

July 15, 1969

B. EDWARDS

3,454,987

APPARATUS FOR SEPARATING RIM NESTED CONTAINERS

Filed Sept. 27, 1966

2 Sheets-Sheet 1

Fig. 1

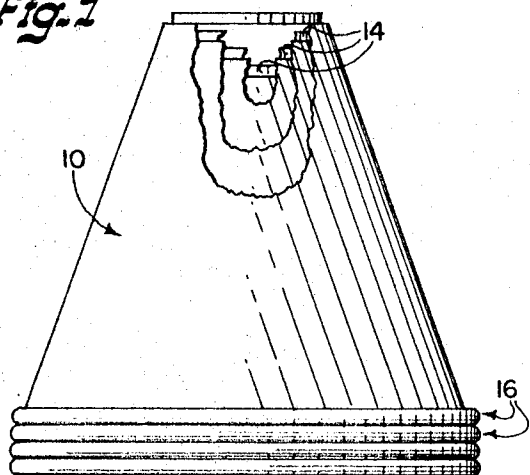


Fig. 2

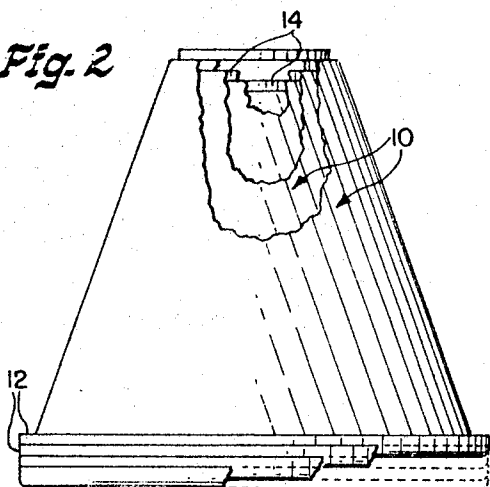


Fig. 3

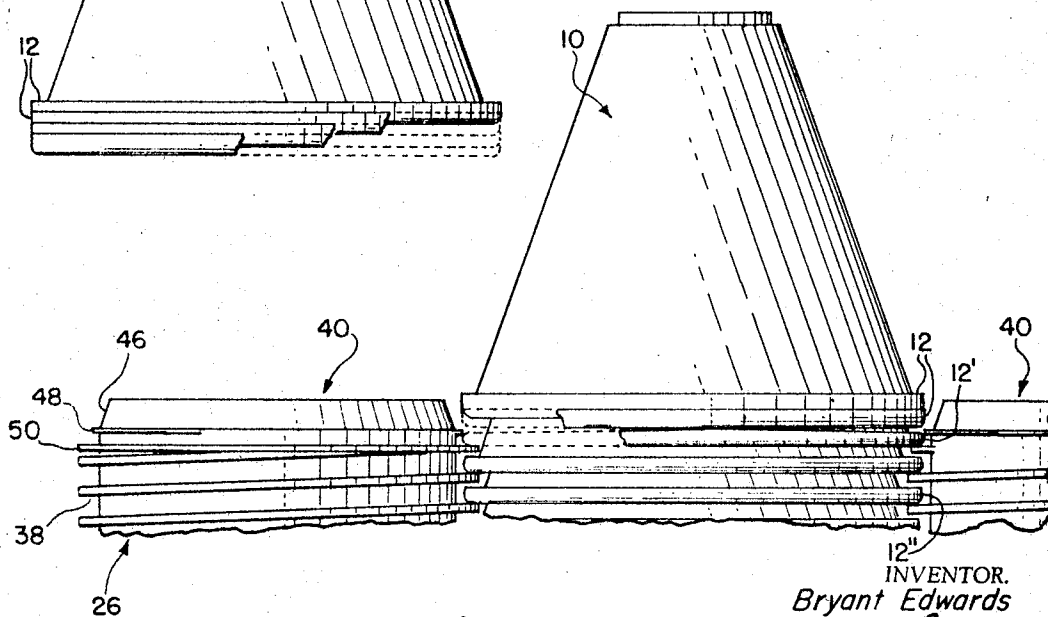
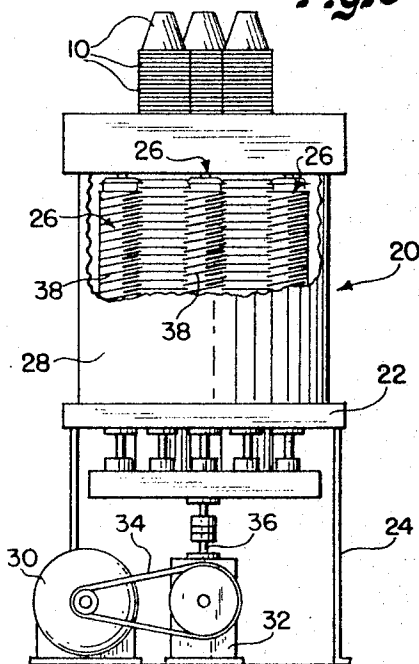


Fig. 4

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2 Sheets-Sheet 2

Fig. 5

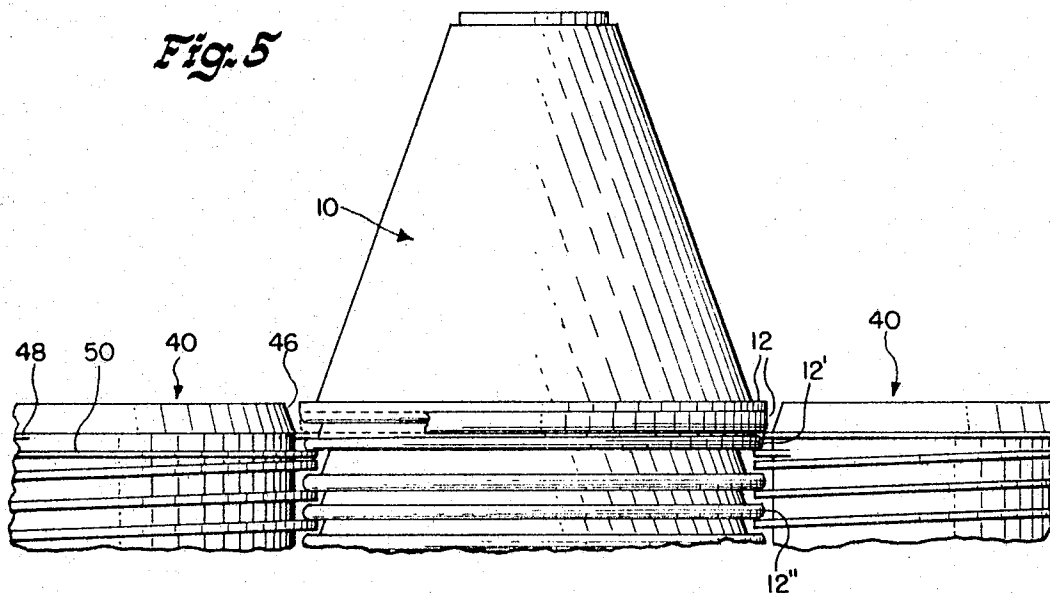


Fig. 7

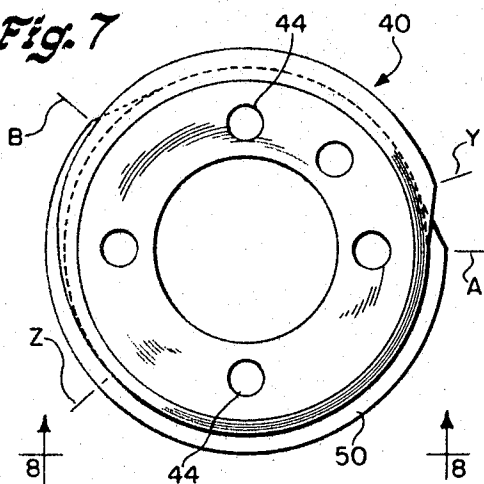


Fig. 8

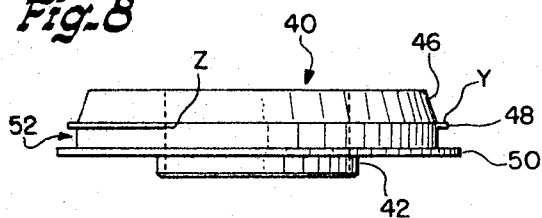
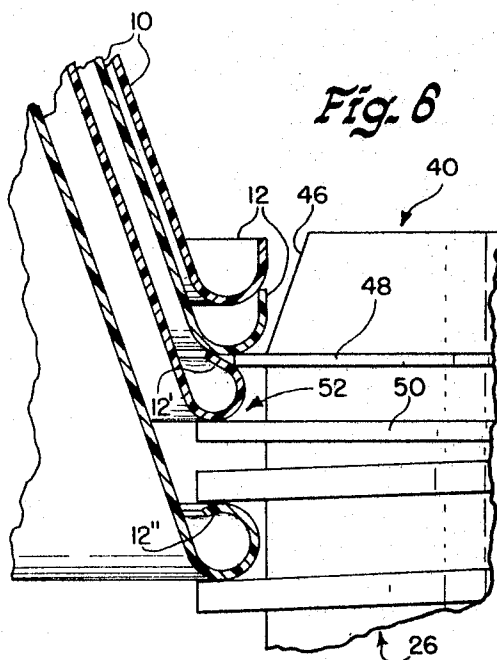


Fig. 6



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3,454,987

APPARATUS FOR SEPARATING RIM NESTED CONTAINERS

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Filed Sept. 27, 1966, Ser. No. 582,284

Int. Cl. B29c 17/00

U.S. Cl. 18—19

2 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus for forming a rolled under rim on a thin wall plastic container which includes means for separating and initially folding back the rim of each container toward its side wall at least to an extent where nesting with the rim of a superposed container is prevented, the apparatus further including elements which are capable of receiving in successive fashion the thus formed plastic containers and forming rolled under rims thereon.

The present invention relates to an apparatus for separating rim nested plastic containers or the like from one another, and more particularly, to an apparatus for separating and folding back the rims of rim nested containers to an extent where subsequent nesting between the rims of adjacent containers is prevented.

It is the customary practice in the disposable or throw away container industry to rim curl or roll the open upper end of a container to present a lip or rim construction which does not injure the lip or hand of a user, and which provides increased lateral strength to the container. There are many known lip curling or rim rolling techniques which can be performed either as the container is formed or in a post forming operation.

In the manufacture of thermoplastic containers, the rim curling operation has conventionally been a post forming technique primarily because simultaneously operations have not operated satisfactorily. In such post forming operations, difficulties have been encountered in handling the containers prior to and during the rim curling operation which have caused machine jam-up with consequent downtime and inefficiency. These difficulties have included such things as cocking of individual containers and nesting of the container rims with attendant container jamming, all of which have contributed to the inefficiencies aforementioned.

It has been found that an accumulation of containers in a nested stack prior to movement to the rim curling station, as disclosed in U.S. Patent No. 3,192,565 dated July 6, 1955, will prevent undesirable cocking of containers which affects the nature of the rim curl and operational efficiency. While this technique reduces cocking of containers, it will increase the possibility of rim nesting or jamming between adjacent containers, particularly where it is desired to have the rim function as the container stacking device after rolling or curling thereof. Rim nesting and jamming between adjacent containers has been a problem even without the accumulation of containers, and thus there has been a desire to provide a method and apparatus which overcomes or corrects the nesting and jamming between the rims of adjacent containers.

It is a primary object of the present invention to provide an apparatus which separates and forms rim nested containers to an extent where subsequent rim nesting is prevented.

Another object of the present invention is to provide an apparatus which separates rim nested containers from each other and forms the container rims such that the

containers may be moved in jam-free relationship to a rim curling station or operation.

A further object of the present invention is the provision of an apparatus which, in addition to the aforementioned objects, assures fast, repetitive, trouble-free operation of a rim rolling or curling station, and which can be simply and easily adapted thereto.

These and other objects and other advantages of the present invention are attained by the provision of a method and apparatus which separates stacked, plastic containers or the like each of which have a side wall terminating in an outwardly directed, reversely bent circumferential rim capable of nestably receiving and being nested within the rims of adjacent similarly configured containers, said method and apparatus being operative to separate the nested rims between adjacent containers in a stack of containers, and while separated, the previously nested rims are formed in a manner to preclude subsequent nesting of the containers whereupon they may be released or further treated by a rim rolling station or operation.

Reference is now made to the drawings wherein:

FIG. 1 is a side elevational view, partially fragmented, of an inverted stack of nestable insert cups constructed to provide rim on rim stacking between adjacent containers;

FIG. 2 is also a partial fragmentary side elevational view of an inverted stack of insert cups prior to the rolling or curling of the rims thereof;

FIG. 3 is an elevational view of a container rim rolling or curling machine which incorporates features of the present invention;

FIG. 4 is an enlarged fragmentary elevational view of a portion of the rim curling or rolling apparatus showing the manner in which rim nested containers are engaged and separated from each other;

FIG. 5 is also an enlarged fragmentary elevational view similar to FIG. 4 which illustrates further engagement and separation of the rims between adjacent containers;

FIG. 6 is an enlarged fragmentary elevational view, partly in section, illustrating the manner in which rim nested containers are separate and formed to preclude subsequent nesting thereof;

FIG. 7 is a top plan view of a container separating and forming element which is employed in conjunction with the rim curling or rolling apparatus shown in FIG. 3; and

FIG. 8 is an elevational view of the rim separation and forming element depicted in FIG. 7.

The method and apparatus of the present invention is particularly useful with containers of the type illustrated in FIGS. 1 and 2. These containers which are generally identified 10 are of the type known as disposable insert cups or containers which are adapted to be used with a supporting holder of hollow construction. Disposable insert cups made of paper have been sold commercially for quite a number of years, and have proved quite successful since the insert can be discarded after usage and replaced with an unused cup.

The insert cups 10 illustrated in FIGS. 1-2 employ the conventional conical shape, but preferably are made from thermoplastic material such as high impact polystyrene. It has been found that plastic disposable insert cups have a high incidence of jamming, and to avoid this, stacking means have been employed to limit the amount of telescoping between adjacent stacked containers and thereby prevent jamming. While various types of stacking configurations may be used, it has been found that the containers of the type illustrated function well by stacking rim upon rim.

This presents a problem since in the manufacture of plastic containers made of high impact polystyrene, a post rim forming operation is customary. The containers 10 can be formed into a one-piece seamless body with

a projecting rim portion 12 which is usually outwardly directed and reversely bent relative to the container side wall, as illustrated in FIGS. 2-6, to aid in the post rim rolling or curling operation. While container stacking means may be employed to prevent the jamming of adjacent, nested containers, there is still the possibility that the rims 12 of adjacent containers can nest within one another, particularly where it is desired to use the subsequently curled rolled rims as the primary container stacking means.

In each of the containers 10 illustrated in FIGS. 1-2, a stacking ring 14 in the vicinity of the bottom thereof is preferably employed to limit the degree of telescoping between adjacent containers. The stacking rings 14 may employ a reverse taper construction of the type disclosed and claimed in U.S. Patent No. 3,139,213. The container stacking rings 14, while usefully employed in transporting the containers 10 from the forming station to the rim rolling or curling station, must have a limited axial height where container rim stacking is employed so as to keep from interfering therewith. In other words, the axial height of each stacking ring 14 must be less than the axial height of the container rim when subsequently curled or rolled so that container rim stacking between adjacent nested containers can take place. In view of the limited height of the stacking rings 14 in each container and the outwardly directed, reversely bent rim configuration 12 which must have sufficient material to enable formation thereof when curled or rolled to an axial height greater than that of the container stacking rings 14, the incidence of rim nesting or jamming is increased. When container rims nest or jam together, it is difficult to separate them to an extent where a rim curling or rolling function can be performed thereon. The matter of separating and forming the rims 12 at least to an extent where subsequent nesting between the rims of adjacent containers cannot take place is the particular aspect with which the present invention is concerned.

The type of rim stacking which has been usefully employed in disposable insert containers 10 and the like is illustrated in FIG. 1 of the drawings. In this figure, each of the containers 10 have a rolled or curled rim 16 which engages and rests upon an adjacent rim 16 of a similarly configured container 10 to prevent jamming between the side wall of adjacent containers. Each of the rolled or curled rims 16 have been formed from the outwardly directed, reversely bent circumferential rim 12 which is formed in that manner at the container molding station. The containers 10 shown in FIG. 1 are in their completed form in the sense that they are now capable of being mounted or held within a hollow supporting holder as is conventional.

The containers 10 come from the container molding or forming station in the shape shown in FIG. 2 of the drawings, and are transported by suitable means such as pneumatic tubes and the like to a machine for curling or rolling the outwardly directed, reversely bent circumferential rim 12. One type of machine which can be used for this purpose is represented by numeral 20 in FIG. 3 of the drawings. Such a machine is specifically disclosed and claimed in U.S. Patent No. 3,096,546, and generally comprises a platform 22 which is mounted on the supporting leg 24. A plurality of spirally grooved cylindrical rim curling or rolling elements 26 are mounted on the platform 22 and encased within the sheet metal drum 28 also supported by the platform 22. A motor 30 is positioned below the platform 22 and drives a speed reducer 32 by means of a belt 34. The speed reducer 32, in turn, drives a shaft 36 which extends up through the platform 22 and drives a gear train (not shown) for rotating the elements 26. The specific gear train mechanism employed may be of the type described in U.S. Patent Nos. 3,096,546, and reference is made to that patent for understanding the driving system employed.

In rolling or curling the rims 12 to their curled or

rolled shape 16 as illustrated in FIG. 1, a plurality of the rims roller elements are disposed in spaced relationship from each other around the circumference of a circle for receiving a stack of containers 10, and for engaging each rim 12 thereof at a plurality of accurately spaced positions. The specific number and arrangement of rim roller elements 26 may be varied to suit the particulars desired.

Each of the rim roller elements 26 includes a screw thread or groove 38 which is designed to form the outwardly directed, reversely bent circumferential rim 12 of each container 10 to the curled or rolled shape 16 shown in FIG. 1. Any type of screw thread or groove formed may be employed which functions to progressively deflect the container rims 12 as the containers 10 are moved through the machine 20. In U.S. Patent No. 3,096,546, a V-shaped groove is employed having a maximum depth at the upper end of the rim roller element 26 which tapers uniformly to a minimum depth near the bottom of the roller, and again deepening to a lesser maximum at the bottom of the roller. The container rims 12 are designed to sequentially engage within the screw thread or groove 38 so that each rim is brought or folded back toward its side wall and assumes the curled or rolled shape 16 illustrated in FIG. 1.

As an aid to the rim rolling operation, it has been found that a smooth, even rim roll or curl is obtained by employing a heating element in connection with one or more of the thread roller elements 26. The heating device may take the form of a Calrod unit or the like. While it is preferable that each of the rim roller elements 26 which are disposed in a circumferential array are formed with a screw thread or groove, it has been found that an acceptable rim roll or curl can be obtained by using a single rim roller element 26 with the other elements disposed in circumferential position relative thereto having a smooth face so as to function in guiding and supporting the containers, but without forming the container rims which is left to the single rim roller element.

The propensity of the containers 10 as illustrated in FIG. 2 to nest or jam in the vicinity of the rims 12 thereof has made it difficult in the individual rolling or curling of container rims without injuring the container products and causing jam-ups in a machine 20 as depicted in FIG. 3. Accordingly, it has become necessary to control and handle the containers 10 in such a manner that the rims 12 of adjacent containers 10 are held in spaced relationship to one another as they are guided and moved through the rim rolling apparatus. In the machine 20, this has been accomplished by employing a cap element 40 with each of the spirally grooved rim roller elements 26 which function to separate the nested rims 12 of adjacent containers 10 from each other for individual movement through the rim roller elements 26.

Element 40, as best seen in FIGS. 7-8, comprises an annular body member having a depending plug element 42 extending from the lower face thereof. The plug element 42 is adapted to be received within a complementary shaped recess formed in the upper end of the corresponding rim roller element 26 with which it is to be associated. A plurality of bolt receiving apertures 44 are formed in the separating and forming element 40 for receiving bolts of suitable size to mount the element 40 to a rim roller element 26. The upper face of the element 40 is substantially planar in construction and merges at its outer periphery into a downwardly and outwardly tapering face 46 which receives and guides the containers through the rim roller apparatus. In this respect, it is to be understood that each of the rim roller elements 26 mounted in circumferential array will include an element 40, thus providing a plurality of spaced downwardly and outwardly tapering faces 46 which receive and guide the containers in the manner desired.

Each separating and forming element 40 includes a pair of axially spaced and interrupted flange or ledge elements

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48, 50 which define there-between a groove 52 for receiving the rims of containers therein. The lower flange or ledge element 50 has a greater diameter than the upper flange or ledge element 48 for supporting the container rims as they are being worked upon by the upper flange or ledge element 48 as will be discussed in detail hereinafter.

The lower flange or ledge element 50 is peripherally uninterrupted between the points A and B as shown in FIG. 7. Individual container rims are supported by the lower flange or ledge element 50 between points A and B. The arc subtended between points A and B is approximately 240° which means that the container rims will be supported for approximately a 240° arc. The flange or ledge element 50 is interrupted or radially reduced in size between point B and point A. Thus, individual container rims are supported between points A and B, but upon reaching point B they are no longer supported and can drop or disassociate themselves from the separating and forming element 40 for movement to the rim roller elements 26.

The upper flange or ledge element 48 is peripherally interrupted between points Y and Z while being peripherally continuous between Z and Y. The arc subtended between points Y and Z is approximately 120°, and this arc is related to the 240° arc between points A and B of the lower flange or ledge element 50 in the sense that the peripherally interrupted portion between points Y and Z on the upper flange or ledge element 48 generally coincides with the peripherally continuous portion between the points A and B of the lower flange or ledge element 50.

At point Z, however, the upper flange or ledge element 48 begins its radial enlargement such that the arc between points Z and Y will coincide with the peripherally continuous as well as the peripherally interrupted portions of the lower flange or ledge element 50.

Reference is now made to FIGS. 3-6 for an understanding of the manner in which the separating and forming elements 40 operate in conjunction with the rim roller elements 26. The containers 10 are telescopically nested in container stacks and placed in inverted position as shown in FIG. 3 atop the machine 20. Each stack of containers 10 is adapted to be received within an axial opening which extends through the upper surface of the machine 20 around which a plurality of rim roller elements 26 are disposed. As shown in U.S. Patent No. 3,096,546 to which reference has been earlier made, there are six circumferentially spaced rim roller elements 26 for each axial opening, and thus each stack of containers are engaged at six circumferentially spaced locations. It will be understood that the number and spacing of the rim roller elements 26 may be varied to suit the particulars desired, it already having been indicated that a single rim roller element 26 may be employed in conjunction with one or more smooth faced cylindrical rollers.

The containers 10 are guided into position by the tapering entering end face 46 of each separating and forming elements 40. Each of the separating and forming elements 40 are driven in phase with one another in the sense that at any point during the cycling of the apparatus, any of the points A, B, X and Y will be positioned at the same arcuate position. As the separating and forming elements 40 are rotated by their respective rim roller elements 26, the interrupted portion between the points Y of each upper flange or ledge 48 will be moved into the vicinity of an individual container rim 12 permitting it to drop by gravity onto the lower flange or ledge element 50. The movement of the container rims 12 past the upper flange or ledge element 40 between the points Y and Z is due to the size of the opening created which is larger than the maximum transverse dimension of each container rim 12. FIGURE 4 illustrates the manner in which containers are deposited on the lower flange or ledge element 50 once they have been moved through the opening created by the radially reduced area located between the points Y and Z of the upper flange or ledge element 48.

The weight of the container stack is supported by the lower flange or ledge element 50 until the radially enlarged portion of each upper flange or ledge element 48 comes into contact with the rim of the bottommost container in the stack. The radially enlarged portion begins at point Z and continues until it reaches point Y where the radially reduced area begins. The effect of each radially enlarged portion between the points Z and Y is the creation of a "knifing-action" between the rims of the bottommost and penultimate containers in the stack. This action, as best seen in FIGS. 5-6 of the drawings, involves the engagement of outwardly directed, reversely bent circumferential rim of the bottommost container in the vicinity of its free extremity and the movement of the rim out of nesting engagement with the rim of the penultimate container by folding the rim of the bottommost container until it assumes the position 12' as illustrated in the drawings. The inherent flexibility of the container rims will permit the outer free extremity of the bottommost container rim to be cammed or moved past the upper rim area of the penultimate container until it is folded back to the position 12'. At this position, the rim of the bottommost container has been folded back at least to an extent where nesting with the rim of the penultimate container is prevented, and the bottommost container can now be released for movement to the rim roller element 26. In this respect, it is to be noted that the area of each separating and forming element 40 between the points B and A is radially reduced to an extent where it can effectively merge with the uppermost projecting spiral thread portion to permit free and uninterrupted movement of containers from the separating and forming element 40 to the rim roller element 26.

While the container rims may be cold worked beyond their point of elastic recovery, it is preferable that the container rims when assuming the position 12' are merely in a temporary state without permanent deformation thereof since it has been found that the combination of heat and pressure through the medium of a heated rim roller element 26 provides an exceptionally good curl or roll of the type that has been found necessary. Accordingly, in its preferred form, the rim and separating element 40 is associated with a rim roller element 26, although a partial cold working of the rim may be effected if it desired to feed the containers to a separate rim rolling station. In its final form, each container rim should preferably assume the shape which is identified by 12" in the drawings where the smooth curvilinear roll or curl has been obtained.

It will be understood that while the present disclosure has been mainly directed to the separating and forming elements 40, other forms which function in the same manner are to be considered as coming within the purview of the present invention. Also, any form of device or manual operation which produces the results desired in a procedural sense is similarly considered to be within the scope of the present invention.

Although the invention has been described specifically with regard to turned down rims on plastic containers, it will be understood that the invention is generally applicable to sheet material containers having exposed edges of similar type.

It is to be understood that the specific embodiment of the invention as herein shown and described is for illustrative purposes only. Various changes in structure will no doubt occur to those skilled in the art, and are to be understood as forming a part of this invention insofar as they fall within the spirit and scope of the appended claims.

I claim:

1. Apparatus for forming a rolled under rim on a plastic container or the like of the type having a side wall terminating in an outwardly directed, reversely bent circumferential rim, said apparatus comprising means for separating and initially folding back the rim of each

container toward its side wall at least to an extent where nesting with the rim of a superposed container is prevented, a plurality of cylindrical elements having their axis parallel and disposed on the circumference of a circle for receiving the plastic containers from the aforementioned means and for guiding the plastic containers in a predetermined path, at least one of said cylindrical elements carrying a spiral groove which is configured to receive and progressively deflect the rim of each container toward its side wall to provide a rolled under rim, said means for separating and initially folding back the rim of each container toward its side wall comprising a grooved cap member which is mounted on said spirally grooved cylindrical element at the upper end thereof, and drive means for operating at least the spirally grooved cylindrical element.

2. The apparatus as defined in claim 1 wherein each of the cylindrical elements are spirally grooved for receiving and progressively deflecting the rims of said containers, each of said spirally grooved cylindrical elements having a grooved cap member mounted thereon at the upper end thereof.

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