same are being advanced by the conveyor, a reciprocatable transfer member mounted adjacent the outer end of the plate to move at right angles thereto and to receive the group of compacted unit packages and remove them from the plane of the plate, releasable compression members carried by the transfer member and engageable with the group of unit packages deposited thereon to retain the same in compacted condition, wrapper applying mechanism extending adjacent the outer limit of movement of the transfer member, and package group engaging and compressing means associated with the wrapper applying mechanism and coordinated with the release of the transfer member-carried compression members to permit return of the transfer member after presentation of its compressed load to the wrapper applying mechanism.

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