March 31, 1964 E. J. MONAHAN 3,127,273

METHOD FOR CONTINUOUSLY WRAPPING BISCUITS

Filed June 7, 1960 4 Sheets-Sheet 1

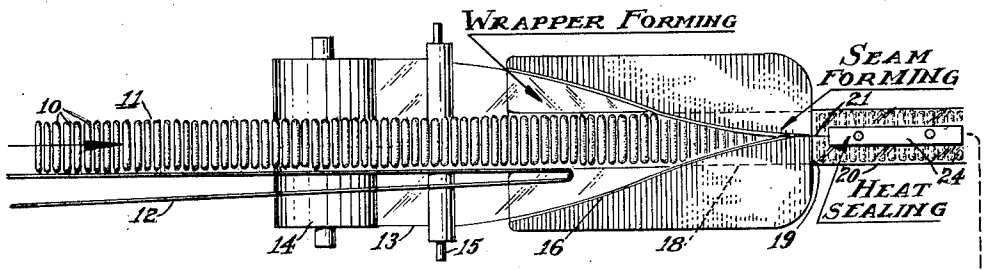

FIG. 1

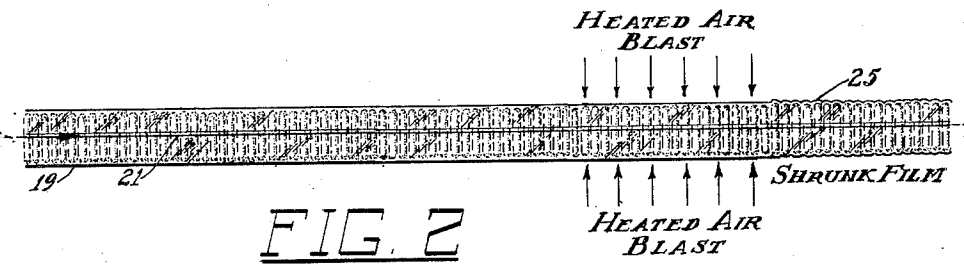

FIG. 2

FIG. 3

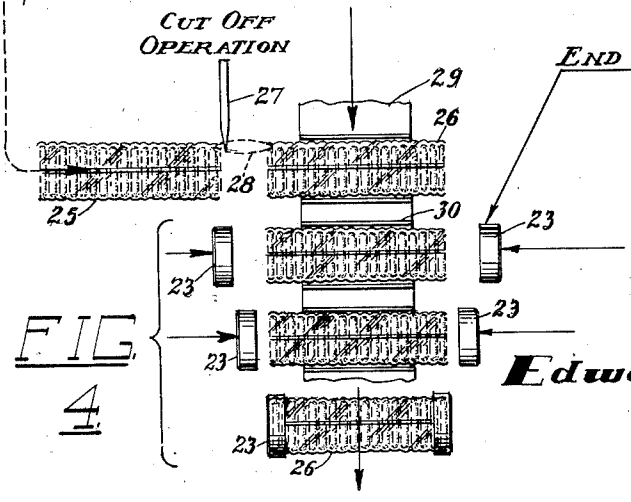

FIG. 4

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METHOD FOR CONTINUOUSLY WRAPPING BISCUITS

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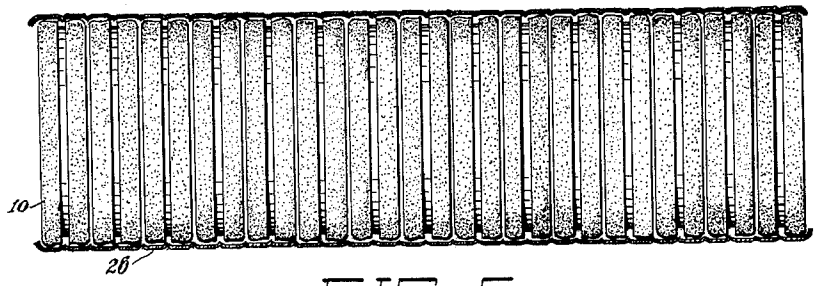

FIG. 6

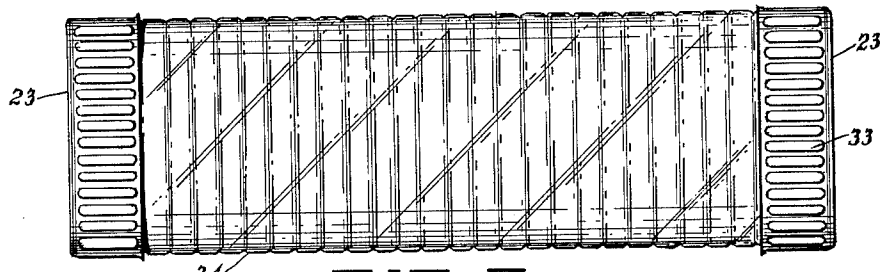

FIG. 7

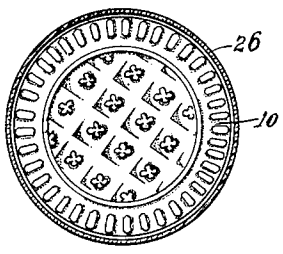

FIG. 8

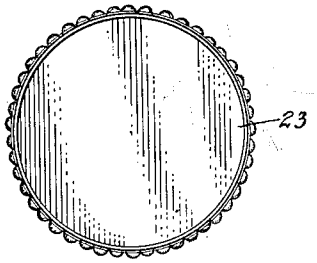

FIG. 9

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FIG. 10.

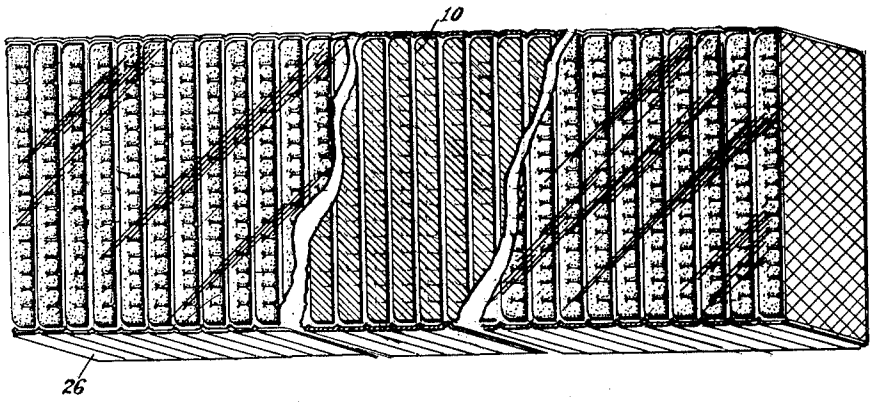
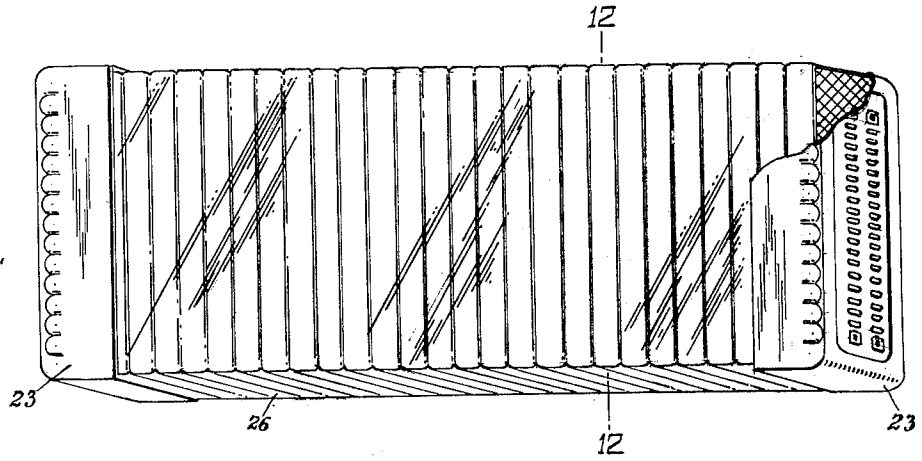


FIG. 11.



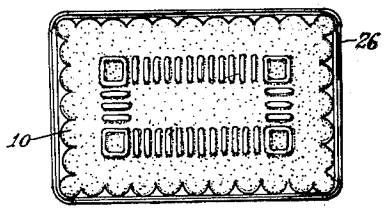


FIG. 12

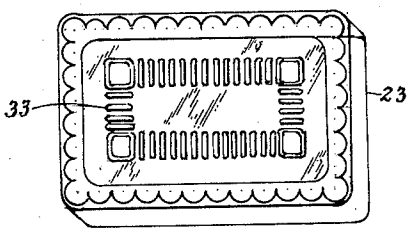


FIG. 13.

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METHOD FOR CONTINUOUSLY WRAPPING BISCUITS

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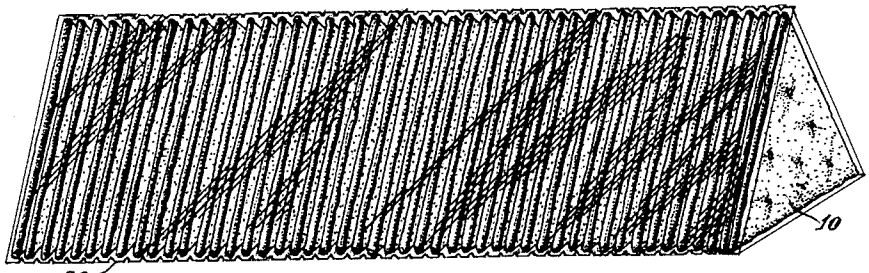

FIG. 14.

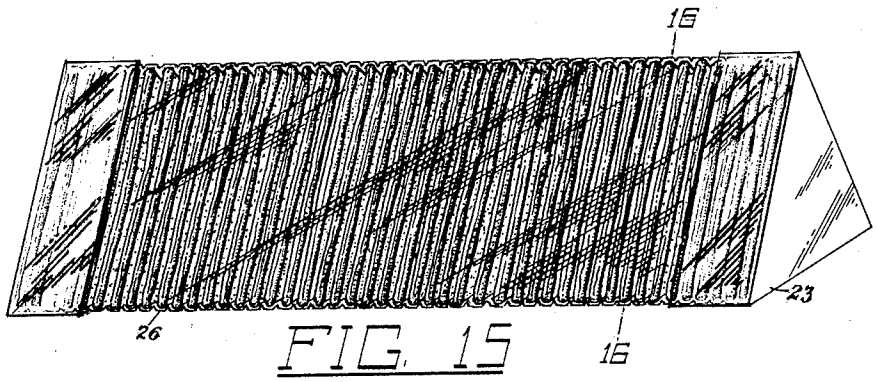

FIG. 15

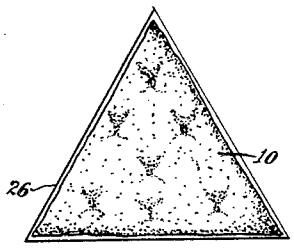

FIG. 16.

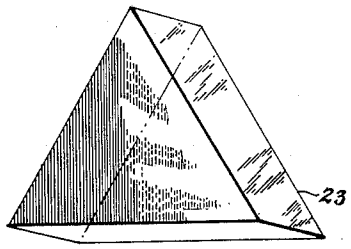

FIG. 17.

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United States Patent Office 3,127,273 Patented Mar. 31, 1964

3,127,273

METHOD FOR CONTINUOUSLY WRAPPING BISCUITS

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Filed June 7, 1960, Ser. No. 34,560
7 Claims. (Cl. 99—171)

This invention relates generally to an improvement in the packaging of edible foods and, more particularly, to the packaging of biscuits, crackers, and wafer-like articles with thermo-shrinkable film.

Various devices are in use at the present time for the packaging of biscuits, crackers, and other baked products. Such devices include cellophane or wax paper wrapping apparatus which is supplied with baked products to be packaged by automatic shingling and stacking equipment. According to present day practice, the biscuits are metered and segregated into units, such as quarter pound units, prior to wrapping.

This entails the use of expensive and bulky equipment. If the baked goods could be wrapped and immobilized prior to segregation, it would greatly facilitate the packaging process, simplify the packaging equipment, and reduce the cost of production.

It is, therefore, an important object of the present invention to provide an improved method of producing packages of stacked baked goods from a continuously advancing column thereof, wherein the advancing end of the column is continuously wrapped and the wrapped end of the column is then separated into smaller units for assembly into the finished package form.

Another object of the invention is to provide a continuous method of packaging an advancing column of stacked goods into unit packages, which comprises continuously wrapping the advancing end of said column with a heat shrinkable sheet of material while said advancing end is part of said column, heat-shrinking said sheet material, severing said advancing end into smaller units, and fitting closure caps at the ends of each unit.

Another object of the invention is to provide an improvement in the production of wrapped groups of articles from a continuously-forming and continually-advancing column of stacked articles, the improvement comprising wrapping the column in heat-shrinkable plastic film, heat shrinking said plastic film in close conformity about said column, and severing the wrapped column into wrapped groups of desirable length which can be handled as self sustaining units.

Another object of the invention is to utilize the thermo-shrinkable properties of polyethylene and similar plastic sheet materials in such a manner wherein a self-supporting unit of stacked articles may be formed without the use of a cardboard supporting tray or rigid paperboard insert, and the individual articles constituting said self-supporting unit tend to remain immobilized relative to one another.

It is a further object of the invention to provide an improved method of packaging biscuits, cookies, and crackers of a wide variety of configurations and shapes, as for example: triangular, square, round, oval, and rectangular forms wherein the occurrence of breakage in transit is minimized and the contents of the packages are more readily identifiable.

It is another object of this invention to provide an improved package for biscuits, crackers, cookies, and the like, the contents of which will be completely visible to the purchaser, and also completely protected against dampness and contamination.

It is a further object of this invention to provide a method of packaging edible foods of the type classified as dry bakery goods; as for example, biscuits, crackers,

cookies and cream filled cookie sandwiches, in tight engagement with a thermoplastic covering which is applied in web-like form in a continuous manner to the stacked product without interrupting its flow from the production source.

It is still another object of this invention to provide a novel method for packaging columnar stacked articles in tight engagement with a thermoplastic film covering, a method which will lend itself readily to automatic, continuous packaging.

It is also an object of this invention to provide a method for packaging stacked biscuits, crackers, or cookies continuously as they emerge from a baker's band oven and with a minimum of operative steps.

Other objects, features, and advantages of the present invention will be apparent to those skilled in the art from the following detailed description of certain embodiments thereof, taken in conjunction with the drawings in which:

FIGURE 1 is a flow sheet illustrating schematically the principles embodied in the present invention in which a single column of stacked biscuits advances through the wrapper forming operations of the invention.

FIGURE 2 is a flow sheet of the column of biscuits, in continuation from FIG. 1, illustrating schematically the heating of the wrapper to effect shrinkage thereof;

FIGURE 3 is a schematic diagram of the shrunk-wrapped column of biscuits emerging as from FIG. 2 and undergoing a cut-off operation to form individual units of desirable length;

FIGURE 4 is a schematic diagram illustrating capping operations for closing the exposed ends of the severed units of shrunk-wrapped biscuits;

FIGURE 6 is a sectional view taken longitudinally of a unit of stacked, sandwich cookies enwrapped in shrunk thermoplastic film;

FIGURE 7 is an elevation of the unit shown in FIG. 6 fitted with closure caps at the ends;

FIGURE 8 is an end view of the open unit shown in FIG. 6;

FIGURE 9 is an end view of the capped unit shown in FIG. 7;

FIGURE 10 is a perspective view of a unit of rectangular shaped cookies, partially shown in section to illustrate the formfitting engagement of its heat-shrunk plastic film wrapper;

FIGURE 11 is a perspective view of a finished package embodying the unit shown in FIG. 10;

FIGURE 12 is a cross section of the finished package taken on the line **12—12** of FIG. 11;

FIGURE 13 is a perspective view of one of the molded plastic caps shown in FIG. 11;

FIGURE 14 is a perspective view similar to FIG. 10 but showing a unit of triangular shaped biscuits;

FIGURE 15 is a perspective view of a finished package embodying the unit shown in FIG. 14;

FIGURE 16 is a cross section of the finished package taken on the line **16—16** of FIG. 15; and

FIGURE 17 is a perspective view of one of the molded plastic caps forming the finished package shown in FIG. 15.

Commencing with the discharge of baked biscuit or crackers from a baker's band oven, continuous removal of biscuit from the oven is effected by means of apparatus and method (not a part of this invention) whereby the biscuit is transported through various steps which involve sheet-breaking, biscuit-detaching, shingling, stacking, diverting and converging operations to form a moving single column of biscuit stacked on edge in face-to-face contact. These operations are disclosed in the copending application of Arthur J. Griner for Packaging Method and Means, Ser. No. 310,532, filed September 19, 1952.

In the description that follows, the invention will be described in terms of the packaging of biscuits. It is to be understood, however, that it is not intended to be limited thereby, and that the invention is susceptible of application with other articles as well as other baked products, such as cookies, crackers and the like.

Referring now to FIG. 1, a column **11** of biscuits **10** stacked on edge in face-to-face contact is shown carried by conveyor belt **12** toward the first station in the sequence of steps which form the present invention. At this station a continuous web **13** of wrapping material in sheet or film form is unwound from a reel supply **14** and fed around an idler roll **15** to effect tension in the film web **13** while it is drawn through a truncated, funnel shaped passageway or forming cone **16**. The forming cone **16** is provided with a notched or longitudinally convergent opening **18** extending substantially the length of the forming cone and terminating in a transverse opening or orifice **19**, thereby affording a through passageway to receive said biscuit column **11**.

Drawing of the film web **13** against the inner face of the forming cone **16** causes the web to follow the contour of the convergent passageway **16**. Upon further movement of the web **13**, the convergent opening **18** draws the edges of the web together to form an elongated tubular wrapping **20** having an overlapping longitudinal margin or seam **21**. Consequently, as the biscuit column **11** advances centrally through the forming cone **16**, it is continuously engirthed with wrapping material, such as plastic film, which progressively surrounds the column **11** regardless of its sectional form or peripheral contour.

In order to maintain the tubular wrapping **20** in wrapped position about the column **11**, the seam **21** may be sealed, if so desired. For this purpose, as the loosely wrapped column **11** advances past the forming cone **16**, it is suitably contacted with a heat sealing plate **24** along the seam **21**.

Preferably, an electric heat sealing plate which is spring-biased to provide a proper pressure against the seam **21**, is utilized. However, other means of effecting a seal may be employed, as for example, a hot wire or hot-knife heat-sealing apparatus.

At this step of the process, the biscuit column **11** is loosely encased and sealed by side seam **21** in a tube **20** of thermo-plastic film as shown in FIG. 2.

In accordance with the invention, means are provided for continuously wrapping an advancing column of stacked biscuits before segregating the column into smaller units for assembly into finished package form. This is accomplished by heating the peripheral surface of the loose tubular wrapper **20** to a temperature which will effect shrinkage of the wrapper material without fusing or melting thereof. This heat shrinking operation serves to tighten and compress the wrapper about the advancing end of the biscuit column to the extent that the individual biscuits comprising the column **11** are self retained in stacked position relative to one another, and the thus heated encased portion of the column is a tightly wrapped, rigid column which can be severed into smaller groups or units of stacked biscuits without affecting the disposition of the individual biscuits in each unit with respect to each other.

In shrinking the material around the column of biscuits, the column is preferably conducted through a heated tunnel (not shown) in which steam or a blast of heated air is directed around the encased column. Heating elements, comprising a bank of infrared lamps (not shown) disposed within the tunnel about the advancing column may be utilized, although other modes of heating may be used if so desired. In conjunction with the heating elements, one or more blowers may be provided to distribute the heat uniformly about the column. The amount of heat will of course vary, depending upon the type of wrapping material used and the speed of the column advancing through the tunnel.

The shrinkage of the wrapping material pulls the column of biscuits tightly together in alignment with one another along the column axis into a rigid stack structure **25** in which the individual biscuits are immobilized. In this manner, any longitudinal slack which may be present in the wrapped column leaving the seam sealing station is taken up. FIGS. 2 to 6 particularly illustrate the manner in which the wrapper material, after heating, is pulled tightly about the edge contours of each biscuit by reason of the radial shrink pressure of the wrapper material thereon, thereby forming an interlocked arrangement in which the individual biscuits are self supported in stacked position.

According to the invention, separation of the biscuit column **11** into smaller groups for assembly into finished package form occurs after the biscuit column has been wrapped. Accordingly, the shrink wrapped biscuit column structure **25** is severed into smaller wrapped units **26** at a cutting station such as shown diagrammatically in FIG. 3, wherein suitable cutting means such as knife **27** is utilized. Since the rigidity of the wrapper unit **26** is not affected by its severance, the individual biscuits comprising the wrapped unit will tend to remain self retained.

Preferably, the cutting-off operation should effect a lateral penetration no deeper into the column **25** than the thickness of its film wrapper **13** so that injury to the inner merchandise may be avoided; and, inasmuch as the column **11** is not physically solid, there is no need to effect a complete cutting-off operation therethrough if the film wrapper has been severed.

In order, however, to prevent colliding and jamming of the moving column **25** with the lateral operating knife **27**, it is preferable to have the knife operate intermittently, timing its operating strokes in combination with the linear speed of the advancing column and also with the desired length of the wrapped units; also advancing the cutting-blade linearly, synchronizing it with the movement of the advancing column during lateral penetration of the wrapper. As the knife blade is withdrawn laterally, it is retracted in a retrograde longitudinal direction to its initial position, thus effecting an oscillatory motion throughout its operative cycle of penetration, linear advance, withdrawal and retraction.

Alternatively, the wrapper severing operation upon the column **25** may also be accomplished by means of a resistance-heated wire loop (not shown). Such a loop may be formed of Nichrome resistance-wire, intermittently actuatable by an electronic current sufficient to bring the coil up to a white heat. Preferably, the wire loop should be operable to penetrate the wrapper laterally while intermittently advancing in synchronized travel with the linear speed of the column, retracting laterally therefrom, and returning columnwise to the original position.

The closed path taken by the cutting blade **27** forms an ellipse **28** shown in FIG. 3. It is to be noted that the linear speed of the cutting element through the ellipse path will vary at different stages, especially in the upper portion of the ellipse, which portion represents the return stroke. In this portion of the ellipse, the cutting element must travel relatively faster than in the advance stroke in order to have it return in time to sever the succeeding unit of stacked biscuit. FIG. 6 shows an enlarged sectional view of a severed length of shrink-wrapped biscuits prior to the capping operation.

In order to seal off the exposed ends of the individual units **25** of wrapped biscuit, molded plastic caps **23** are utilized. FIGS. 7 and 9 show these caps in better detail.

Cap sealing of the severed units **26** may be effected by means of a conveyor belt **29** travelling at an angle of 90° to the line of travel of the unsevered column **25** of shrink-wrapped biscuits in the manner indicated in FIG. 4. The conveyor belt **29** is preferably an endless belt formed with spaced, semi-circular mountings **30** for cradling the individual unit packs **26**. While each unit

pack 26 is advancing laterally as shown in FIG. 4, a pair of molded plastic caps 23 is suitably advanced laterally inward toward the exposed ends of each advancing unit pack.

The interior diameter of each cap has a close tolerance with relation to the outside diameter of the plastic film surrounding the unit stacks of biscuit or cookies. Consequently, each cap will fit tightly when fully seated, thus obviating the need for any form of heat sealing or adhesive to anchor the caps to the opposed ends of the unit packs.

The end caps 23 herein illustrated and described are molded from plastic sheet material such as transparent or translucent polyethylene or "Mylar," a brand of polyester film, characterized by high tensile strength which may be ornamented, if desired, with raised configurations 33.

Referring to FIG. 6, a longitudinal sectional view of a shrink-wrapped unit of cookie sandwiches is disclosed while FIG. 7 discloses the completed package 34 with right and left hand end caps 23 fitted thereon. FIG. 8 shows an end view of the exposed unit pack of FIG. 6 while FIG. 9 is an illustration of the end view of the unit shown in FIG. 8 after it has been capped.

FIGS. 11 and 15 illustrate the extraordinary versatility of this method of packaging. Either square, rectangular, or crackers of round or triangular conformation may be packaged according to this method. FIGS. 10, 11, 12 and 13 disclose details relative to the use of the method as applied to a rectangular shaped cracker in which similar elements of the package bear similar numerical designations as does the previously described package shown in FIGS. 6, 7, 8 and 9. Similar elements of the triangular shaped package of FIGS. 14, 15, 16 and 17 bear similar numerical designations as does the cylindrical package of FIGS. 6, 7, 8 and 9.

With regard to wrapper material, a wide variety of plastic films are now available to carry out the practice of this invention. Among these, "Saran," a polyvinylidene chloride, is preferred.

Other thermo-shrinkable films which may be used in carying out this invention include films such as rubber hydrochloride, commonly known and sold under the trade name of Pliofilm; vinyl polymers, vinylidene polymers, vinyl-vinylidene copolymers, vinyl chloride, vinyl acetate, and ethyl hydrochloride.

Any suitable combination of wrapping materials, such as laminated sheets of rubber hydrochloride may also be employed. The film is usually prepared from two outside plies of unstretched film with an intermediate stretched film containing butyl stearate. Many advantages are derived from the lamination of films such, for example, as added strength and increased resistance to water vapor transfer. Optimum benefits are derived when the film comprises a lamination having an outer ply of thermo-shrinkable material substantially .002 inch in thickness bonded to an inner-ply of thermo-sealable plastic film.

It will be realized that the present invention embraces the method of wrapping a column of stacked biscuits prior to segregation, wherein heat shrinking of the wrapped column is accomplished concurrently with the wrapping step, utilizing the sensible heat of the biscuits to heat shrink the wrapping material. This modification has the dual advantage of eliminating the necessity for a separate heat-shrinking step requiring the use of external heat and also obviates the need for cooling prior to packaging.

From the foregoing description it will be seen that the present invention affords novel means for the production of unit packages of biscuits from a column of stacked biscuits wherein the column of biscuits is preliminarily wrapped before segregation and assembly into unit packages. In addition to simplifying and reducing the cost of production, the present invention has the following advantages:

It eliminates the use of cartons in packaging biscuit, crackers or cookies; it provides for the continuous packaging of stacked biscuit, crackers or cookies for which up to now there has been no practical method of continuous packaging; it makes possible the production of self-supporting, content-visible units of biscuit, crackers or cookies; it provides great economy and flexibility in packaging biscuit, crackers and cookies in a multitude of shapes and configurations; it provides a maximum degree of protection for biscuit, crackers and cookies against dampness and contamination.

It will be understood that modifications and variations may be effected without departing from the spirit and scope of the invention.

What is claimed is:

1. A continuous method of packaging an advancing column of stacked biscuts into unit packages comprising the steps of continuously wrapping the advancing end of said column with a heat shrinkable sheet material while said advancing end is part of said column, sealing the top edges of said sheet material, heat shrinking said sheet material, severing said advancing end into smaller units, and closing the ends of each unit.

2. A continuous method of wrapping a column of stacked biscuits into unit packages comprising longitudinally and rectilinearly advancing said column in a continuous manner, continuously wrapping the leading end of a continuous web of heat-shrinkable sheet material about the girth of said advancing column to loosely encase said advancing column, sealing the top edges of said sheet material, subjecting the advancing encased portion of said column to heat to shrink said sheet material thereon, thereby to impart rigidity to the thus heated encased portion of said column, severing the heat treated portion of said column into separate groups of stacked goods, and enclosing the ends of each group.

3. The method of wrapping biscuits which comprises the steps of forming a continuously advancing column of biscuits stacked in face-to-face contact, applying a continuous web of thermo-shrinkable wrapping material about said advancing column, sealing the top edges of said wrapping material, shrinking said wrapping material about said advancing column by utilization of the sensible heat thereof, then severing the column into units of desirable length and enclosing the ends of each unit.

4. The method of wrapping biscuits which comprises the steps of forming a continuously advancing column of biscuits stacked in face-to-face contact, applying an advancing web of thermoshrinkable wrapping material lengthwise of said advancing column, progressively folding said web around said advancing column in the form of a loose tube enveloping the same, sealing the top edges of said wrapping material, shrinking said wrapping material about said advancing column by the application of heat thereto, then severing said column into units of desirable length and enclosing the ends of each unit.

5. The method of wrapping biscuits which comprises the steps of forming a continuously advancing column of biscuits stacked in face-to-face contact, applying an advancing web of thermoshrinkable wrapping material to one side of said advancing column, progressively folding said web of wrapping material lengthwise about said advancing column to form an overlapping longitudinal seam, sealing said longitudinal seam, heating said wrapping material to shrink it about said advancing column, then severing said wrapped column into units of desirable length and enclosing the ends of each unit.

6. The method of wrapping a continuously advancing column of biscuits stacked in face-to-face contact which comprises: drawing a web of thermoshrinkable wrapping material lengthwise from a continuous supply thereof and applying the web to a side of said advancing biscuit column, progressively overlapping the free edges of the web about said advancing column, sealing said free edges to form a seam lengthwise at the side of said column, heat-

ing the surface of said wrapped column of stacked biscuits sufficiently to shrink the wrapper thereon whereby it will embrace the column tightly to render it self-supporting, then severing the column into units of desirable length and enclosing the ends of each unit.

7. A continuous method of packaging an advancing column of stacked biscuits comprising: initially applying a moving web of thermoshrinkable wrapping material to the side of said advancing biscuit column, loosely progressively wrapping the advancing end of said column in synchronization with its rate of progression while maintaining said advancing end as part of said advancing column, sealing together the lengthwise edges of said wrapping material, heating said loose wrapping material about the advancing column, and thereafter severing said tightened wrapped column as it advances into shorter self-contained units, and enclosing the ends of each unit for assembly into finished package form.

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