Nov. 12, 1968 C. P. CATO 3,410,397

WRAP-AROUND CARTON AND APPLICATION OF THE SAME TO ARTICLES

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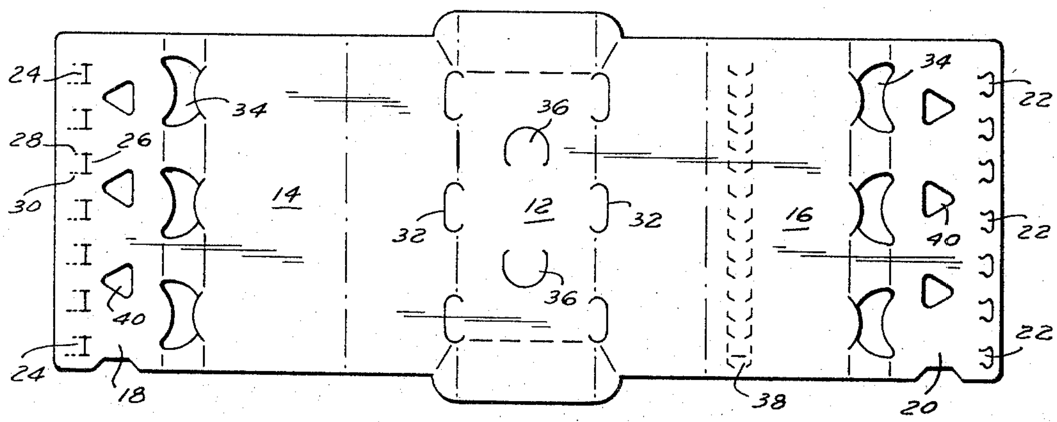
FIG. 1



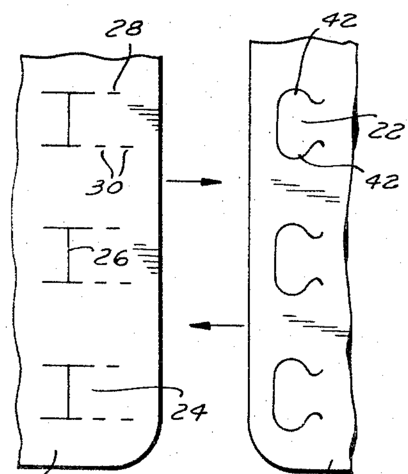


FIG. 2

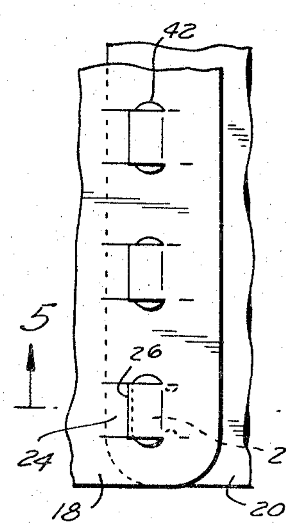


FIG. 3

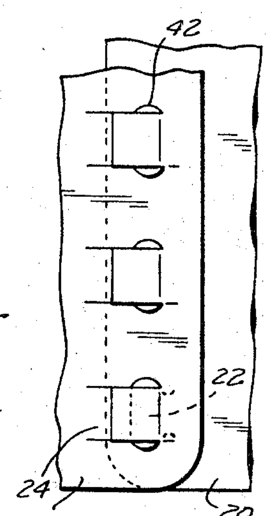
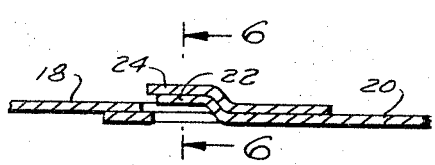


FIG. 3A

FIG. 5



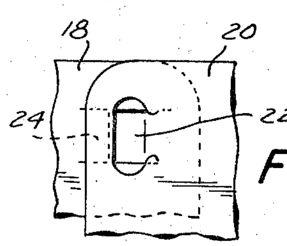


FIG. 4

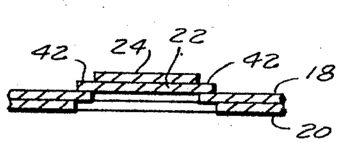


FIG. 6

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WRAP-AROUND CARTON AND APPLICATION OF THE SAME TO ARTICLES

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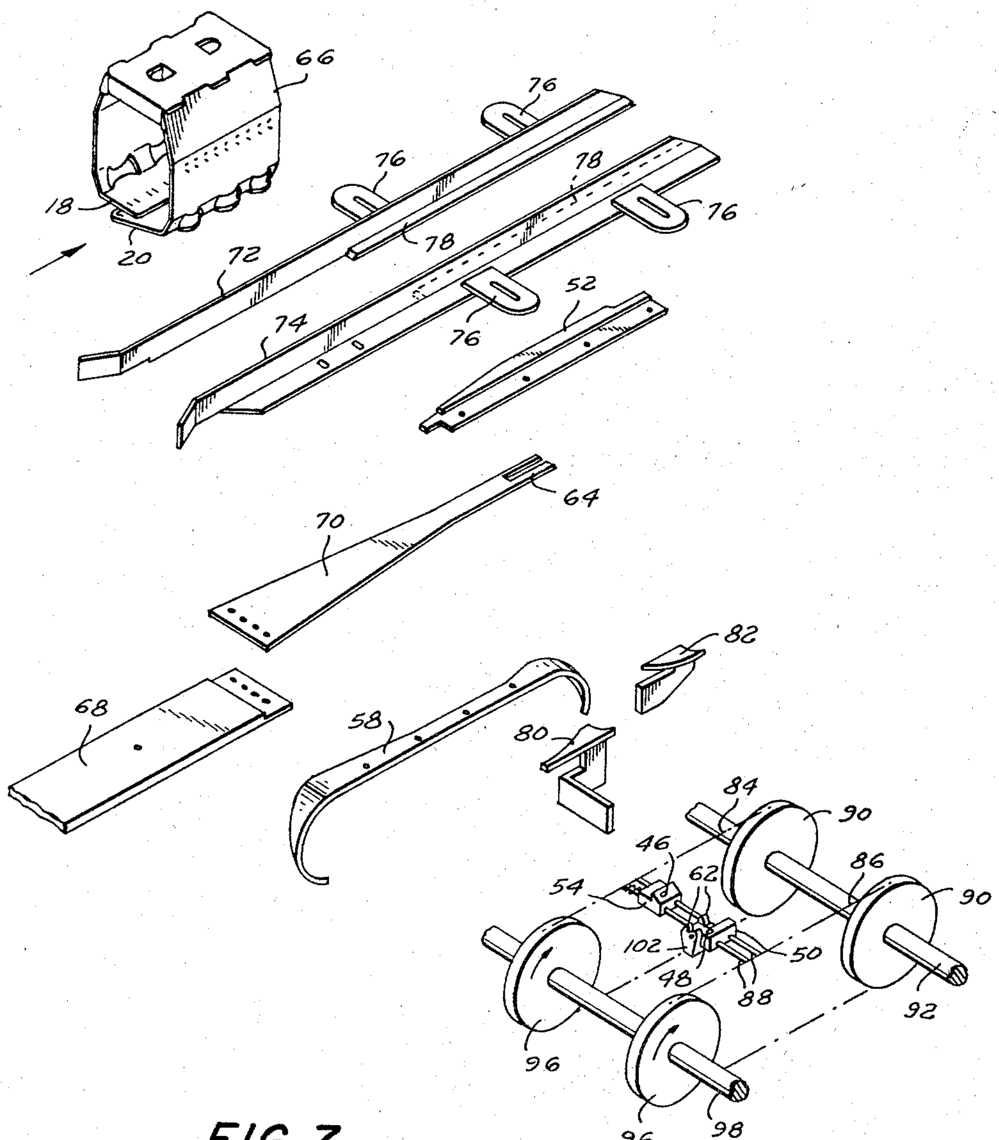

FIG. 7

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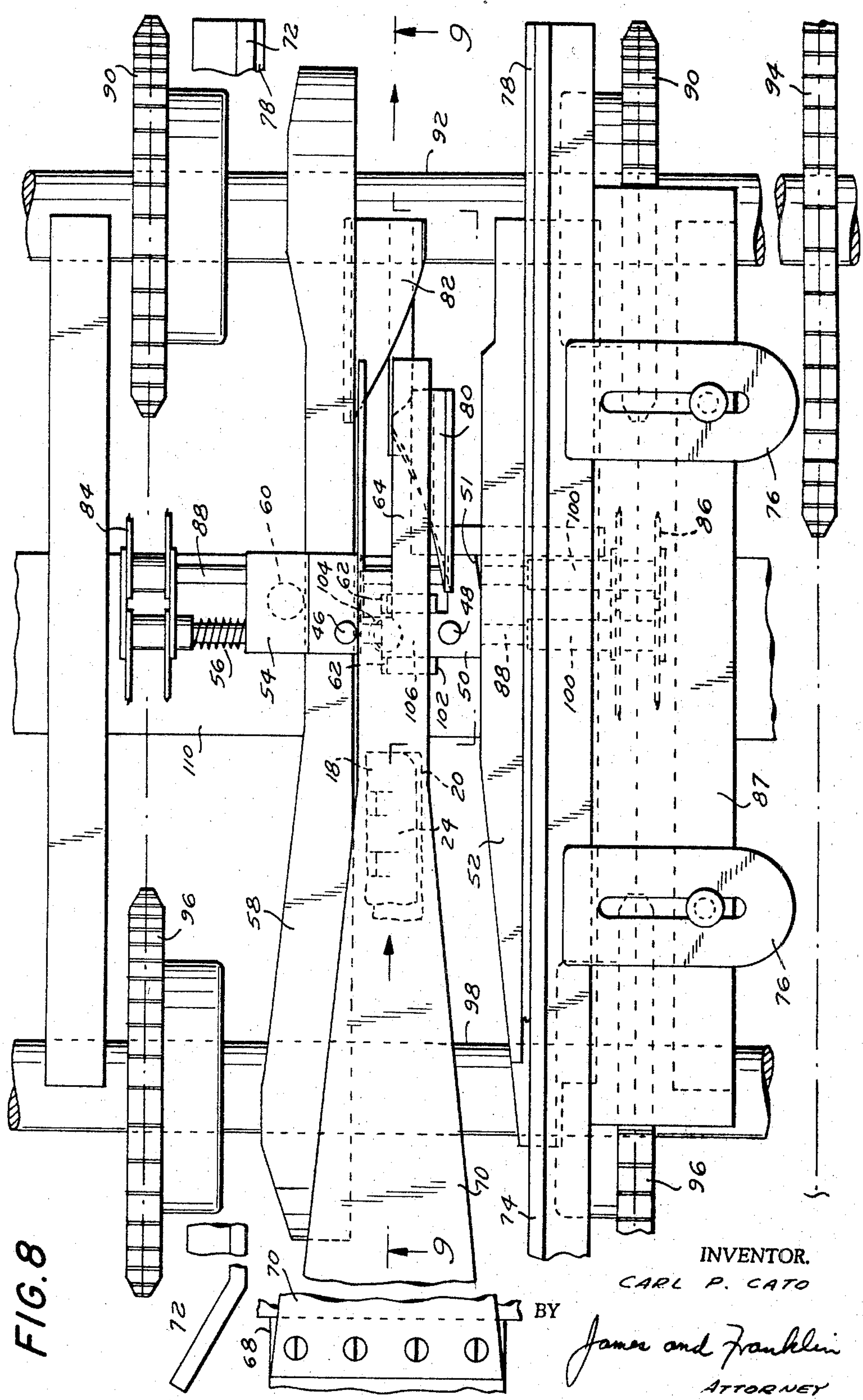

FIG. 8

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WRAP-AROUND CARTON AND APPLICATION OF THE SAME TO ARTICLES

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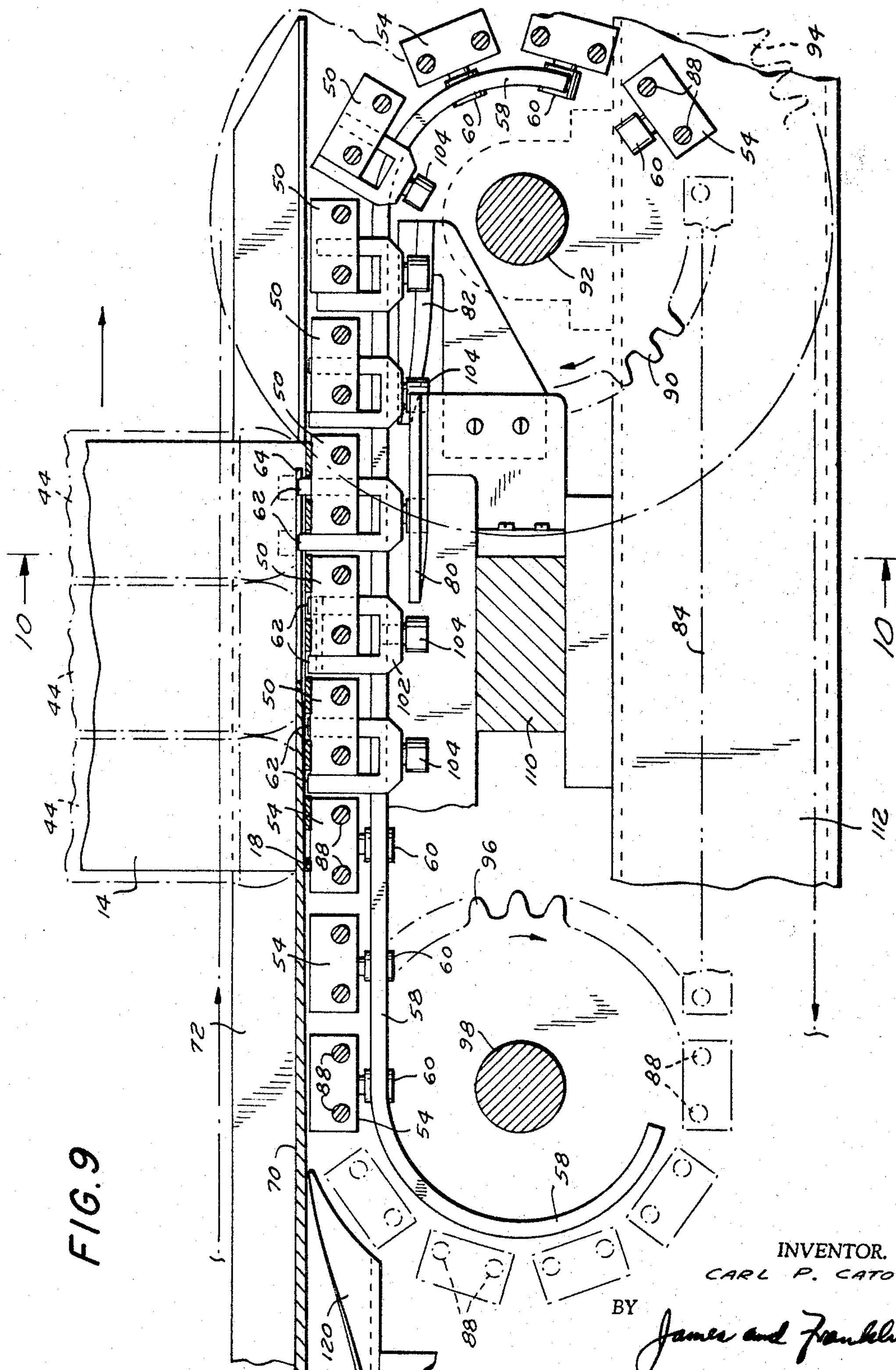

FIG. 9

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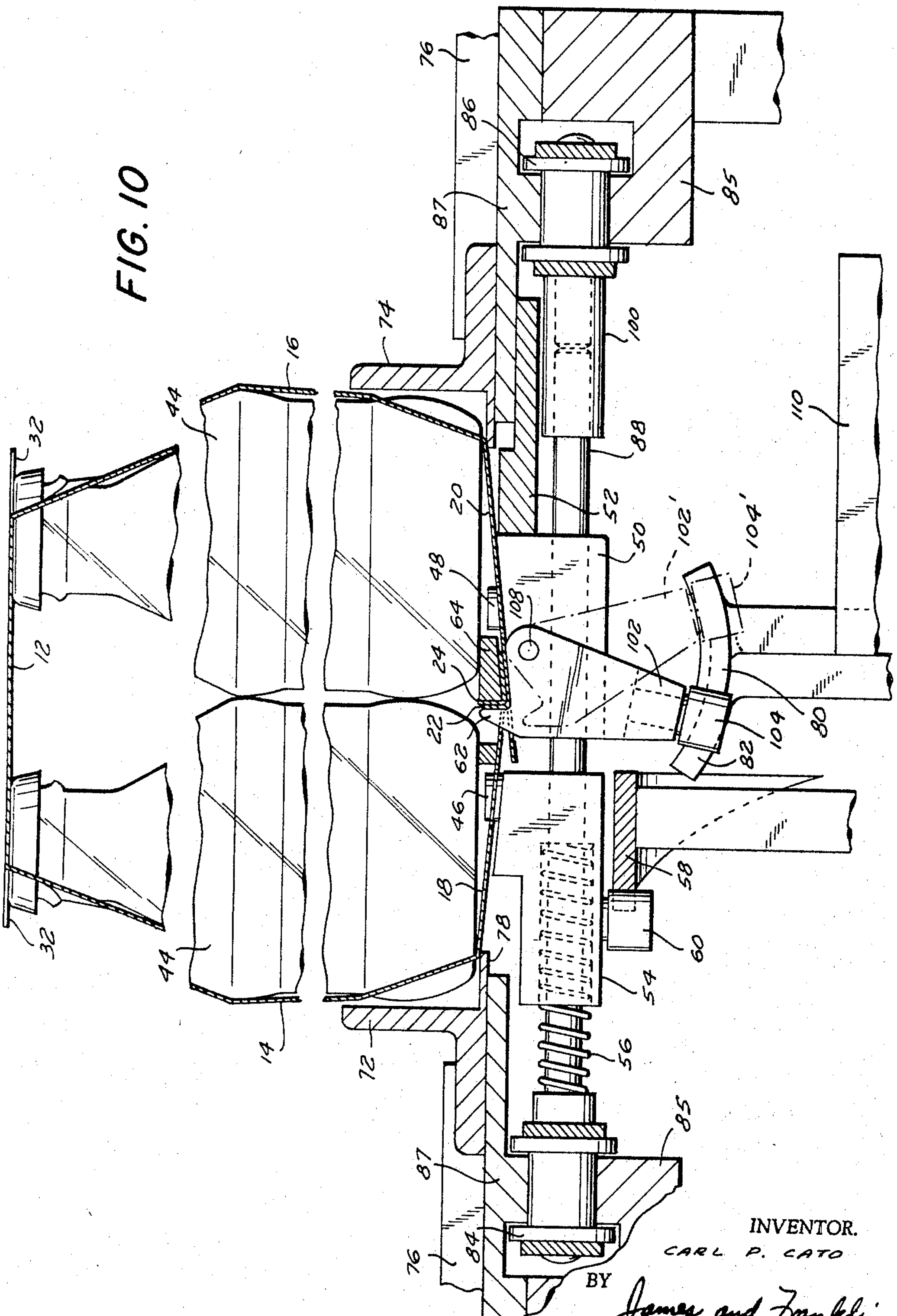
FIG. 10



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United States Patent Office

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3,410,397
WRAP-AROUND CARTON AND APPLICATION OF THE SAME TO ARTICLES

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15 Claims. (Cl. 206—65)

ABSTRACT OF THE DISCLOSURE

A sleeve type multi-pack carton is wrapped around a group of articles, typically glass beverage bottles. The bottles may vary somewhat in size, and the present improvement adjusts the band size to compensate for minor variation in bottle size. For this purpose the closure panels are moved into overlapping relation with a desired force in order to fit snugly around the articles, and only thereafter is the lock tab formed from one panel and forced through the other panel. One panel may be pre-cut to form lock tabs and the other panel may be pre-cut to form embryo friction tabs of variable length, and the lock forming operation completes the making of friction tabs of proper length. In preferred form the friction tabs are initially defined by an end cut and by side perforations, and only the necessary number of side perforations are used to give the tab its desired length. The compensation at one end of the carton may differ from that at the other end, as may be needed for the desired snug fit around the outside of the bottles.

This invention relates to wrap-around cartons and to the application of the same to articles to form a package. The apparatus is not claimed herein, it being claimed in my copending divisional application, Ser. No. 708,466, filed Dec. 26, 1967.

Heretofore sleeve-type multi-pack cartons with mechanical closures have been made to assume a fixed "band" size around the product group. This creates a difficult carton sizing problem when designing a carton to fit a product whose size is subject to variation, and a typical example is glass beverage bottles, such as the GB168 family of non-returnable beer bottles. Tolerance on diameter alone is minus $\frac{1}{32}''$ to plus $\frac{1}{16}''$, which means that the width of a two row multi-pack group may vary $\frac{3}{16}''$. In a fixed "band" size carton it is necessary to design to the largest size, and this causes a loose fit when the product is at nominal size or is under size. Because the security of the package is directly related to snugness of fit, a fixed "band" size carton results in unsafe packages.

The general object of the present invention is to improve such cartons and the utilization of the same. A prime object is to compensate for product size variation by automatically adjusting the band size, or differently expressed, it is to vary the relative location of the parts of the closure which effectively determine band size in order to fit the articles being packaged. For this purpose the carton is first wrapped around the articles with a desired snugness, and thereafter a portion of one overlapping panel is caused to pass through an embryonic opening in the other panel. Still more specifically, the lock tab is precut and is fixed in location, but the opening to receive the lock tab is varied. The said opening is preferably formed by a friction tab. The result is a size-variable compensating lock, which may be referred to more briefly as a compensating lock.

Another object of the invention is to minimize the operations needed in the packing machine. The lock tab is precut as before, and for the mating friction tab an end cut or even better an H cut may be provided, but the sides

are defined by perforations. At this time the friction tab may be termed "embryo." Later on, in the packing machine a lock former which completes the friction tab ruptures only so many of the perforations as are necessary to define correct band size, that is, the length of the friction tab varies, and therefore the effective location of the lock tab relative to the friction tab is varied. (It is convenient to speak of rupturing the perforations, although considered more precisely it is the material between adjacent perforations that is ruptured.) In accordance with a further feature and object of the invention, the perforations are staggered or spaced in alternation, thereby minimizing the steps or variations in length of the friction tabs.

Heretofore the tabs of punch locks and hook locks had to be located at voids or dead spaces between or within the articles being packaged. A further object is to eliminate this requirement, for which purpose the lock former works against a fixed blade which is interposed between one of the articles and the overlapped panels, and the thickness of the fixed blade, although kept small, provides the clearance needed for the lock forming operation.

A further object is to form the compensating lock progressively along the package, thereby making it possible to fit articles even if different dimension at one end compared to those at the other end of the same package.

To accomplish the foregoing general objects and other more specific objects which will hereinafter appear, my invention resides in the wrap-around carton and in the application of the same to articles being packaged, as are hereinafter more particularly described in the following specification. The specification is accompanied by drawings in which:

FIG. 1 shows a carton blank designed to carry six bottles, and embodying features of the invention;

FIG. 2 is a fragmentary plan view showing the closure panels about to be overlapped before interlocking the same;

FIG. 3 is a similar fragmentary view after locking the panels together with considerable overlap, as when the articles being packaged are somewhat small;

FIG. 3A is a view like FIG. 3 but showing the panels locked together with less overlap, as when the articles being packaged are somewhat large;

FIG. 4 is a fragmentary bottom plan view of the package lock shown in FIG. 3;

FIG. 5 is a section taken on the line **5—5** of FIG. 3 but drawn to larger scale;

FIG. 6 is a section taken on the line **6—6** of FIG. 5;

FIG. 7 is an exploded schematic view showing parts of the packaging machine used for tightening and locking a carton which has been folded to the condition shown in the upper left corner;

FIG. 8 is a plan view of the machine parts in assembled relation;

FIG. 9 is a vertical section taken approximately in the plane of the stepped line **9—9** of FIG. 8; and

FIG. 10 is a transverse section taken approximately on the line **10—10** of FIG. 9.

Referring to the drawing and more particularly to FIG. 1, the particular carton shown is intended to package six non-returnable beer bottles of the stub type. It is folded as shown in the upper left corner of FIG. 7, and holds the bottles with the aid of positioning slots as shown in FIG. 10. The carton comprises a top panel **12** (FIG. 1), side panels **14** and **16**, and closure panels which in this case are bottom panels **18** and **20**. The closure panels are overlapped and interlocked by means of a compensating lock consisting of lock tabs **22** precut in panel **20**, and friction tabs **24** which are only "embryo" or partially precut in closure panel **18**. More specifically, each friction tab **24** (FIG. 2) is defined by an end cut **26** and side perforations 28 and 30. The side perforations make the length of the friction tab variable, so that the carton may be dimensioned to compensate for some variation in the dimension of the articles being packaged.

As is usual, the carton has additional openings to position the articles, and in the present case there are cuts 32 (FIG. 1) which receive the tops or caps of the bottle, and openings 34 which receive the outer edge of the bottom of the bottles. The top panel 12 may have tabs 36 which form finger openings or a handle. A rip strip may be provided at 38 to facilitate opening the carton. The bottom panels 18 and 20 have tightening holes 40 which receive parts of the packaging machine which tighten the closure panels while they are in overlapped relation. The lock tabs 22 are relatively small in dimension but large in number, there being seven in the present case.

Referring now to FIG. 2 the lock tabs 22 may be conventional in configuration, having ends which are enlarged laterally as shown at 42. Each friction tab 24 has an end cut 26 which may be and preferably is given an H shape as shown in the drawing. In such case the perforations 28 and 30 extend one end of each of the two sides of the H, in a direction toward the lock tabs 22.

In FIG. 3 the closure panels 18 and 20 have been overlapped and the lock tabs 22 have been pushed upward through the openings around the friction tabs in order to interlock the panels as shown. In this case the bottles are assumed to be sized toward the smaller end of the tolerance range, with the overlap of the panels 18 and 20 increased, and the perforations being relatively unused. In FIG. 3A however, the bottles are assumed to be sized somewhat larger, with the overlap of the panels 18 and 20 somewhat reduced, for which purpose more of the perforations of the friction tabs have been used.

FIGS. 4, 5 and 6 further show how the lock tab 22 is engaged by forcing it upward with the friction tab 24. The function of the perforation pattern in the embryo friction lock is to adequately define a line of rupture. Fibre board is more easily ruptured or torn when the direction of rupture is the same as the grain direction of the material. Defining the line of rupture by perforation is not difficult in this carton because the preferred grain direction is the same as the rupture line direction. FIG. 4 is a bottom view, and shows the opening in panel 20 from which the lock tab 22 has been displaced.

Reverting to FIG. 2 the perforations 28 and 30 are preferably staggered or located in alternation. Inasmuch as the lock tab can be adequately held by the material at one side, this disposition of the perforations increases the number of and reduces the size of the increments available when converting an embryo friction tab into an actual friction tab. Although not so illustrated in FIGS. 3 and 3A it may be pointed out that with a row of tabs as here illustrated, each friction tab may be made to fit the articles carried at its part of the carton independently of the number of perforations ruptured for a friction tab at another part of the carton. This takes care of a situation in which the bottles at one end are somewhat small and those at the other end of the same package are somewhat large. Moreover, because of their small size and freedom of location, the large number of lock tabs used insures an adequate distribution of interlocking and interfering points of panel engagement to resist separating stresses.

Referring now to FIG. 10, the overlapped closures 18 and 20 are tightened around the bottles 44 by means of studs 46 and 48, which are received in the tightening holes previously referred to (40 in FIG. 1) and which studs are moved toward one another. In the present case tightening stud 48 projects from a block 50 which is moved inward and definitely located by a fixed cam 52. The tightening stud 46 is formed on a block 54 which is urged inwardly yieldably by means of a compression spring 56. It is initially retracted by means of a fixed cam 58 engaging a cam roller 60 carried by block 54, but at the punch station the cam 58 is cut away or shaped to permit inward movement of the stud 46, thus tightening the carton with a desired force in order to fit around the bottles with a desired snugness. A lock former 62 then pushes the lock tab 22 from panel 20 upward into or through the panel 18. The lock former 62 simultaneously pushes the friction tab 24 upward, thereby completing the embryo friction tab in proper location and length to maintain the desired snug carton fit.

By the design of the shapes and locations of the cams 58, 52, and 80 the studs 46 and 48 are received in the tightening holes 40 in opposed pairs and in time succession. Tightening occurs progressively and successively to the point at which the lock tabs are brought into registered lateral lock position and the friction tabs are fully operated on by the springs. Additional travel occurs before lock forming occurs, and the design and dimension of the parts preferably are such that at least two pairs of tightening holes are brought into correct alignment before the lock forming operation. This insures an adequately squared up inter-relation of the parts for locking.

Lock former 62 preferably cooperates with a fixed blade 64 the working edge of which is preferably though not necessarily located at the center line of the package. The tightening stud 48 holds the lock tab 22 in fixed location relative to the fixed blade 64, and it is the friction tab 24 which then becomes the variable, as is desired, it being ruptured and pushed upward in proper length for the lock tab to hold the carton closed with a snug fit around the bottles.

The fixed blade 64 is thickest at the midline of the multi-pack, but has a tapered lateral section. At the location in the machine where locking action occurs the blade 64 is slotted to provide a folding edge appropriately aligned with the "root" of the lock tab, the root being the location of the shortest distance between the two cut sides of the lock tab. This also provides a clearance between the root of the lock tab and the bottles into which the lock tab and the friction tab can be punched. The thickness of the lock former blade is held to a minimum in order to prevent significant slackening of the package tightness after removal from the blade. Of course, the closure panels are held away from the bottoms of the product during locking, and cannot be drawn up as tightly as without a blade. However, the loss of tightness is only a small fraction of the loss of tightness involved when using a fixed band size on variable size products.

The presence of the bottom folding edge of the blade 64 at the root of the lock former 62 results in rupturing only enough of the perforations of the friction tab 24 to permit passage of the head of the lock tab 22. After the package slides off the blade 64, the bottles will rest on a number of the friction tabs and lock tabs which, in warehousing and shipping, will contribute to the holding power of the lock.

Referring now to FIG. 7, the parts of the tightening and locking mechanism are shown schematically in separated relation. It must be understood that the packaging machine preceding what is here illustrated includes the usual means to group, separate and feed the bottles, in this case in groups of six having two rows of three each. It also includes means to feed the carton blanks, and to position a blank over each group of bottles. There are also means to fold down the side panels, and to fold inward the closure panels, thus bringing the carton to somewhat the relation shown at 66 in FIG. 7, with closure panel 20 beneath panel 18.

In FIG. 7 the bottles have been omitted, but they have been riding along a main dead plate 68, and this is narrowed and thinned to form a blade 70 the trailing end of which is bifurcated to provide the previously described working part 64 of the fixed blade against which the lock former 62 works.

Meanwhile the package is confined between side guides 72 and 74 the spacing of which is adjustable, as by means of slotted ears **76**. These may include narrow support rails **78** which take over the support function from the dead plate **68**.

The stationary lock tab positioning cam **52** moves the closure **20** inward to a fixed desired position, as was explained with reference to FIG. 10. The stationary cam **58** opposes a compression spring (**56** in FIG. 10) and is narrowed or cut away to permit the spring to move closure **18** to tighten the carton around the bottles at the locking station. The fixed cam **80** operates the lock former, and the fixed cam **82** retracts the lock former as it moves along with the package.

The lower right part of FIG. 7 schematically represents a pair of spaced roller chains **84** and **86** which carry slide rods **88** on which positioning block **50** carrying a pair of lock formers **62** is slidable. The cross rods **88** also slidably carry the tightening block **54** which is urged inward by a compression spring on one of the rods. The chains **84** and **86** move along with the package, it being understood that the chain is filled with slide rods and blocks, although only one such units is shown in FIG. 7. In the particular case illustrated there are **24** such units.

Referring now to FIGS. 8, 9 and 10, the endless roller chains **84** and **86** are carried at one end on sprocket wheels **90** carried by a shaft **92**. At the other end the chains **84** and **86** are carried by sprocket wheels **96** mounted on a shaft **98**.

In FIG. 9 the broken lines **95** represent the path of "flight bars" carried by two parallel chains driven by sprockets **94** on shaft **92**. These flight bars take charge of the product group from product groupers (not shown) and transport the product group through the stages of receiving carton, carton side wall folding, and closure panel folding, and deliver the product group and the carton accurately registered to each other and to the operating parts of the lock station.

The flight bar chains are fairly long, and perform three distinct functions, namely, power transmission, conveying and registration. They may be driven by shaft **92**.

Since flight bar speed must match the speed of the tightening lugs and the lock formers, it is not possible to secure sprockets **90** to shaft **92**. Instead, sprockets **90** are rotatable on shaft **92**, and chains **84** and **86** are driven by sprockets **96** secured to shaft **98**. Shafts **92** and **98** are coupled by a drive chain and appropriate sprockets to insure equal speed for chains **84** and **95**. Chains **84** and **86** have a short span and may run snugly fitted. The closely coupled chain drive between shafts **92** and **98** insures sustained close registration between the flight bars and the lock station parts.

An advantage of the lock station arrangement is that the tightening lugs which position the closure panels for locking, and the lock formers which do the locking, are supported and moved in unit groups by one and the same members, meaning slide rods **88**, and also, the registering tightening lug and the lock former are carried on one and the same block **50**, thus insuring good registration.

FIG. 10 shows how the roller chains **84** and **86** may be guided by chain guides **85** and by chain overguides **87**. In FIG. 8 one of the side guides **74** is shown disposed over one of the chain overguides **87**, but the corresponding parts for the other side of the machine have been omitted in FIG. 8 in order to better show the parts which are located therebeneath. Also one sprocket wheel **94** and chain **95** are shown at one side only, but these are duplicated at the other side of the machine.

FIG. 8 shows how the pins of the roller chains **84**, **86** are greatly extended to provide the slide rods **88** which extend across the machine between the chains. For ease of assembly the cross rods may be joined near chain **86** by bushings **100**. Only one pair of cross rods is shown in FIG. 8, but FIG. 9 shows how the chain is filled with pairs of cross rods carrying slidable blocks. Each block **50** carries a pair of lock formers **62** which are connected at their lower ends as shown at **102**, and which are operated by a cam roller **104**. The block **50** is L-shaped as shown in FIG. 8, and the pair of lock formers **62** straddles part **106** of the block **50**.

The pin on which the lock formers pivot is best shown in FIG. 10 at **108**. In FIG. 8 the fixed cam **80** moves the cam roller inward at the lock station, following which it is moved back outward by a fixed cam **82**. This motion is illustrated in FIG. 10 by the change between the broken line position **102'** and the solid line position **102**. The said cams are carried on a block **110** (FIGS. 9 and 10) mounted on a base **112** (FIG. 9) fixed on or forming a part of the frame of the machine.

Reverting to FIG. 1 it will be seen that there are three tightening holes **40** for each closure panel, these being located between pairs of lock tabs. In FIG. 8 the tightening studs **46** and **48** are similarly located between the pair of lock formers **62**. Inasmuch as in the present case there happens to be an odd number (seven) locking tabs, the last tab is locked by the first one of a fourth pair of lock formers. This will also be seen by examination of FIG. 9, except that the fourth pair of lock formers is not shown.

In FIG. 9 part of the section is taken to show the cam rollers **104** for the lock formers, and another part of the section is displaced to show the cam rollers **60** on the tightening blocks **54** which are spring pressed in tightening direction. Although the parts are not completely shown in the drawing it will be understood that the roller chains **84** and **86** are filled with extended pins or slide rods **88** carrying the positioning blocks **50**, the tightening blocks **54**, and the lock formers **62**, and that these come successively into operation as they move past the lock station. The carton is progressively locked, and the friction tabs therefore may differ in length at one end of the package, compared to the other end, if that be needed to fit the bottles.

It will be understood that once the tightening studs **46** and **48** enter the tightening holes **40** (FIG. 1) they take over the feed of the package, and this insures synchronous travel of the package with the chains and the lock formers for locking the bottom panels of the carton.

In FIG. 8 it may be noted that the leading part of the block **50** is disposed at an angle as shown at **51**, for better cooperation with the sloping portion of the positioning cam **52** as the block approaches and is moved inward by the said positioning cam.

In FIG. 9 one of the folders for folding a closure panel inward is shown at **120**, ahead of the chains at the tightening and lock station.

The small size of the lock tab (**22** in FIG. 1) permits the use of a larger number of tabs in a given package, and the total holding power is influenced more by the number of interference stress points than by the total area of the tabs.

Small tabs also contribute to minimum panel overlap and to economy in the use of paper board. Also small size tabs combined with freedom of location in respect to the packaged articles makes it feasible to use a standard array of locks in any carton within the range of a given machine, and the carton manufacture and the machine mechanism can be standardized.

It is believed that the configuration and method of use of my improved wrap-around carton, as well as the advantages thereof, will be apparent from the foregoing detailed description. The closure panels are overlapped yieldably and with a desired force in order to fit around the articles with a desired snugness, and thereafter a lock tab is displaced from one panel through the other panel, thereby compensating for variation in dimension of the articles. In preferred form one closure panel is precut with a row of lock tabs, and the other panel is precut with a row of embryo friction tabs of variable length, and the locking operation completes the friction tabs in proper location and length. The locking is performed progressively from one end of the carton to the other so that the compensation along the carton may be made appropriate for the articles in each part of the carton. The embryo friction tabs are preferably defined by an end cut and by side perforations, and the locking operation then makes use of only so many of the side perforations as are needed to properly dimension and locate the friction tab.

The overlapping closure panels need not necessarily be located at the bottom of the package. It will therefore be understood that while I have shown and described the invention in a preferred form, changes may be made without departing from the scope of the invention, as sought to be defined in the following claims.

I claim:

1. A wrap-around container blank comprising an elongated piece of paper board having fold lines to form panels including closure panels designed to overlap when applied to a group of articles to be packaged, one closure panel having a lock tab, the other closure panel having an embryo friction tab defined by an end cut and side perforations, the side perforations making the length and effective location of the friction tab variable so that the carton may be dimensioned to compensate for some variation in the dimension of the articles being packaged.

2. A wrap-around container blank as defined in claim **1**, in which one closure panel has a row of lock tabs, and the other closure panel has a row of mating embryo friction tabs each defined by an end cut and side perforations so as to be variable in length, whereby each friction tab may make use of that number of side perforations which gives it a length and effective location to fit the articles carried at its part of the carton, independently of the number of side perforations used by a friction tab at another part of the carton.

3. A wrap-around container blank as defined in claim **2**, in which the perforations defining the sides of each friction tab are staggered or located in alternation.

4. A wrap-around container blank as defined in claim **2**, in which the end cuts are H shaped, and in which the perforations extend one end of each of the two sides of the H.

5. A package comprising a group of articles and a wrap-around carton folded therearound, said carton having overlapped closure panels one of which has a lock tab and the other of which has a friction tab receiving the lock tab, said friction tab being defined by an end cut and side perforations, said friction tab making use of only that number of the side perforations which gives it a length which compensates for some variation in the dimension of the articles so that the carton fits the articles despite such variation in dimension.

6. A package as defined in claim **5**, in which one closure panel has a row of lock tabs, and the other closure panel has a row of mating friction tabs each defined by an end cut and side perforations so as to be variable in length, each friction tab making use of that number of the side perforations which gives it a length such that the wrap-around carton fits the articles carried at that part of the carton despite some variation in dimension of the articles.

7. A package as defined in claim **6**, in which the side perforations defining each friction tab are staggered or spaced in alternation.

8. A package as defined in claim **6**, in which the end cuts are H shaped, and in which the perforations extend one end of each of the two sides of the H.

9. A package as defined in claim **6**, in which the body of the wrap-around carton has positioning slots which receive parts of the articles in the package in order to anchor the same in position.

10. A package as defined in claim **9**, in which there are two rows of beverage bottles in the package, the said bottles being snugly held to minimize breakage despite variation in the dimension of the bottles.

11. In the application of a wrap-around carton to a group of articles that have dimensional variation, said wrap-around carton having overlapping closure panels, the method which includes folding the carton around the outside of the group of articles, folding the closure panels into overlapping relation yieldably and with a desired force in order to fit around the articles with a desired snugness, and only thereafter forming a lock tab from one panel and forcing it through the other panel and thereby compensating for variation in the dimension of the articles.

12. A method as defined in claim **11** in which one closure panel is precut to form a lock tab, and the other panel is precut to form an embryo friction tab of variable length, and in which the lock forming operation completes the friction tab in proper location and length to accommodate dimensional variation of the articles, and inserts the lock tab into the opening formed by the friction tab.

13. A method as defined in claim **12**, in which one closure panel has a row of lock tabs and the other has a row of mating embryo friction tabs, and in which the compensated location of the friction tabs in one part of the row is independent of that in another part of the row.

14. A method as defined in claim **13**, in which the formation of the friction tabs is performed progressively from one end of the carton to the other end of the carton, and in which the compensation along the carton is thereby made appropriate for the articles in each part of the carton.

15. A method as defined in claim **13**, in which the embryo friction tabs are preliminarily defined in the carton blank by an end cut and side perforations, and in which the compensated lock forming operation makes use of only so many of the side perforations as are needed to properly dimension and locate the friction tab.

References Cited

UNITED STATES PATENTS

1,885,492	11/1932	Trew	217—3
2,004,098	6/1935	Andrews	229—87
3,203,152	8/1965	Wilcox	53—48
3,269,531	8/1966	Weiss	206—65

WILLIAM T. DIXSON, Jr., *Primary Examiner.*