

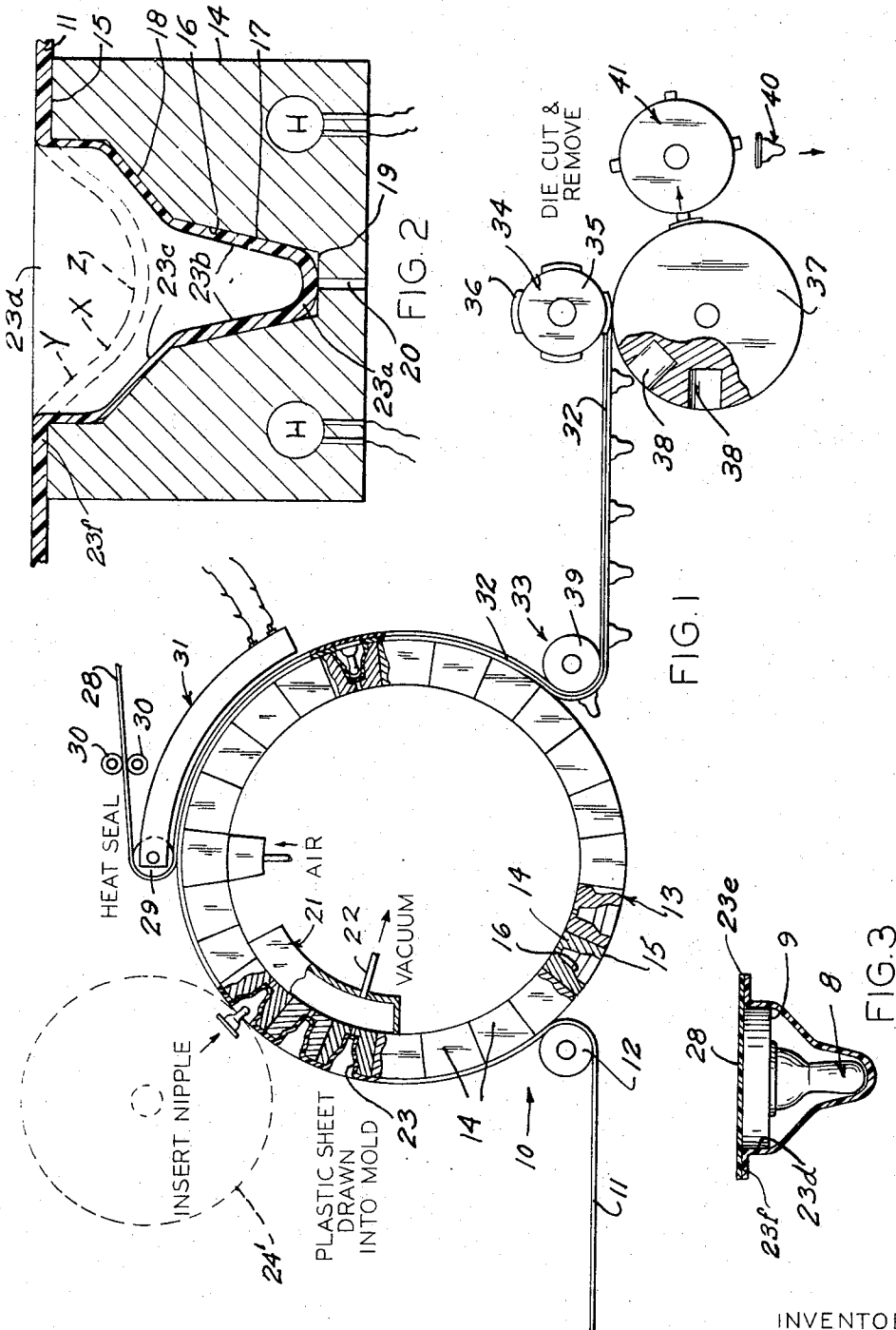
Nov. 21, 1967

C. E. CLOUD ET AL  
METHOD OF AND APPARATUS FOR PACKAGING  
ELONGATED ARTICLES SUCH AS NIPPLES

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3 Sheets-Sheet 1



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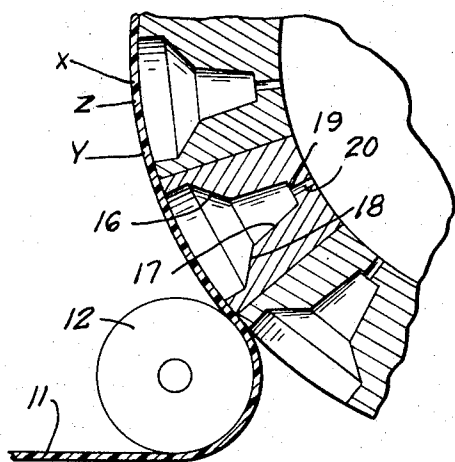


FIG. 4

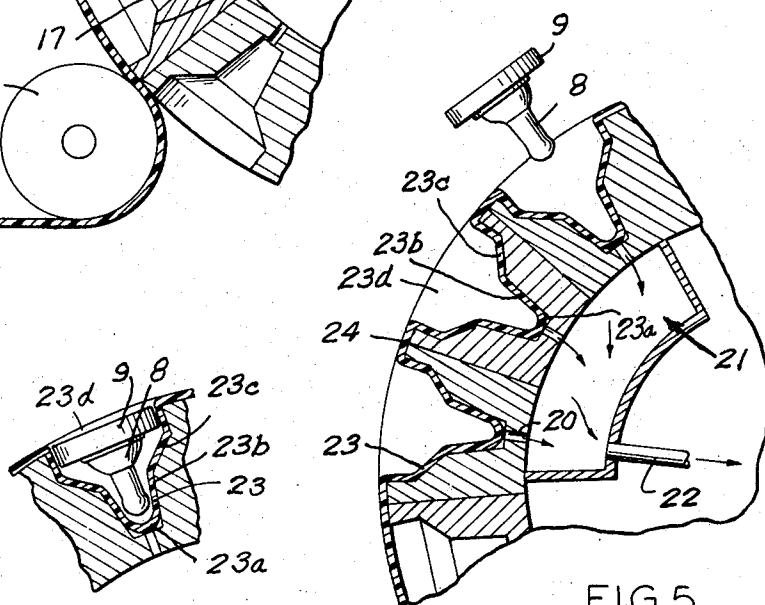


FIG. 5

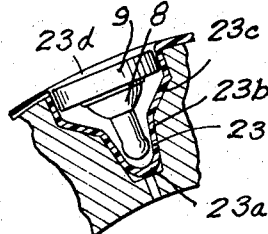


FIG. 6

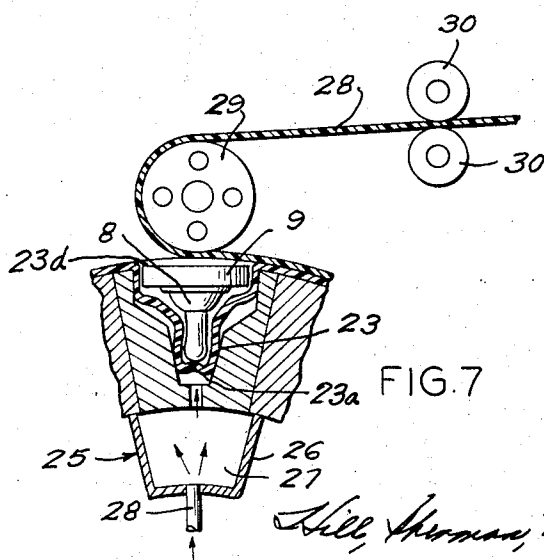


FIG. 7

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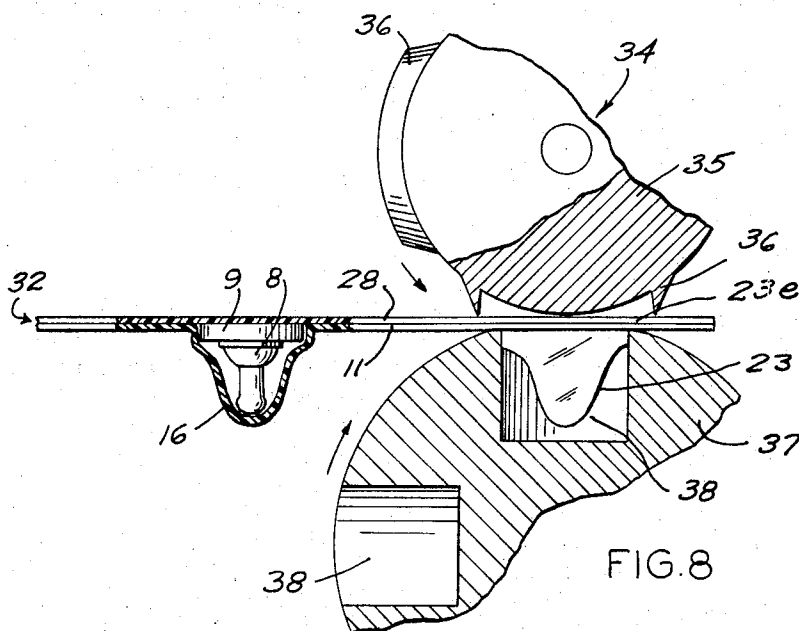


FIG. 8

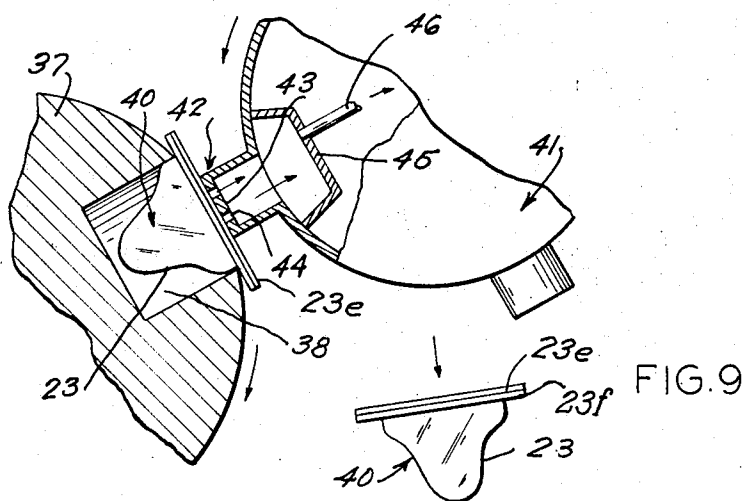


FIG. 9

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3,353,329

## METHOD OF AND APPARATUS FOR PACKAGING ELONGATED ARTICLES SUCH AS NIPPLES

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6 Claims. (Cl. 53—30)

The present invention relates generally to a new and improved method and apparatus for manufacturing contoured articles or cups and/or packages utilizing the cups as a component part thereof. This invention also relates to a new and improved packaging machine and method for the packaging of articles such as nipples and the like. In experiments with the packaging of articles of an elongated type, such as nipples, with a stretchable material or film, it has been found that when the material is stretched and drawn into a cup-shaped die to form a series of elongated cups, the bottom or central area of each of the cups is stretched to a greater extent and is formed with a smaller cross-sectional thickness than a side wall area. When articles are packaged in elongated cups of this type, it has been found that there is some tendency for the packages to rupture due to the thinness of the material and due to the fact that the bottom of the cups are subjected to greater handling stresses in subsequent packaging operations and by the purchasing public.

In order to provide a new and improved cup or package which can more effectively withstand handling stresses without having to use thicker more expensive type films, a new and improved method and apparatus has been developed whereby the material is stretched along a side area of each cup in a controlled manner so that the thickness of the cup can be controlled. Packages or cups formed having a thicker bottom are capable of withstanding greater handling stresses and are less susceptible to rupture.

An important object of this invention is to provide a new and improved method and apparatus for manufacturing cups and/or packages embodying the cups whereby the thickness of the side walls and the thickness of the bottom of the cups can be controlled.

Still another object of this invention is to provide a new and improved cup or package which is less apt to rupture when handled.

A further object of this invention is to provide a package for an elongated article that includes a cup having a bottom with a controlled thickness that is preferably the same as or greater than the thickness of its side wall, an article disposed in the cup and a closure strip in heat sealed assembly with a flanged open end of the cup.

According to still other more specific method features of this invention, a web of stretchable material is caused to be moved over a series of heated dies. A pressure differential of a suitable type such as a suction is then applied to the stretchable material causing the stretchable material to be drawn into the dies with the material being progressively stretched and thinned in a controlled manner as a selected peripheral area of the web or material is drawn into adjacency to the heated side walls of the dies to form a strip of elongated cups. According to one preferred form of the invention, the bottoms of the cups have a thickness as large as or larger than side walls of the cups. The articles are then inserted into the cups and a closure web of material is heat sealed over open ends of the cups whereupon the webs are severed to provide individually packaged articles.

Other objects and features of this invention will more fully become apparent in view of the following detailed

description taken in conjunction with the accompanying drawings illustrating therein a single embodiment and in which:

On the drawings:

FIGURE 1 is a side view of a machine, with parts broken away, for the packaging of articles;

FIGURE 2 is an enlarged fragmentary view partially in section illustrating in full and dotted lines the manner of stretching a portion of a web of stretchable material over a package forming die;

FIGURE 3 is a side view of an elongated article encased in a package that is illustrated in section and is of a type produced from the machine and method illustrated in FIGURE 1;

FIGURE 4 is an enlarged fragmentary cross-sectional view illustrating the manner by which the film is moved over die cups before being processed to form cups for receiving articles;

FIGURE 5 is an enlarged fragmentary section similar to FIGURE 2 further illustrating the formed film cups and the manner of loading an article into one of the thus formed cups;

FIGURE 6 is an enlarged fragmentary cross-sectional view similar to FIGURE 5 illustrating one of the articles mounted in one of the film cups;

FIGURE 7 is an enlarged fragmentary cross-sectional view illustrating the manner of applying a second web of material over open ends of the cups prior to sealing of the webs together;

FIGURE 8 is an enlarged fragmentary side view of a cut-off mechanism for severing packages from a continuous strip of packaged articles; and

FIGURE 9 is an enlarged fragmentary partially sectioned view showing the manner in which each package may be removed from the machine.

As shown on the drawings:

The present invention is concerned with the packaging of elongated articles such as nipples 8 having enlarged ends 9. An apparatus or machine 10 is provided for packaging the elongated articles or nipples 8 from a continuous web 11 comprised of a stretchable material. The apparatus 10 further includes a guide roller 12 for applying the web 11 to a rotating drum 13. The guide roller 12 can be heated for heating the film depending on the results desired. The drum 13 has a series of dies 14 mounted about its outer perimeter. The web 11 is applied directly against an outer die surface 15 as the drum is rotated in a clockwise direction past the roller 12.

Each of the dies 14 has an elongated cup 16 that is partially defined by a flared cup side wall 17. The flared wall has a stepped area 18 to provide a seat for the enlarged end 9 of the nipple 8. The cup 16 is further provided with a cup bottom 19 and a suction passageway 20 is extended from the bottom 19 to an inner surface of the die 14.

### Web stretching station

As the drum 13 is rotated, dies 14 and the suction passages 20 are caused to move past means for creating a pressure differential across the film lying over open ends of the dies to cause the film to be moved or drawn into the dies. This means may comprise a plug or air pressure directable against the exterior surface of the overlying film or a stationary suction header or manifold 21 as is illustrated in the drawings. The header or manifold 21 has a suction pipe or conduit 22 that is connected to a vacuum pump (not shown) which may be of any suitable type. Heating elements are connected to the dies 14 and particularly to the flared cup side wall 17 of the die cup 16 so that the cups are continuously maintained in a heated condition during the operation of the machine 10. The die cup 16 is heated to a sufficient temperature so

that when a peripheral portion of the web or film of stretchable material moves into adjacency to the heated die cup area or surface as a result of the pressure differential applied to the area of film overlying the open end of the die cup, the film will be heated and then progressively stretched and thinned and allowed to take a set whereby residual stresses and tensions in the thus thinned peripheral portion of the film are minimized. Stated otherwise, as the portion *x* of the stretchable material overlying the open end of the cup is subjected to a pressure differential, in the illustrated embodiment, this same film portion is caused to be moved in a direction out of its longitudinal direction of travel so that a selective peripheral area *y* of the portion *x* is contemporaneously heated and stretched as the film is moved into adjacency to the heated side wall of the die cup to selectively stretch the same rather than to stretch the central area *z* of the portion. In the practice of the method and in the operation of the apparatus or machine, the temperature of the die cup 16 will vary depending on the type of film used. There are a number of conventional means that can be used to heat the inner surfaces of die cups 16 as indicated at H in FIGURE 2.

As the cups 16 are rotated past the suction manifold 21, portions of the web are drawn into the elongated cups 16 and uniquely formed to provide contoured articles or cups 23 in accordance with important features of this invention. To this end, as the web is moved into the cup, the heated flared wall heats the film causing the web material to be stretched and progressively thinned to form the elongated cups 23. The web material can be thinned by maintaining the die side wall 17 at 230° F. to 240° F. where a polypropylene film or web is used. As mentioned previously, any suitable means can be utilized to create the pressure differential to cause the film to be moved into the cup. Where an external pressure is applied to the film to urge the film into the cup, the cup passage 20 is useable as a vent to facilitate movement of the film into the cup. These elongated cups 23 can be linked together by intermediate strip areas 24 (FIGURE 5) or they can be individually formed. Each cup includes a bottom 23a, a flared side wall 23b, a stepped area or seat 23c, and an open end 23d. As a result of the just described stretching and thinning operation, the side wall 23b may be very desirably left in a condition whereby it is thinner than the thickness of the bottom 23a. Excellent results can be obtained by using a polypropylene film known as the "UDELM" film that is sold by Union Carbide Plastics Co. By practicing this method, it is possible to use a 3 mil polypropylene sheet instead of a 5 mil polypropylene sheet whereby the packaging expense may be substantially reduced. Where a 3 mil polypropylene sheet is used, the stretching operation can be controlled and excellent results can be obtained where the cup is formed having a bottom 23a with a thickness of 2.7 mils and where the side wall 23b has a thickness of 1.5 or 2 mils and where a flanged end 23f is left with a thickness of approximately 3 mils. According to other features of this invention, the side wall and the bottom are formable so as to be of an essentially uniform thickness. Depending upon the type of material required and the results desired, the film can be preconditioned for contoured forming in the heated die cup 16. The film can be heated or chilled and the roller 12 is heatable or chillable to condition the film in the desired manner. Where polypropylene is used, the film can be preheated to a temperature of 200° F. to 400° F. or chilled to 35° F. or 40° F. where preheating or chilling is desired. To load stretched cups with articles such as frankfurters or suppositories, the formed cups must be removed from the hot dies and placed into dies having a temperature appropriate to the product being packaged. Thereafter, the cups are loaded and peripherally sealed to prevent the heat from affecting the product. The nipples can be loaded into a hot die as they will not be affected by the heat. In accord-

ance with the present invention, where articles are to be packaged in side-by-side relation, the shape of the die cup can be varied to provide a die having a bottom that is essentially flat and only slightly tapered side walls so that an essentially parallel sided package can be produced. The film in the formed cup will be thinned along its parallel sides and the bottom will be thicker than the sides.

#### Loader

After the cups 23 are formed to shape, they are in condition to receive the articles or nipples 8. These articles or nipples 8 can be manually inserted into the elongated cups 23 or inserted by means of a loader 24' of any suitable type. As illustrated, the loader 24' may be of any suitable type and in the illustrated form comprises a wheel that is capable of holding the nipples on the wheel until the nipples are inserted into the cups 23.

#### Package closing station

At the package closing station, means or apparatus 25 is provided for slightly collapsing the elongated cups 23 at the bottom 23a. This apparatus includes a stationary box 26 which defines an air chamber 27. The chamber 27 is connected with an air inlet passage 28 which is in turn connected to a suitable source of air pressure. As the dies 14 are rotated past the box 26, the suction passage-way 20 is connected with the air chamber 27 enabling pressurized air to flow in a direction toward the elongated cups 23 causing the cup bottoms 23a to be collapsed as illustrated in FIGURE 7.

Guide rollers 29 and 30, 30 are provided for applying a second web 28 of stretchable material onto the rotating drum over the open ends 23d of the elongated cups 23 as the cup bottom 23a are being collapsed. A heat sealer 31, of any suitable type, is provided for joining the webs 11 and 28 contemporaneously as the cup bottoms 23a are collapsed. The heat sealer 31 may be of any suitable type capable of joining two layers or webs of stretchable film together. In the sealing operation, it will be appreciated that the area surrounding the open end 23d of the cup 23 is sealed to form a continuous strip 32 of packaged nipples.

Apparatus or means 33 is provided for removing the continuous strip 32 from the dies 14 which includes a roller 39 and a driven cut-off mechanism 34. The cut-off mechanism 34 functions to pull the strip 32 from the dies over the roller 39.

#### Cut-off

The cut-off mechanism 34 includes a rotating wheel or roll 35 having a series of heated oval-shaped knives 36 about its perimeter. A back-up wheel or roll 37 is mounted opposite the wheel or roll 35 and driven at the same rate. A series of cup receiving pockets 38 is provided about its circumference for receiving the cups 23 on the strip 32. The circle formed by each of the knives 36 is sufficiently large so that as each heated knife is rotated against the back-up wheel 37, a flanged area 23e is cut out about the enlarged or open end 23d of the cup completing the formation of a packaged unit or a flanged package 40.

#### Removal of packages

A pick-up mechanism 41 is provided for removing the packaged units or articles 40 from the cup receiving pockets 38 provided on the back-up wheel 37 of the cut-off mechanism 34. The pick-up mechanism comprises a wheel having circumferentially spaced suction heads 42 which project radially outwardly from the outer perimeter of the wheel. The wheel and the heads 42 are rotatable at the same rate as the wheel 37 and timed so that the heads 42 come in contact with the end of the packaged unit or article to withdraw the same from the associated pocket 38. After the packaged unit 40 is removed, the suction is cut off by a suitable valve arrangement and

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the package 40 is allowed to drop into a box or onto a conveyor for further processing.

Each suction head 42 includes an enlarged head end 43 having suction passages 44 therein through which suction may be applied to the end of the packaged unit or article. An opposite end 45 of each of the heads 42 is connected by means of a suction pipe 46 to valves and to a suction pump which may be of any suitable type. As previously mentioned, as the units or articles 40 are removed from the pockets 38, the suction applied through the pipe 46 is cut off permitting the unit or article 40 to drop free into a box or onto a conveyor.

Although minor modifications might be suggested by those versed in the art, it should be understood that we wish to embody within the scope of the patent warranted hereon, all such modifications as reasonably and properly come within the scope of our contribution to the art.

We claim as our invention:

1. In a method of packaging elongated articles, the steps of:

moving a web of stretchable material over a series of heated dies,

causing the stretchable material to be moved into the heated dies with the material being progressively stretched and thinned as it is heated by the heated side walls of the dies forming a strip of elongated cups with bottoms of the cups having a greater cross-sectional thickness than side walls of the cups, attaching a closure web of material over open ends of the cups after articles have been inserted into the cups providing a strip of packages, and separating the packages from one another.

2. A packaging apparatus including:

a series of heated cup-shaped dies

means for applying a web of stretchable film over open end of the dies,

means for causing a pressure differential to be applied to the stretchable film overlying the open ends of the cup-shaped dies for causing the material to be moved into the dies and to be thinned forming cups each having a thinned stress relieved side wall,

means for applying a second web of material over the open end of the cup,

means for sealing the webs together closing the open end of the cup, and

a cut-off mechanism comprising a first roll having circumferentially spaced pockets for receiving the cups on the film strip and a second co-rotating roll having a series of circumferentially spaced circular heated knives synchronized for the cutting of the webs about open ends of said pockets for forming flanged packages.

3. A cup forming apparatus including:

a series of heated cup-shaped dies

means for applying a web of stretchable film over open end of the dies,

means for causing a pressure differential to be applied to the stretchable film overlying the open ends of the cup-shaped dies for causing the material to be

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moved into the dies and to be thinned forming cups each having a thinned stress relieved side wall,

a cut-off mechanism comprising a first driven roll having circumferentially spaced pockets for receiving the cups on the film strip and a second co-rotating roll having a series of circumferentially spaced circular knives synchronized for the cutting of the web about open ends of said pockets for forming flanged cups, and

a rotating suction roll having suction heads about its perimeter with the suction heads being cooperable with the pockets on said first driven roll for removing the flanged cups therefrom.

4. In a method of forming a cup, the steps of:

positioning stretchable synthetic film plastic material over a heated die, and

applying a vacuum to one side of the material causing the material lying over the die to be drawn into the die while contemporaneously causing an outer peripheral area of the material lying over the die to be progressively engaged against a heated side wall area of the die and stretched and thinned leaving a central area of the material at essentially its original thickness forming a cup with a bottom having a greater cross-sectional thickness than its side wall.

5. In a method of forming a cup, the steps of:

positioning stretchable synthetic film plastic material over a heated die, and

causing relative movement between the material and the die thereby progressively engaging an outer peripheral area of the film against the heated side wall of the die thereby thinning the outer peripheral area forming a cup with a bottom having a greater cross-sectional thickness than the side wall of the cup.

6. In a method of forming contoured articles, the steps of:

causing relative movement between a web of stretchable synthetic plastic material and a series of heated dies and utilizing a combination of the movement and the heat from the heated side walls of the dies to progressively stretch and thin at least a portion of the web to form a strip of contoured articles.

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