Oct. 6, 1953 L. D. PIERCE 2,654,473

NESTING CONTAINER SHELLS

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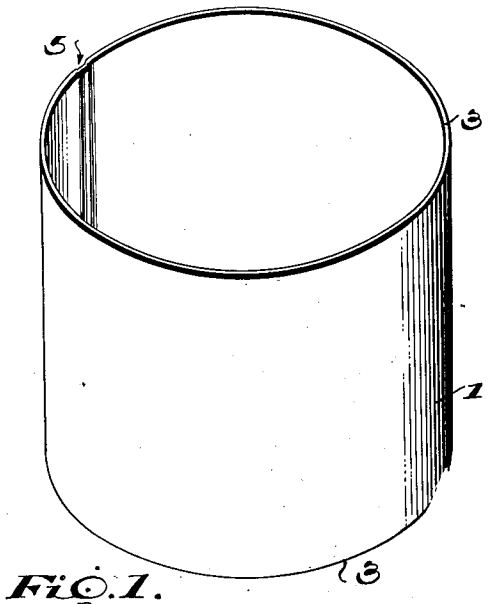


Fig. 1.

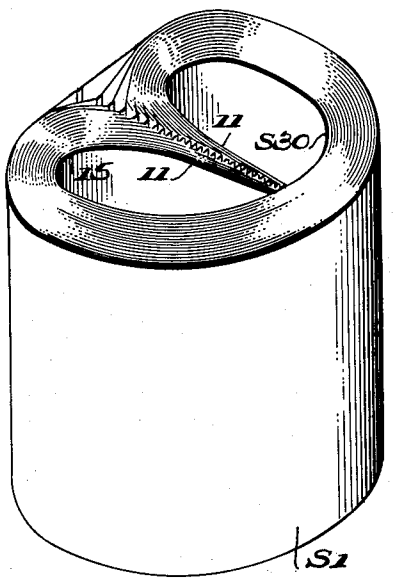


Fig. 2.

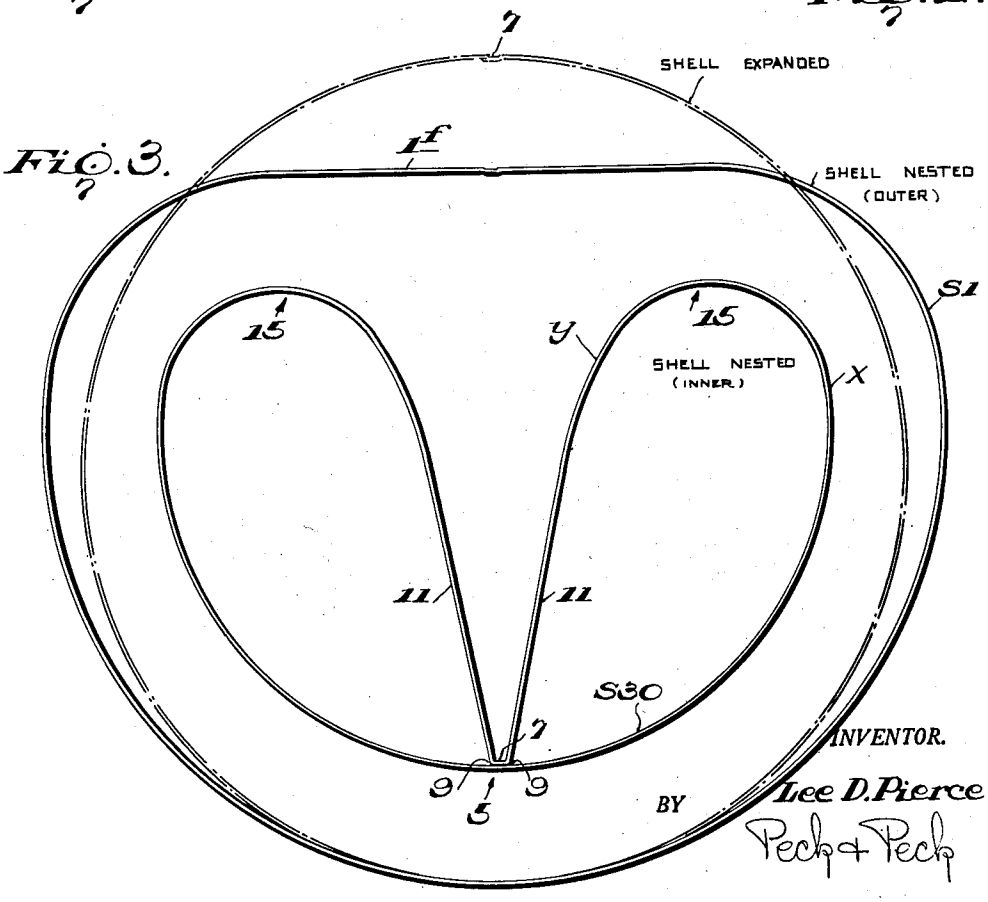


Fig. 3.

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Fig. 5.

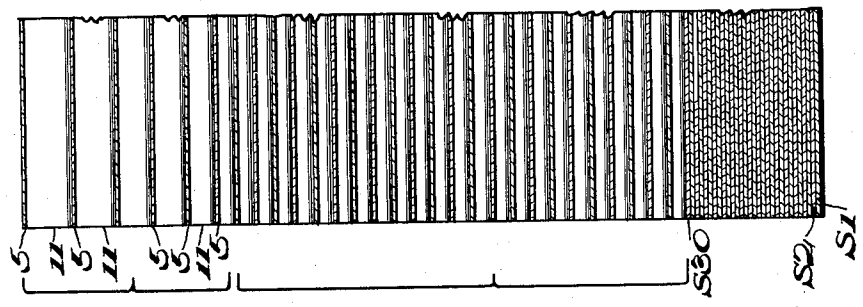
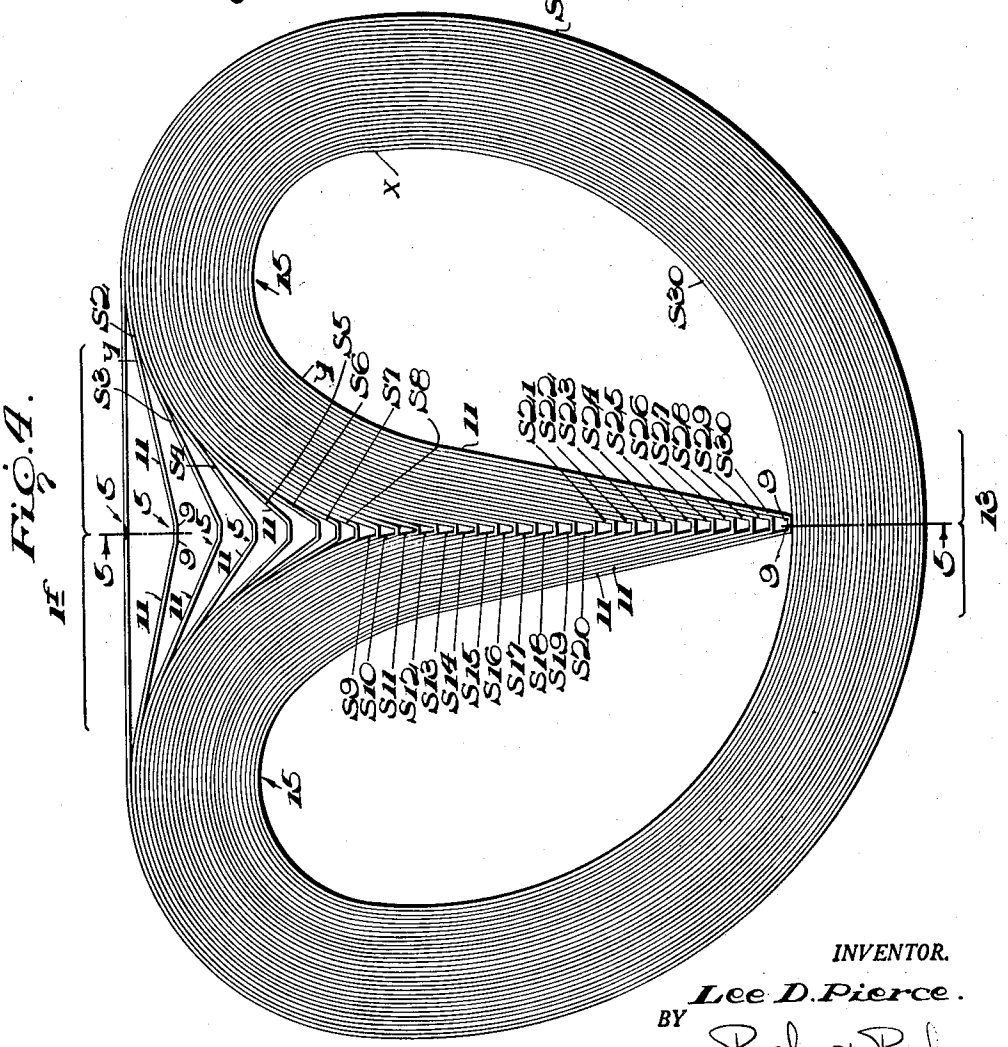


Fig. 4.



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Fig. 6.

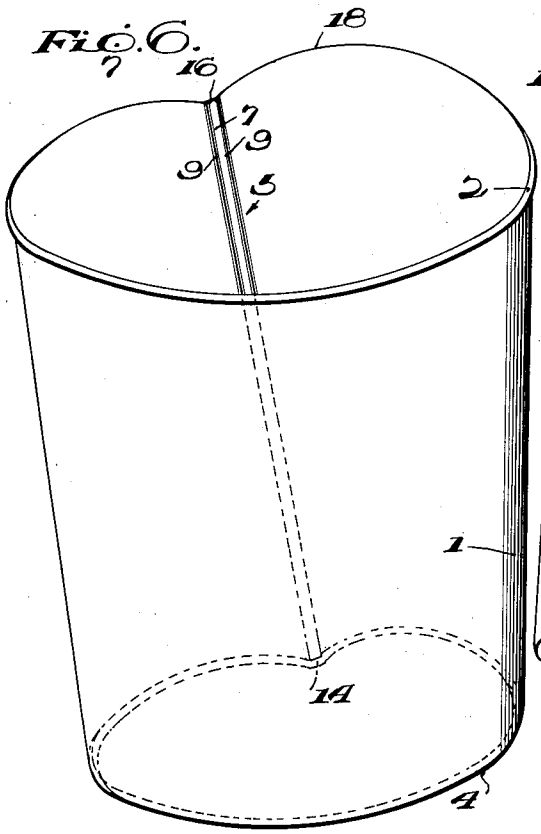


Fig. 7.

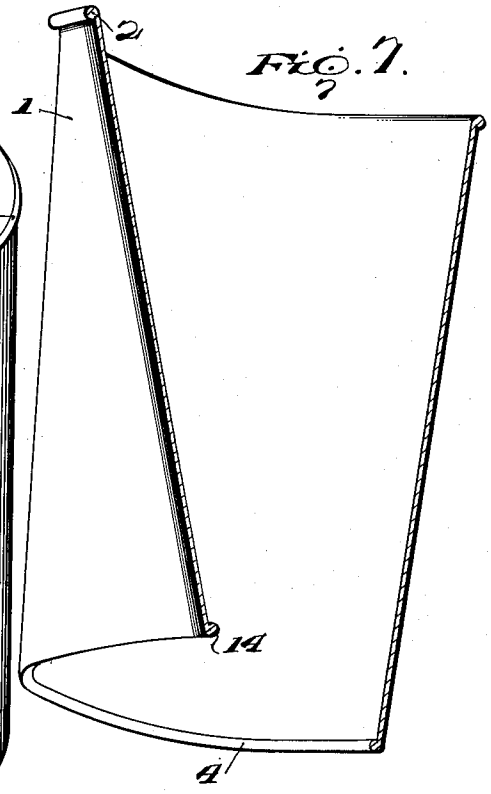
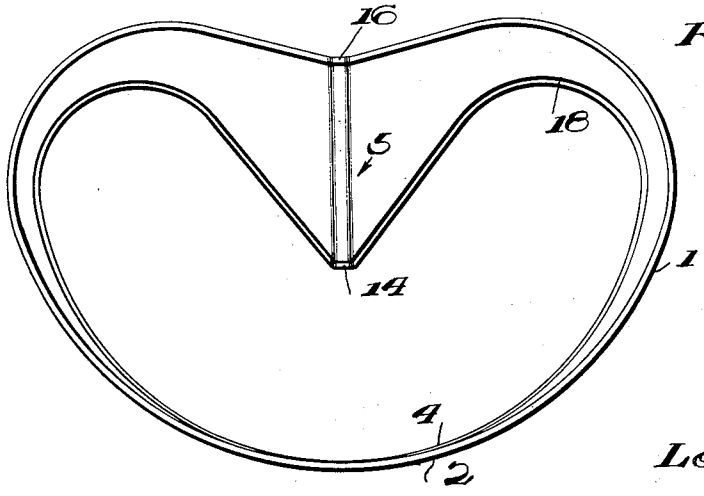


Fig. 8.



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NESTING CONTAINER SHELLS

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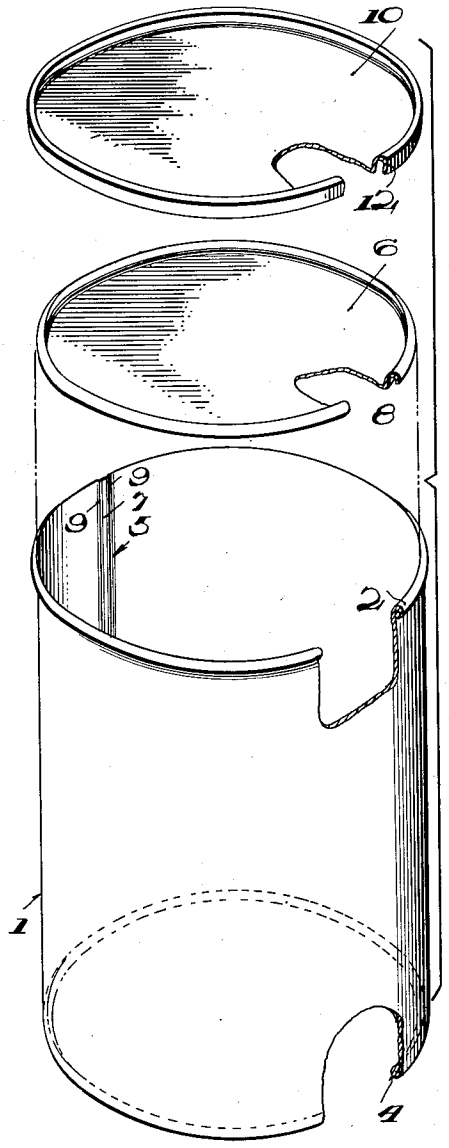


FIG. 9.

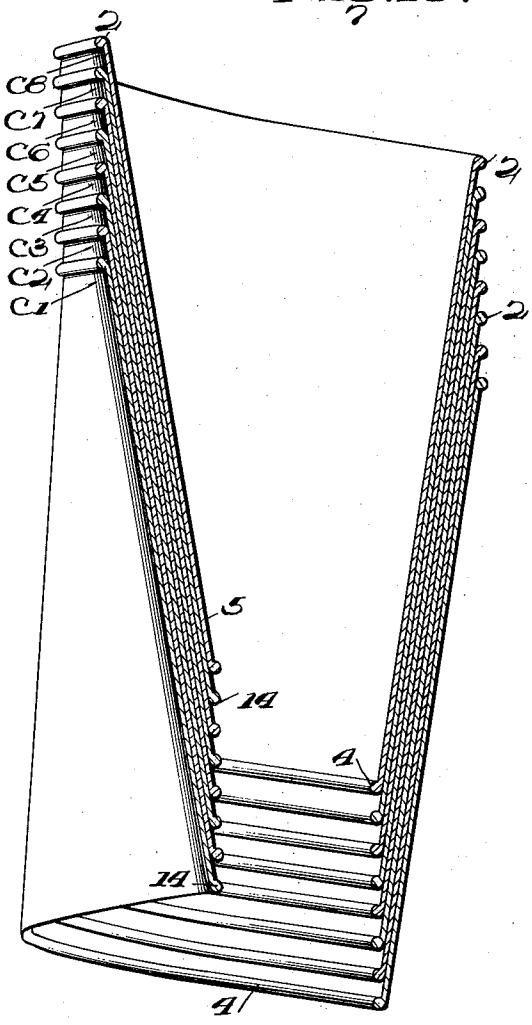


FIG. 10.

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NESTING CONTAINER SHELLS

Lee D. Pierce, Fulton, N. Y.

Application January 10, 1950, Serial No. 137,760

5 Claims. (Cl. 206—65)

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This invention relates broadly to the art of containers, and in its more specific aspects it relates to containers which may be shipped from the place of manufacture in nested condition for the conservation of space; and the nature and objects of the invention will be readily recognized and understood by those skilled in the arts to which it relates in the light of the following explanation and detailed description of the accompanying drawings illustrating what I at present believe to be the preferred embodiments and mechanical expressions of my invention from among various other forms, arrangements, combinations and constructions, of which the invention is capable within the spirit and scope thereof.

The containers with which I am particularly concerned may be formed of fibrous material or the like and are of the relatively large capacity or bulk type, probably the most common sizes being those of two and one-half gallon capacity and five gallon capacity which, among other uses, are commonly used for packing bulk ice cream. While the containers may be of the large capacity type and formed of fibrous material I do not intend to limit this invention to those particular types of containers, for it is of equal utility for containers of various sizes and formed of various materials. The containers in which I am particularly interested are of substantially cylindrical shape, when in operative position for filling and when filled, and the material from which they are made has a certain resilience and flexibility. A complete container includes a cylindrical shell or body portion and top and bottom closures therefor.

It will be recognized that the containers of this character are bulky and consume considerable space when shipped or stored separately. In order to reduce shipping and storage costs arrangements have been devised for nesting the container shells as well as for shipping and storing the shells in flattened condition. Nesting of shells or flattening the shell bodies has necessitated a deformation thereof and this has been made possible in part by the practice of separately packing and shipping the shells and the end closures therefor. When this has been done the closures are applied to the shells at the filling plant.

As far as I am aware, the nesting of a plurality of shells of equal diameters, when in operative condition, has heretofore proceeded along two general lines. The first has been to nest or pack a plurality of shells within the overall dimensions

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of one shell by progressively reducing the diameter of each shell inwardly in a nested unit. The second has been to nest or pack a plurality of cylindrical shells into a unit of a greater longitudinal dimension than one shell but of a substantially less longitudinal dimension than the combined lengths of all the shells nested within a unit, this having been generally accomplished by reducing the diameter of one end of each shell so that the small end will telescope into the large end of the next adjacent shell in a unit.

The nesting arrangements of the first type with which I am familiar are objectionable for a variety of reasons. It has heretofore been necessary in order to provide a nested unit falling within the overall dimensions of a single shell, to form a plurality of score or hinge lines in the body of each container shell, and then to deform the shells by forming inwardly projecting folds or flaps along the plurality of score or hinge lines to thereby reduce the diameter of each shell for nesting purposes. Obviously the formation of a plurality of hinge lines in the shell body weakens it and breaks down the material of the shell body so that when charged with material any moisture therein may have deleterious effects on the body. A container shell which has been weakened by pressing a plurality of score lines into the body thereof may require more than the usual top and body closures to maintain it in expanded cylindrical operative position after having been deformed by bending on the plurality of hinge or score lines.

It will be understood that the shells nested in a unit which is no larger than an individual shell must be progressively of reduced diameter to take care of the thickness of the stock of the nested shells. The method which has been followed in prior art arrangements for producing this progressive diameter reduction of shells probably presents the most serious defect or highly undesirable characteristic of such nesting arrangements. This progressive reduction of shell diameters has heretofore been met by providing a differing space of score lines on each shell dependent upon the ultimate position that particular shell is to assume in the nested unit. Thus, in such prior art systems, the score or hinge lines on the shell body for, say, the third shell in the unit must be spaced apart a certain distance and for the fourth shell a greater distance, and so on. By this scoring method the infolding flaps are made progressively larger to thereby progressively reduce the diameters of the shells. In

nesting a plurality of shells scored in this manner it is necessary that the shells be placed in their proper relative positions dependent upon the scoring, if they are not so placed they cannot be nested. Obviously this arithmetical progression method of nesting is time-consuming and requires relatively skilled help, and it also greatly adds to the complexity of scoring the container shells.

My Patent No. 2,291,755 is an example of one prior form of nesting wherein the arithmetical progression principle was followed. Each can in this nesting method must be scored differently and each can must be nested in a certain predetermined position in the unit.

Another proposal for nesting a plurality of container shells within the overall dimensions of a single shell involves the formation of flutes in the shell bodies. In this prior arrangement each shell inwardly within a nested unit being provided with an additional flute to thereby progressively reduce the diameters of the shells. This method not only requires different fluting on the bodies but also requires the proper relative positioning of the shells when being nested. This method, under present day mass production of containers is obviously an unsatisfactory answer to this nesting problem.

It has been my purpose to devise a nestable container shell which may be prepared for nesting by a simple operation and without materially weakening the body of the shell, and a plurality of which may be nested together in any relative positions, that is, any shell may be nested next to any other shell. The container shells of this invention which are so formed that they may be nested together to produce a unit of substantially the same size as a single shell are formed with only a single longitudinally extending score line which runs from the top edge to the bottom edge of the shell. The diameters of the shell bodies are reduced for nesting by pressing the shell body inwardly along the score line thereby providing an inwardly projecting section, the length of such section determining the degree of reduction of the diameter of the shell.

The container shell formed for nesting with the single score line in accordance with this invention is highly advantageous for the further reason that every container is scored in exactly the same manner, there is no necessity for progressive scoring dependent upon the ultimate position the shell is to take in the nested unit. All that is necessary is that each shell body have a longitudinally extending score therein.

The container shells, which may be nested into a unit, the overall dimensions of which are substantially equal to those of a single shell to thereby greatly save shipping and storage space, are of uniform diameter when in expanded operative condition and are formed at each end with annular square cut edges which are perpendicular to the longitudinal axis of the cylindrical shell. The shells of this character when in nested positions fit or mate entirely one within the other to produce the desired size of unit which economizes space as greatly as possible.

Various types of end closures may be applied to containers having such square cut end edges and these closures are shipped separately from the nested units of shells for application to the shells at the filling plant.

The manner of nesting container shells and the way in which I propose to remove the shells from nested positions are such that the disassembly of the shells is greatly facilitated with substantial saving of time.

It is often desirable, however, to provide end closure organizations for containers of this character which involve the crimping or rolling of one or both of the end edges of the container shell for co-action with a part of a closure element such for instance as a flange or lip thereon. When containers having such rolled or crimped edges are used it is preferable to spin the crimp on one or both edges at the plant where the containers are produced rather than at the filling plant. Thus, container shells which are provided with one or both edges of crimped formation, are not of uniform diameter throughout their lengths as in the case of shells having square cut end edges.

It has been one of my purposes to devise a nesting arrangement for container shells formed with crimped or rolled end edges as well as for those having square cut end edges, and to make this nesting of the two types possible and practical by the provision of only a single longitudinally extending score line. Hence a container shell is formed with only one longitudinally extending score line whether or not it is to have square cut end edges or crimps or rolls on one or both ends.

Prior nesting ararngements for shells having crimped or rolled end edges have provided means for deformation of the shell in such manner that one end of the shell is reduced in diameter relative to the other end, the shells being nested by inserting the small end into the large end. The shells so prepared are of general tapering or conical construction. In order to deform the shell it has been usual to provide a plurality of diverging hinge or score lines in the shell body. For the reasons hereinbefore set forth such construction is objectionable.

I have devised a novel arrangement for nesting container shells having crimped or rolled edges and I accomplish this by merely providing a single longitudinally extending score in the body of the shell. It will be recognized that this constitutes a simplification of production procedure in the manufacture of containers. In producing nestable container shells having crimped or rolled end edges I preferably first score the shells and then crimp or roll the end edges, the score carrying over into the crimp. A factory producing containers of this general character may score with the single score line all shells in production and then any of such scored shells may be selected for crimping. It is thus not necessary to scole shells in a different manner nor at a different time in production dependent upon whether they are to have square cut end edges or crimped or rolled end edges.

In nesting a plurality of container shells having crimped end edges and provided with the single score in accordance with this invention it is only necessary to deform the shell body to reduce the diameter of one end thereof by pressing the body inwardly at the score line in such manner that the apex of the inwardly pressed portion extends inwardly a greater distance gradually toward the reduced diameter end. This provides what I term an "angled nesting arrangement" for the longitudinally extending score line when pressed in, is angled with respect to the substantially undeformed portion of the shell. Thus if the apex of the score line is three inches from the substantially undeformed wall portion at the top end of the shell and two inches from the substantially undeformed wall portion at the

bottom end of the shell, that much more of the diameter at the bottom end has been taken up and thus the bottom end is of reduced diameter relative to the top end of the shell. With the shell bodies so deformed they may be telescoped into nested positions by inserting the small end of a shell into the large end of a shell.

It is important not to weaken or break down or otherwise injure the crimps or rolls which are formed on the end edges of container shells. It is essential that the crimps be in satisfactory condition so that they will properly co-act with the end closures to provide a leak-proof and tight closure organization and so that moisture may not enter the rolls. In prior arrangements providing nestable containers with end rolls the plurality of score or hinge lines which have heretofore been necessary in order to deform the shell for nesting produced a corresponding number of weak spots on the rolls so that the ability of the rolls to function properly was substantially reduced.

With the foregoing general objects, features and results in view, as well as certain others which will be apparent from the following explanation, the invention consists in certain novel features in design, construction, mounting and combination of elements, as will be more fully and particularly referred to and specified hereinafter.

Referring to the accompanying drawings:

Fig. 1 is a view in perspective of a container shell having square cut end edges and formed with the single score.

Fig. 2 is a view in perspective of a plurality of container shells of the type illustrated in Fig. 1 nested into a unit the overall dimension of which is equal to that of a single container shell.

Fig. 3 is a diagrammatic view showing a container shell in expanded operative position, and the outer and inner shells in a nested unit.

Fig. 4 is a plan view of a plurality of container shells of the type disclosed in Fig. 1, nested together forming a unit of the dimensions of a single container shell.

Fig. 5 is a view in section taken on the line 5—5 of Fig. 4.

Fig. 6 is a perspective view of a container shell having crimped or rolled end edges, and having a portion thereof deformed for nesting.

Fig. 7 is a sectional view of the container shell of Fig. 6 with a portion thereof angularly deformed for nesting.

Fig. 8 is a top plan view of the container shell of Fig. 6 with a portion thereof angularly deformed for nesting.

Fig. 9 is a perspective view of the container shell of Fig. 6 in expanded, substantially cylindrical condition, and the top and bottom closure members separated therefrom in positions preparatory to being operatively positioned, parts of the shell and closures being broken away.

Fig. 10 is a sectional view of a nested unit of angularly deformed shells having crimped or rolled end edges.

In Figs. 1 through 5 of the accompanying drawings I have illustrated one embodiment of my invention involving the structure and nesting of container shells having square cut end edges. Referring to the disclosures of these five views and particularly to Fig. 1 thereof, I have used the numeral 1 to designate a container shell of generally cylindrical hollow configuration provided with square cut end edges 3. The shell 1 is of constant diameter throughout its length and the wall thereof is unbroken and continuous throughout

the complete circle thereof when in expanded operative position as illustrated in Fig. 1. The container shell 1 is preferably formed of any material such as paper, or of any other material having the required durability, flexibility, strength and other characteristics required for a nestable container shell of this type. These containers may be of any capacity in which they are customarily made.

The container shells 1 are each formed with a single score line designated generally by the numeral 5. This score line extends longitudinally of the shell body from one square cut edge thereof to the other and is of the same width throughout its length.

The score 5 is formed in the shell body by compressing the material thereof radially inwardly, and the score comprises a relatively narrow groove 7 in the material of the body, the sides of the groove providing hinge lines 9, for a purpose which will hereinafter become apparent. The hinge lines 9 are formed at the junctions of the compressed material and the normal or uncompressed shell body and the width of groove 7 is constant throughout its length. It is to be understood that each container shell is provided with the single longitudinally extending score 5 comprising the groove 7 and the hinge lines 9. Any suitable means may be employed for radially compressing the portions of the shell bodies to provide the score, and when a shell has been operated on or scored it is in condition for deformation for nesting. No other scoring is needed, and it will be appreciated that every shell is scored in the same way, and that every score is of the same width. Thus, the container shell 1 of Fig. 1 exemplifies every container shell which has been scored and is therefore in condition for deformation along the score line for diameter reduction for nesting.

In nesting a plurality of the shells illustrated in Fig. 1 it is to be understood that any shell inwardly of the exterior shell must be progressively reduced in diameter the amount of the thickness of the stock or material of the one or more shells in which any shell may be nested.

A unit consisting of a plurality of nested shells, all of which are provided with the single longitudinal score 5 which has been described in detail, and which unit is within the overall dimensions of a single shell, comprises an exterior shell S1 which is not distorted or inwardly bent at the score 5 therein, however when the exterior shell S1 is in position surrounding a plurality of nested shells I have found that the entire wall thereof does not retain its normal circular shape. Instead there is a slight deformation thereof providing a somewhat flattened portion designated generally by 1f. This flattened portion does not follow the circular outline of the remainder of the shell body.

In the particular nested unit illustrated in the drawings thirty container shells have been nested together. It is to be clearly understood that this is merely one example of the number of shells which may be nested together into a unit, and is not intended as limiting this invention to this number of nested shells. It will be recognized that the number of shells which may be packed together forming a nested unit is governed by the thickness of the stock from which the shells are made, as well as the relative tightness of the unit desired by the packer.

The shell S2 which is nested within and adjacent to exterior shell S1 is deformed for re-

ducing the diameter thereof so that it will completely nest within said exterior shell S1. The shell body S2 is deformed for nesting purposes by an inward bending of the body at and along the entire length of score 5, such bending occurring along the hinge lines 9. This bending of the shell provides inwardly bent or extending portions 11 on both sides of the score and these inwardly extending portions extend from top to bottom of the shell body. This deformation or bending displaces score 5 from the normal cylindrical contour of the shell body toward the undeformed portion 13 of the shell body S2 and reduces the diameter of the shell the amount of the thickness of the stock of shell S1, the amount of diametric reduction being governed by the degree of displacement of score 5 from the normal operative or expanded circular outline of the container shell.

The shells S3, S4, S5 and S6 which are nested in that order within shells S2 and S1 are each progressively reduced in diameter by deformation of the shell bodies at the scores 5 to take care of the progressively increasing thickness of the stock of the nested shells exterior thereto. Each of these shells is deformed for diameter reduction by an inward bending of the shell body at the score 5 along the hinge lines 9 forming inwardly extending portions 11 on both sides of scores 5. Thus the diameter of shell S6 must be less than the diameter of shell S4 and therefore score 5 on shell S6 is displaced a greater distance from the circular outline of the shell body than is the score on shell S4. This degree of displacement follows for all the shells in a unit, the scores of any shell nested inwardly with respect to any other shell is displaced inwardly a greater distance than the score of said other shell.

It will be apparent from consideration of the drawings that the scores 5 of shells S1–S6 are not evenly spaced apart when the shells are in nested condition and the scores are displaced, and that the scores progressively become closer together inwardly of the unit. It will also be evident that the included angle formed by the inwardly extending portions 11 becomes progressively smaller inwardly of the unit with respect to the shells S1–S6.

I have found in the nesting of a plurality of container shells of this character that a number of the shells from the exterior of the unit inwardly when deformed as described produce this unequal spacing of the displaced scores of adjacent shells. In the particular example illustrated in the drawings shells S1 through S6 are those in which the included angles formed by inwardly extending portions 11 are progressively smaller and in which the displaced scores 5 are unequally spaced apart. I have also found that the remaining shells nested inwardly relative to the aforementioned number of outward shells assume such positions within the unit that the displaced scores are all substantially equally spaced apart and the included angles formed by the inwardly bent portions are substantially equal.

In this particular example of a nested unit in which thirty shells are nested it happens that six outwardly nested shells S1–S6 have their displaced scores unevenly spaced while the displaced scores of the remaining nested shells are equally spaced apart. It is to be understood that these numbers of shells in an outward nested group OG and an inward nested group IG may vary in accordance with the total number of shells nested together and with the thickness of the stock of the shell bodies.

As I have stated, an outward group of shells (in this particular embodiment shells S1–S6) in a nested unit have their displaced scores unevenly spaced apart and the included angles formed by inwardly extending portions 11 becoming progressively smaller inwardly of the unit. The group of shells deformed for nesting and nested within the outward group of shells, includes, in this particular example which is used as an illustration and not as a limitation, shells S7 through innermost shell S30 and I shall, for purposes of description, term this group of shells the inward group of nested shells.

In this inward group of shells each shell inwardly of the group must be progressively reduced in diameter a greater amount than the next outwardly adjacent nested shell and this is accomplished by a greater displacement of each score toward the undeformed portions 13 of the shells. Thus shell S27 must be diametrically reduced by a greater amount than shell S26, therefore score 5 on shell S27 is deplaced closer to wall 13 than is score 5 on shell S26. Now the scores 5 on shells S7 through S30 are substantially evenly spaced apart and the included angles formed by the inwardly extending portions 11 are substantially equal in all the shells S7–S30. Since all of the angles formed by inwardly extending portions 11 of the shells S7–S30 are substantially equal and since all adjacent scores 5 are spaced apart a substantially equal distance I am enabled to nest cans having only a single score which is of constant width throughout its length and in which the single score on each shell is of the same width as every other score.

It will be recognized that in nesting a plurality of shells each having a single score, every shell is deformed in the same manner along the hinge lines 9, the only difference being that as the shells are nested inwardly the scores are displaced a greater amount, and the inwardly extending portions or projections become progressively longer inwardly of the unit until the score 5 of the innermost shell is disposed closely adjacent to the undeformed wall portion of said innermost shell. While I have disclosed a nested unit in the drawings containing the maximum number of shells of the individual thickness of those shown, it is not necessary that the maximum number be nested in a unit.

In deforming each shell for nesting, whether the shell is to be disposed in the outward group of nested shells or in the inward group of nested shells, to provide the portions or projections 11 which take up or reduce the shell diameter, a bending or curving of the shell body occurs as at 15 and this curved part forms a joining section for connecting the inwardly extending portions 11 to the remainder of the shell body. As the shell is deformed to provide the inwardly extending portions or projections a section of the body of the shell is bent out of the normal curvature thereof forming the curved joining sections 15. Thus as the shell body is bent or deformed to provide the inwardly extending portions 11 no sharp angled bends occur in the stock between such portions and the remainder of the shell body, the inwardly bent portions or projections 11 being joined to the remainder of the shell body by the curved section 15.

Each curved joining section 15 does not follow the normal circular outline of the undeformed

part of the shell body but each such curved section constitutes an arc of a substantially true circle of less radius than that of the undeformed part of the shell body. The curved or arcuate joining section 15 which constitutes an arc of a substantially true circle begins at substantially the point where the deformation of the shell body from the circular outline starts, and ends at substantially that point where the curved section 15 starts to diverge from the arc of a true circle and into the inwardly extending portions 11. In Figs. 3 and 4 of the drawings I have designated these points as X and Y, respectively.

It is to be understood that every shell in a nested unit with the exception of exterior shell S1 has this curved joining section 15 forming an arc of a substantially true circle. In a unit of nested containers the radius of the sections 15 will be progressively reduced inwardly of the unit, thus the radius of section 15 of shell S2 will be greater than that of shell S20 or shell S30. The greater the displacement of score 5 the greater will be the reduction of the radius of section 15, hence a co-relation exists between the displacement of a score 5 and the radius of joining section 15.

As particularly illustrated in Figs. 2 and 4 of the drawings a unit of nested shells includes an exterior shell having a portion of the wall thereof somewhat flattened and a plurality of shells nested therewithin each being diametrically reduced a greater amount than the next adjacent outer shell, the diameter reduction being achieved by providing inwardly extending portions which project toward the undeformed parts of the shell bodies. These projections being joined to the shell bodies at their bases by curved joining sections which are arcs of substantially true circles all of which are of less radius than those of the undeformed part of the shell bodies. Any shell may assume any relative position within the nested unit by displacing the score thereof the amount necessary to reduce the shell diameter the required amount.

When any shell is deformed for nesting there are no sharp bends in the shell body except at hinge lines 9 formed by scores 5, the remaining part of a shell body is entirely free of scores or sharp bends and the deformation of a body in accordance with this invention produces only curves in addition to the bends at hinge lines 9.

The shells may be nested together by working from the innermost shell outwardly or from the exterior shell inwardly.

In removing or separating the shells from nested position it is preferable though not necessary to remove the exterior shell first and work inwardly of the unit. In a unit including the maximum number of shells, the shells are rather tightly packed and as the exterior shell is removed the next shell is somewhat released from its tight position and may be removed quite easily and this principle operates throughout the unit so as each outermost shell is removed the next adjacent one is loosened or partially freed for simple removal.

It is also within my contemplation to wrap each unit in a sheet of relatively strong wrapping paper or the like, such paper being tightly wrapped about the unit with a slight degree of compressive force. When such a wrapped unit is to be disassembled it is only necessary to slit the wrapping with a knife or the like whereupon the exterior shell will be somewhat loosened and may be removed with facility.

In Figs. 6 through 9 of the drawings I have illustrated a nesting arrangement for container shells having rolled or crimped end edges instead of the previously described square cut end edges. The nesting of shells having such crimped or rolled end edges presents certain problems not encountered in shells having square cut end edges for they may not be completely longitudinally received one within the other and thus a nested unit is of a larger size than that of a single shell. I have devised a container shell having crimped or rolled end edges which may be nested into a unit the overall longitudinal dimension of which is substantially less than the combined length of all of the nested shells. Such container shells having radially extending crimped end edges increase the thickness of the shell at each end and for this reason they may not be completely received one within the other for nesting.

I have used the same reference numerals in Figs. 6 through 10 of the drawings as were used in Figs. 1 through 5 to designate similar parts. Referring particularly to Figs. 6 through 10 of the drawings wherein I have used the numeral 1 to designate the container shell which is of generally cylindrical configuration and may be made of the same materials as the shells illustrated in Figs. 1 through 5 of the drawings. The shells 1 are formed with a longitudinally extending score 5 comprising the groove 7 and hinge lines 9, this score being exactly the same as that described hereinabove in connection with the shells having square cut end edges. As I have explained all of the shells being produced in a plant and adapted for nesting are provided with the same score 5, regardless of whether the end edges are to be rolled or whether they are to remain square cut.

The container shells of this particular character are formed with a radially outwardly extending roll or crimp 2 on the top edge and a radially inwardly extending crimp or roll 4 on the bottom edge thereof. It is to be understood that the top roll may be a radially inwardly extending roll and the bottom roll a radially outwardly extending roll and still fall within the scope of this invention. It will be recognized that the invention involves a new and ingenious method of nesting of shells having radial extensions on the top and bottom edges regardless of whether they extend inwardly or outwardly radially of the shell body.

As I have pointed out the purpose of the crimps is to provide means cooperative with closure members for closing the top and bottom of the shell. In this particular embodiment I disclose merely as one example of one type of bottom closure a disc-like cap 6 having a rolled edge 8 adapted to mate with a crimp 4. The closure is adapted to be inserted into operative shell bottom closing position from the top of the shell. I also may use a snap-on top closure 10 for closing the top of the shell after it is filled. A rim 12 of groove-like formation is pressed in the annular edge of cap 10.

In the production of shells for nesting, whether the shells are to be of the straight edge or of the rolled edge type, each shell is formed with only one longitudinally extending score 5, providing a groove 7 forming longitudinally extending hinge lines 9. In shells having the crimped edges the score is first pressed in the shell body and then the crimps are formed on the end edges,

with the result that the score is carried over into the crimp and the fibres are not damaged.

In order to nest shells of the character of those illustrated in Figs. 6 through 10 the shells are deformed along the single score line in such manner that the diameter of the bottom portion of each shell is reduced relative to the top so that in a nested unit consisting of a plurality of shells, adjacent shells are nested by inserting the bottom of a shell into the top of the next adjacent shell.

This diameter reduction of the bottom portion of a shell having crimped end edges and a single longitudinal score line in the body thereof is accomplished by a deformation of a part of the shell body along the hinge lines 9 of the score. The score line 5 is pressed inwardly to displace it from the normal circular contour of the shell body and the lower or bottom end 14 thereof is displaced to a greater extent than the upper or top end 16 thereof to thereby dispose the score line 5 in an angled position relative to the normal longitudinal plane of any part of the shell body. This angled displacement of the score 5 is clearly illustrated in Fig. 8 of the drawings. Thus, with any shell deformed in this manner with the bottom or apex 14 of score 5 inwardly displaced a greater extent than the top 16 of score 5 the diameter of the bottom portion of the shell will be reduced a greater degree than will the top so that the bottom of a shell may be inserted in the top of a shell for nesting. The degree of displacement of apex 14 determines the amount of diameter reduction of the bottom of the shell. For instance, if the top 16 is displaced so that it is three inches from the opposite or undeformed wall of the shell and the apex 14 is displaced so that it is two inches from said wall, that much more of the bottom of the shell has been reduced and therefore its diameter is that much smaller than the diameter of the top of the shell.

While I have described the shell bottom as being reduced more in diameter than the shell top, the reverse could of course be true and the shells nested as described. All that is necessary is that one end of the shell be reduced in diameter a greater amount than the other end of the shell.

In deforming shells of this character for nesting it will be recognized that I have eliminated the necessity of a number of sharp bends in the shell body and in the crimps. Instead the body of the shell is bent on hinge lines 9 and this portion extending from the hinge lines to the rest of the body is curved as at 18 and thereby presents no sharp bends which may have a damaging effect on the stock of the shell body and on the crimps.

In Fig. 10 of the drawings I have illustrated a unit consisting of a plurality of nested shells which have been deformed along hinges 9 of score line 5 to reduce the diameter of the bottom end relative to the top end by angling the score line, that is the apex 14 of score line 5 is pressed inwardly a greater distance than top 16 of score line 5, so that the score line extends inwardly from top to bottom at an angle relative to the undeformed wall portion of the shell. Thus the shells C1–C8 compose a nested unit each being deformed by angling the score line 5 as described. Each score will be substantially parallel to every other score. In nesting the shells the reduced bottom end of shell C2 is inserted in the top end of shell C1, the shell being disposed therein until the bottom end is adjacent to but removed from the bottom end of shell C1, then shell C3 is nested in shell C2 and so on until the unit is completed. It will be appreciated that such a nesting system provides great flexibility and considerable latitude is present in the amount of diameter reduction possible.

When a plurality of shells are deformed for nesting by pressing the score line inwardly a greater distance at the bottom of the shell than at the top so that the score lines will all extend at equal angles, the apexes 14 of each shell will be aligned forming a straight line which is substantially vertical where the unit is disposed in substantially vertical position relative to a horizontal plane.

It will be appreciated that the spacing between crimps 2 of adjacent nested shells in a unit is dependent upon the thickness of the stock of the shells being nested.

It will of course be understood that the closure members 6 and 10 will be packed and shipped separately from the nested units and that the crimps may take any form.

It will now be evident that I have devised a container shell having only a single score in the body thereof which may be nested regardless of the type of end edges formed thereon. Where crimped end edges are spun on the shells it will be appreciated that deformation along only a single score eliminates the usual damage done to the crimp by bending along many lines.

I claim:

1. A unit of nested container shells consisting of an exterior shell and a plurality of deformed container shells including an outward group of shells and an inward group of shells, and each of said shells having diameter reducing means thereon, the shells of both groups nested one within the other throughout their lengths and within the exterior shell, and all of the shells being of the same diameter when in expanded undeformed cylindrical condition, said deformed container shells being of progressively reduced diameter from said exterior shell to the innermost shell, each of said shells when in deformed nested position having inwardly extending portions the inner ends of which are hingedly connected together, the extending portions of any shell being disposed within the extending portions of the next inwardly adjacent shell, and the inner ends of the extending portions of the outward group of shells being unequally spaced apart and those of the inward group of shells being equally spaced apart.

2. A unit of nested container shells consisting of an exterior shell and a plurality of deformed container shells having square cut end edges and nested one within the other throughout their lengths and within the exterior shell, all of the shells being of cylindrical shape and of the same diameter when in expanded undeformed condition and being of progressively reduced diameter from said exterior shell to the innermost shell when in deformed nested position, and each of said shells having a single score pressed therein providing spaced hinge lines thereon, said single score being the sole compressed portion of the shell body, and each shell of said nested unit of shells being bent along said score into deformed nested condition, and every hinge line extending longitudinally of the shell perpendicular to the plane of said square cut end edges and the hinge lines on every shell being spaced apart the same distance.

3. A unit of nested container shells consisting of an exterior shell and a plurality of deformed container shells nested one within the other throughout their lengths and within the exterior shell, and all of the same diameter when in expanded, undeformed cylindrical condition, said deformed container shells being of progressively reduced diameter from said exterior shell to the innermost shell, and each of said container shells having a single longitudinally extending score line pressed therein providing spaced hinge lines thereon and the remainder of the shell body being uncompressed, and each of said container shells being bent along said score line to reduce the diameter of the shell for nesting.

4. A unit of nested container shells consisting of an exterior shell and a plurality of deformed container shells having square cut end edges and nested one within the other throughout their lengths and within the exterior shell, all of the shells being of cylindrical shape and of the same diameter when in expanded undeformed condition and being of progressively reduced diameter from said exterior shell to the innermost shell when in deformed nested position, and each of said container shells having a single longitudinally extending score line pressed therein providing spaced hinge lines thereon for bending of the container shell therealong when nested, the remainder of the shell body being uncompressed, and means progressively reducing the diameters of the nested shells including portions extending inwardly from each body and hingedly connected together at their inner ends by said score line when displaced from the normal circular contour of a shell and connected to the shell bodies at their other ends by curved sections, the amount of displacement of the inner ends of

the inwardly projecting portions being progressively greater inwardly of the unit and the radii of the curved sections being progressively reduced inwardly of the unit.

5. A unit of nested container shells consisting of an exterior shell and a plurality of container shells each having diameter reducing means thereon and part of the bodies of which are deformed, said container shells nested one within the other throughout their lengths and within the exterior shell, and all of said container shells being of the same diameter when in expanded undeformed cylindrical condition, said deformed container shells being of progressively reduced diameter from said exterior shell to the innermost shell, and each of said deformed shells nested together within said exterior shell having inwardly extending portions joined to the undeformed portion of the shell body by curved sections each forming an arc of a substantially true circle and each arc being of progressively reduced radius from said exterior shell to the innermost shell.

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