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Koehler

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[54] **EXPANSIBLE AND COLLAPSIBLE SPRING ACTING, MULTI-SIDED STRUCTURES AND BLANKS THEREFOR**

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[52] **U.S. Cl.** .....**229/41 B,** 229/30, 229/41 C

[51] **Int. Cl.** **B65d 5/36**

[58] **Field of Search**.....229/41 A, 41 B, 41 C, 229/16 R, 16 C, 30, 41 D; 206/44 R

[56] **References Cited**

UNITED STATES PATENTS

3,369,729	2/1968	Stopper	229/41
1,968,660	7/1934	Towell	229/41 D
1,555,054	9/1925	Berkowitz	229/41 C
1,838,191	12/1931	Rumpel	229/41 B

FOREIGN PATENTS OR APPLICATIONS

158,551	8/1954	Australia	229/41 C

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[57] **ABSTRACT**

A container having sidewalls, end walls and a bottom wall, all formed from a hand cut, stamped or die cut integral blank.

The bottom wall is constructed so as to have spring action for automatically moving it quickly to the fully expanded position by the mere pressing together of longitudinally separated edges of the blank, which spring action locks the blank in its expanded position. The spring action occurs as a consequence of progressive unfolding the collapsed bottom wall along its medial fold line to progressively expand the blank until such fold line attains a critical position, at which time the bottom wall will suddenly spring downwardly and become locked in its fully expanded and flattened position. An integral top wall or lid of similar construction may also be provided.

3 Claims, 16 Drawing Figures

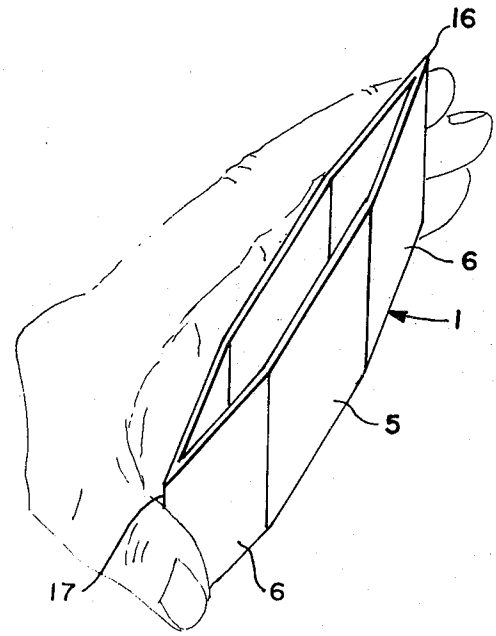


Fig.1.

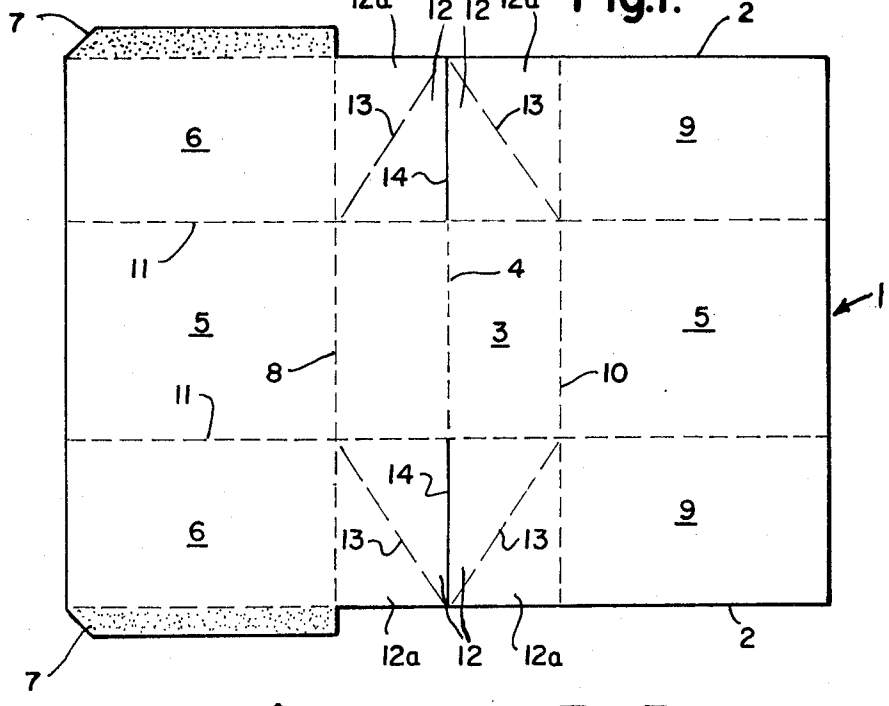


Fig.2.

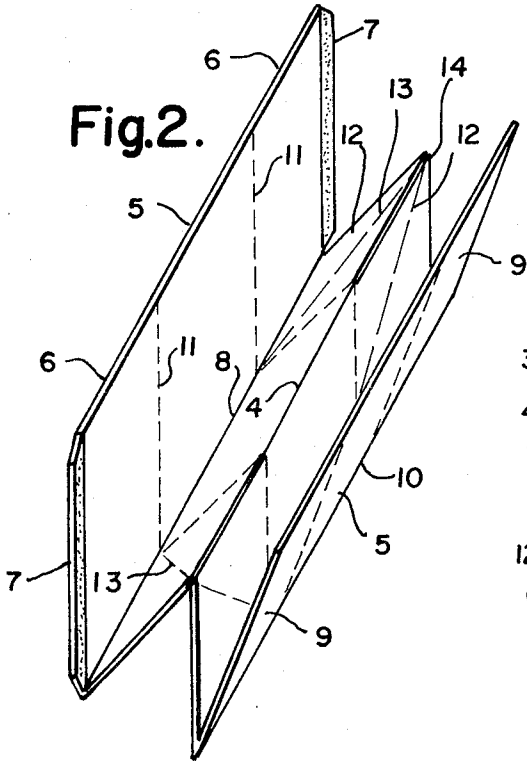


Fig.3.

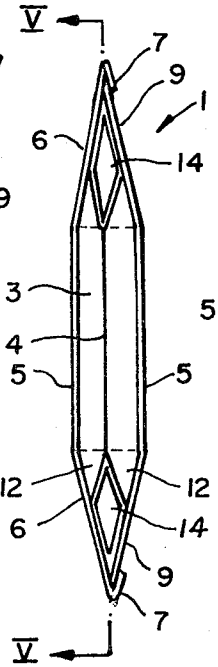
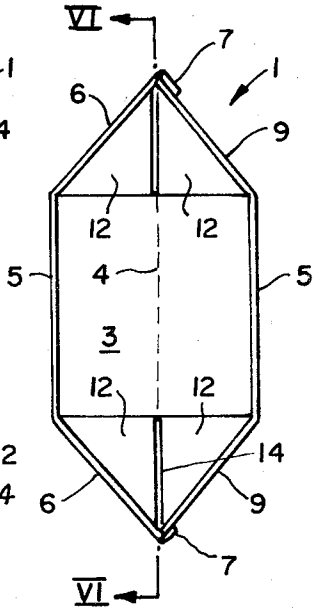


Fig.4.



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Fig.5.

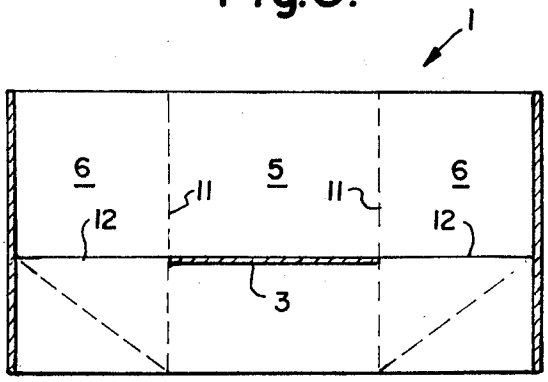


Fig.6.

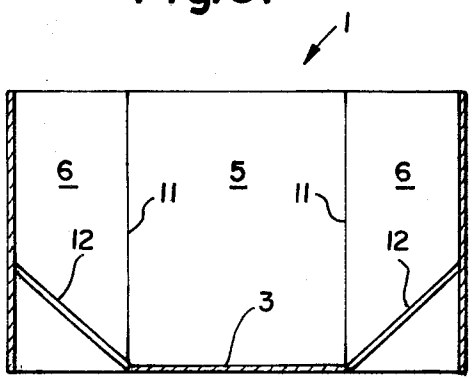


Fig.7.

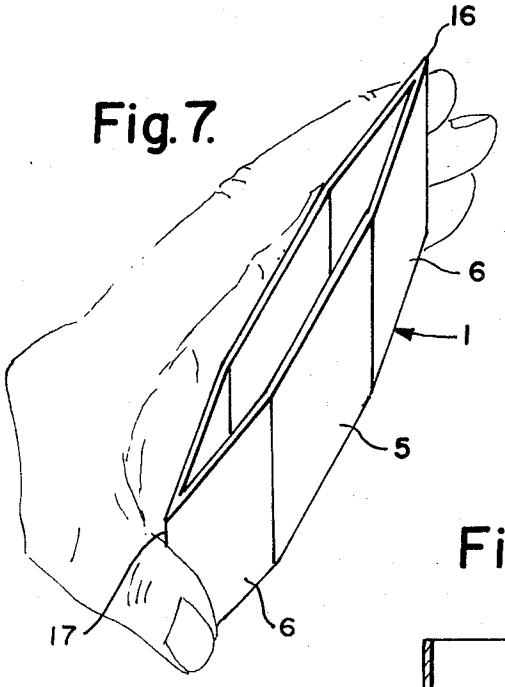


Fig.8.

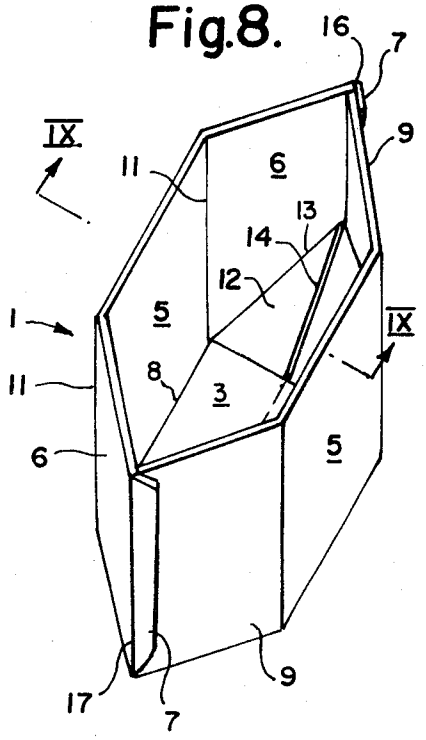
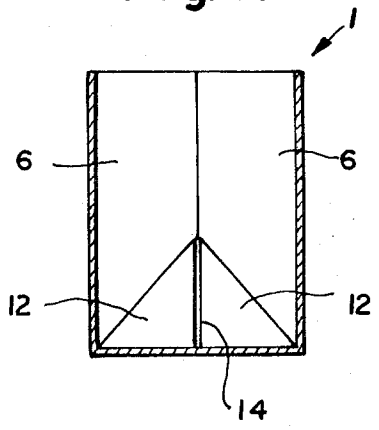


Fig.9.



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Fig.10.

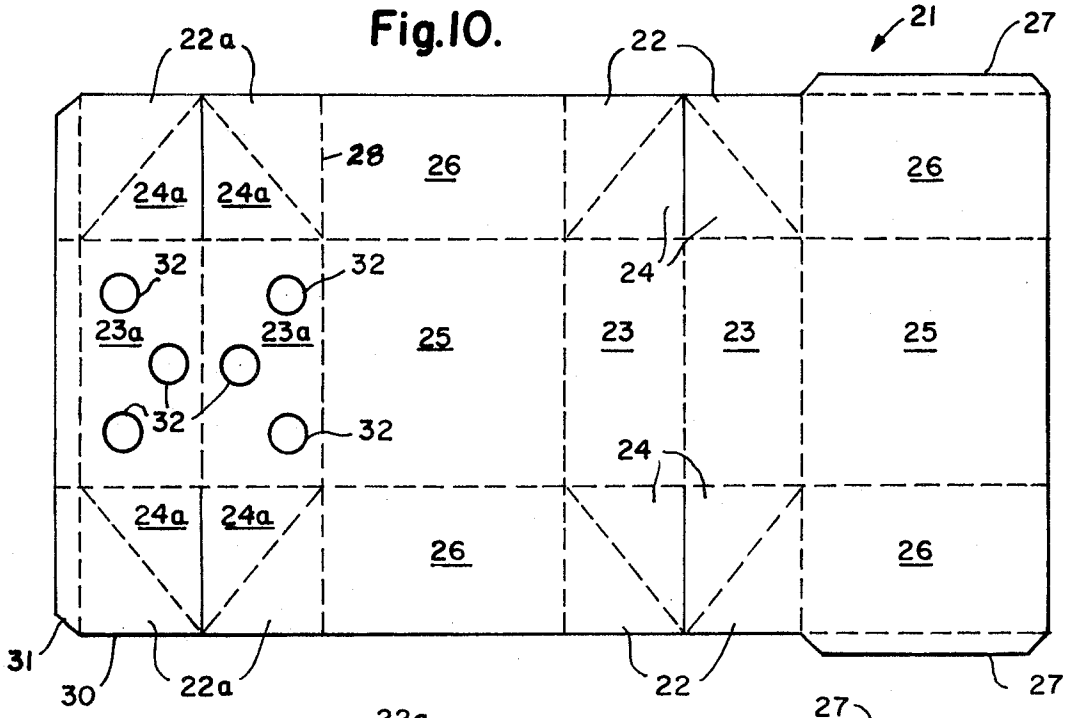


Fig.11.

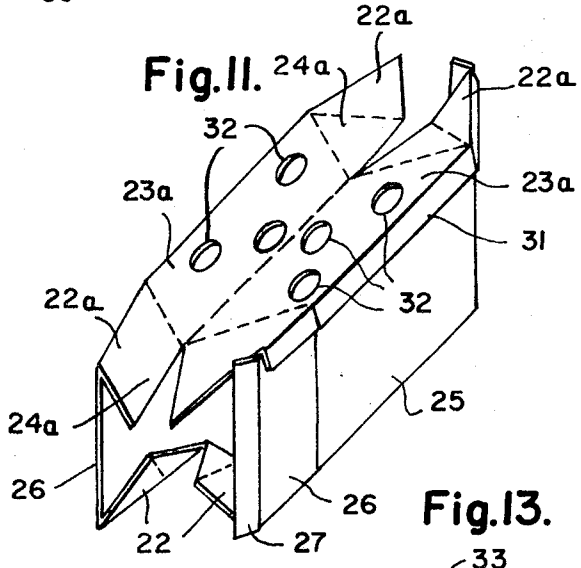


Fig.12.

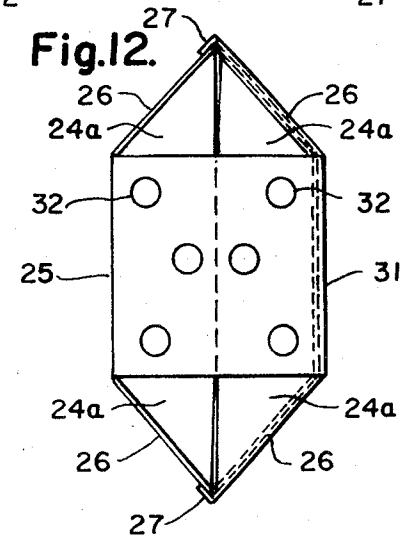
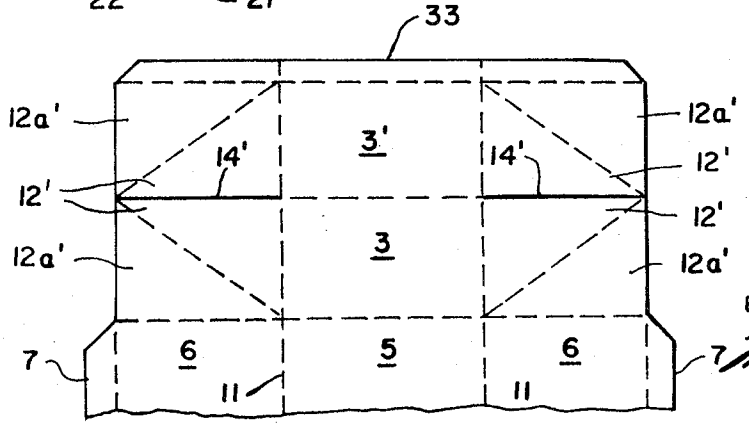


Fig.13.



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Fig.14.

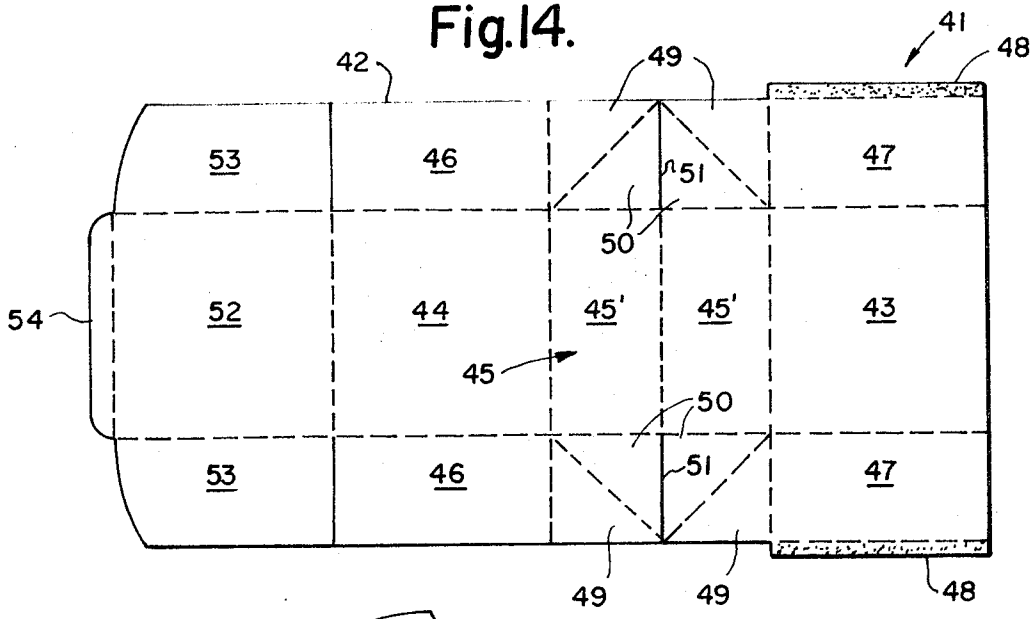


Fig.15.

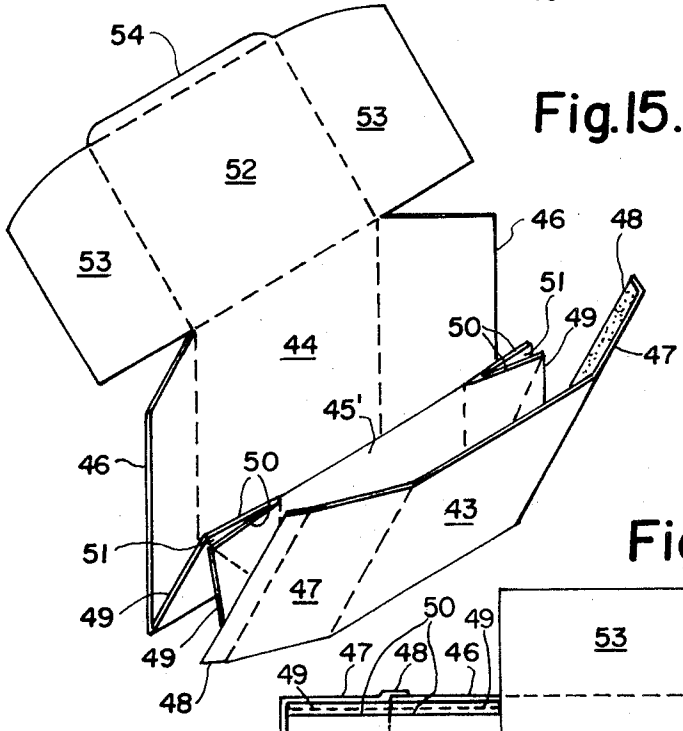
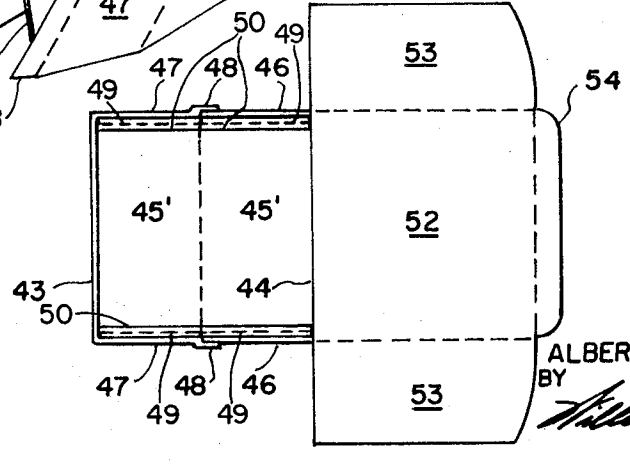


Fig.16.



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EXPANSIBLE AND COLLAPSIBLE SPRING ACTING, MULTI-SIDED STRUCTURES AND BLANKS THEREFOR

BACKGROUND OF THE INVENTION

This invention relates to a multi-sided container, such as a four or six sided container as well as varied similar configurations, formed from a single blank sheet and so assembled to provide automatic expansion by spring action, of the bottom and/or the top wall. The container may be used as advertising pieces or shipping containers of any practical size for whatever purpose intended.

DESCRIPTION OF THE PRIOR ART

Collapsible and expansible multi-sided containers are well known in the art. However, these have the outstanding objection of having to be cut-out in such a manner so as to cause waste of material and requiring time, difficulty as well as expense in assembly or erection. A further difficulty is the tendency for expanded containers to collapse and thus fail to remain in erected condition, and thus result in an unstable structure.

The abovementioned disadvantages are overcome by the present invention which provides a substantially rectangular or square one-piece blank which may be easily and quickly assembled at minimum cost, and which can be expanded by spring action so that it will be temporarily locked and maintained in its desired erected condition.

SUMMARY OF THE INVENTION

This invention relates to a multi-sided containers, such as a six sided or four sided containers made from a slit and prescored blank of substantially rectangular or square shape which can be easily and quickly folded and assembled in such a manner that the structure can be expanded quickly and automatically by built-in spring action when the longitudinally separated edges thereof are pressed together, or similarly collapsed at will.

The assembled container has a bottom wall as well as a top wall which is foldable along a longitudinally extending medial fold line. Spring action of such bottom wall occurs as the result of two integral adjoining triangular portions at each end which extend angularly upwardly from the bottom wall and are separated by a slit so that as the longitudinally separated edges are pressed together, when the blank is in collapsed condition, the bottom wall will progressively unfold downwardly as the triangular portions become curled and the slit defining edges thereof are progressively separated until a downward position of the fold is reached when automatic, toggle-like spring action occurs because of the tendency of the curled triangular portions to uncurl or become flattened as a consequence of which the bottom wall is locked in assured, expanded position. The container has many uses, such as that of a display unit for any desired size which can be imprinted with pictorial, decorative or advertising matter, or which may be used as a shipping or storage container or perhaps one for containing small objects such as pencils, mail, etc.

The unique and highly useful spring action results also in the collapsing direction as a consequence of lifting of the bottom wall in the vicinity of longitudinal fold line . Such spring action occurs as a consequence of the tendency of the curled triangular sections of the adjoining triangular sections to uncurl or become flattened and at the same time effect quick lifting of said medial fold line and locking of the blank in a totally collapsed condition.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view illustrating one embodiment of the invention and showing an integral blank that is cut so that it can be folded to form a collapsible container with a hexagonal wall;

FIG. **2** is a top, perspective view of the blank illustrated in FIG. **1** when partially folded, showing the first step in assembly of the blank;

FIG. **3** is a top view of the blank shown in FIGS. **1** and **2** after complete assembly and while in the partially expanded position;

FIG. **4** is a top view of the completed container or other structure showing it in the fully expanded position;

FIG. **5** is a longitudinal, cross-sectional view taken along line V—V of FIG. **3**;

FIG. **6** is a longitudinal, cross-sectional view of the blank when expanded fully, taken along line VI—VI of FIG. **4**;

FIG. **7** is a top, perspective view of the folded or collapsed blank showing how the longitudinally separated edges are pressed together to effect expansion of the blank;

FIG. **8** is a top, perspective view showing the blank of FIG. **7** in the fully expanded or erected position; and,

FIG. **9** is a transverse, cross-sectional view taken along line IX—IX of FIG. **8**;

FIG. **10** is a plan view of a modified blank for forming a box with a top wall;

FIG. **11** is a partially folded perspective view thereof;

FIG. **12** is a top view thereof;

FIG. **13** is a fragmentary view of a modification of FIG. **10**;

FIG. **14** is a plan view of a further modified blank for forming a square box;

FIG. **15** is a partially folded perspective view thereof; and,

FIG. **16** is a plan view thereof with the lid open and unfolded.

Referring more particularly to FIG. **1** of the drawings, numeral **1** generally denotes a blank of any suitable material, such as paper, paperboard or cardboard, thin plastic or metal foil, or any suitable material for making a multi-sided container. More specifically, the blank **1**, if originally substantially rectangular or square, is cut along edges **2** so as to provide adhesive coated tabs or flaps which may be adhered to the sidewall edges in the manner shown in FIGS. **3** and **4**. The container comprises a bottom wall **3**, two sidewalls **5, 5** and four end walls **6, 6** and **9, 9** which end walls are joined to the walls **5, 5** along scored fold lines **11** illustrated in dotted outline. Each of the side walls **5, 5** and end walls **6, 6** and **9, 9** is of rectangular outline although variations thereof may be made. The sidewalls **5, 5** are joined to the bottom wall **3** along fold or score lines **8, 10**.

End walls 6, 6 an 9, 9 are likewise joined to triangular portions 12*a*, 12*a* which are joined to complementing triangular portions 12, 12 as defined by slits or cuts 14.

It should be noted that blank 1 may be of any desired size, ranging from a very small size comparable to a paper cup or pencil container to a very large shipping carton or display which is several feet in height. The sizes are limited only by suitability and structural strength of the material employed.

FIG. 2 shows the first step in assembling the blank to form a container or other similar structure. Such first step comprises folding the bottom wall 3 upwardly along its medial line 4 and about fold lines 8 and 10 as hinges in the manner shown in FIG. 2. The next step is to adhere both adhesive flaps 7 to the outside edges of walls 9, 9, as shown in FIG. 3. Alternatively, the adhesive may be on the opposite sides of flaps 7 in which case the flaps would be adhered to the inside of the edges of walls 9, 9, — or perhaps instead of using adhesive for the above described modifications, the flaps 7 may be stapled or otherwise fastened to the edges of end walls 9, 9.

FIG. 3 shows the structure when partially expanded so as to more clearly illustrate the relationship of the various parts of the blank when assembled. It will be noted that because of slits 14, the edges thereof defining the slits will become progressively separated so as to effect curling of the triangular portions 12 while the triangular portions 12a tend to remain flatly against end walls 6, 6 and 9, 9, by virtue of the crease lines 13 forming fold lines or pivot lines for such curling of triangular portions 12.

FIG. 8 more clearly illustrates how triangular portions 12 are folded along fold lines 13 which extend angularly downwardly from substantially the mid portion of the height of edges 16, 17 to the bottom wall 3 (see also FIGS. 5, 6).

An important feature of the present invention resides in the easy and quick manner that the container or other structure is expanded automatically by the simple squeezing together along opposite longitudinally separated edges 16 and 17, as shown in FIG. 7. Such automatic feature, more specifically, comprises the spring action of the bottom wall as a consequence of the arrangement of disposition of the adjoining triangular portions 12 and 12*a*. Such spring action causes automatic and positive locking of the container in the expanded or open position, as illustrated in FIGS. 4 and 8.

The abovementioned spring action will now be described more specifically. As the collapsed container shown in FIG. 7 is squeezed together by pressing along opposite longitudinally separated edges 16 and 17, sidewalls 5, 5 will gradually separate, as well as the end walls 6, 6 and 9, 9. As the fold lines 8 separate, along with fold lines 13, the triangular portions 12 become increasingly bowed or curled, as shown in FIG. 3. At the same time, the fold 4 gradually moves downwardly toward the bottom of the container until a critical position is reached wherein a toggle-like action occurs, causing sudden spring action which automatically and quickly moves the bottom wall 3 from the folded position, illustrated in FIG. 5, to the expanded position, illustrated in FIGS. 4, 6, and 8. This important and unique spring action is caused by the tendency of the bowed triangular portions 12 to unbow or straighten out when a critical lower position is achieved during downward movement of said fold line 4. During all of such downward movement of said fold line 4 to the expanded position, the triangular portions 12a will continuously remain flat against the end walls 6, 6 and 9, 9.

In short, the bending or curling or triangular sections 12 occurs along a pivot or hinge defined by fold lines 13.

An unexpected and highly useful feature of the above described construction is that after the container automatically expands, by built-in spring action of its bottom wall to the position shown in FIGS. 4 and 8, it will be locked automatically and positively in such expanded position and will remain so during use of the container until the bottom wall 3 is pushed up along its medial fold line 4, or perhaps until the sidewalls 5, 5 are pushed firmly towards each other.

The container is collapsed by pressing upwardly the bottom surface of the bottom wall 3 in the vicinity of the medial fold lines 4. After a predetermined amount of such upward pressing so as to reach a critical height, spring action will occur to quickly and suddenly move the bottom wall 3 to the completely collapsed condition in which it is locked against accidental expansion. This occurs because initially, the triangular portions 12 are bowed and placed under tension until attainment of the aforesaid critical height, after which, by automatic toggle-like action, the tension of the curled triangular portions 12 will tend to further lift the fold line 4 by their tendency to straighten out and thus suddenly and automatically cause complete collapsing of the container.

FIGS. 10, 11 and 12 shown a modification of the invention which includes not only a bottom wall, but a top wall or lid as well, which lid may have perforations for receiving pencils or similar articles, such as when the container is used as a pencil holder.

FIG. 10 shows a blank 21 of the basic container illustrated in FIG. 1 with the addition of a panel 30 which serves as the lid or cover portion. MOre specifically, triangular portions 22 of FIG. 10 correspond to portions 12*a* of FIG. 1; portions 24 correspond to portions 12 of FIG. 1; portions 23, 25, 26 and 27 correspond to portions 3, 5, 6 and 7, respectively, of FIG. 1. Integrally secured by fold line 28, corresponding to fold line 8 of FIG. 1, is a top panel or lid 23*a* having a plurality of holes, if desired, such as holes 32 and having adjoining triangular portions 24*a* which complement the triangular portions 22*a* secured thereto by fold lines illustrated in dash outline. Integrally secured to the panel 30 is an adhesive flap 31.

Instead of providing a plurality of holes 32 in the lid, a single large hole may be used instead (such as 32*a*) for receiving pencils or any other articles in the container.

In assembling, the basic panel portion, which is similar to FIG. 1, is first folded and assembled in the manner previously described and thereafter the lid or top portion 30 is folded in a similar manner, as more clearly illustrated in FIG. 11, so as to provide a finished container having a completed top portion, as illustrated in FIG. 12, which is identical in construction and assembly as the bottom portion thereof. Adhesive tab 27 is adhered to the end portion of panel 26, whereas the adhesive tab portion 31 is adhered to the top end portion of panel 25. Of course, if holes 32 were not

desired, the container may be in the form of a totally enclosed box. Such modification is illustrated in FIG. 13 which is identical to FIG. 10 except that half of the top panel 23*a* is provided with a flap 33', — the other half, of similar construction, is integrally tacked on to the right side of panels 25 and 26 as viewed in FIG. 10 and a hole 32*a* is provided in the center of the blank as shown in FIG. 10 if desired instead of a closed box.

While a six sided sidewall construction has been described it should be noted that a larger or smaller number of sidewalls may be used instead. For example, the container may have the shape of a square box with only a four paneled sidewall when made from a blank as shown in FIGS. 15 and 16.

More specifically, FIG. 14 shows a blank 42 for forming the square box having side panels 43 and 44 in opposed relationship, forming two sides of the square, and two pairs of opposing side panels 46 and 47, which are joined together by adhesive tab 48 so that each pair will form another side of the square box when folded in the manner shown in FIG. 15. The bottom is made up of panels 45', 45' folded along the medial fold which is in alignment with slits 51 which provide triangular portions 49 and 50 separated by diagonal crease lines. Adhesive flaps 48 are provided on one side of the blank and a tab 54 is provided on the lid or cover 52 joined by a crease line thereto and to side flaps 53 by other crease lines.

As shown more clearly in FIG. 15, the blank is folded in flattened condition by folding the two bottom panels 45', 45' along the intermediate crease line. When it is desired to assemble the box, the triangular flaps 49 and 50 are folded in the manner shown and thereafter each adhesive tab 48 is adhered to the corresponding edge portion of flap 46 so as to form two opposite sides of the square box. The lid 52 is then folded over the side flaps 53 and the front flaps 54 are folded at right angles along their crease lines to intefit the box top edge portion.

FIG. 16, is a top view of the assembled square box with the lid 52 and adjoining flaps 53 and 54 shown in open, flat condition.

Other modifications of the invention will be suggested to those skilled in the art. By simply varying heights and widths of dimensions, a virtually endless variation of sizes may be made, thereby creating many geometric variations within the four and six sided structure. Width and height, as well as bases of each structure may vary and with each change in dimension a variation of the basic geometric four and six sides will change.

Thus it will be seen that I have provided an efficient, relatively inexpensive, one-piece blank so shaped and foldable as to cause spring action or automatic expansion and locking of the container by the mere pressing together of opposite edges of the collapsed container; furthermore, I have provided a blank which is practically of rectangular construction, therefore resulting in practically no waste of the cut-out blank material; furthermore, I have provided a unique structure which can be easily and quickly expanded or collapsed to form a container of any type for various applications, such as holders for various articles, such as mail, pencils, etc.

While I have illustrated and described several embodiments of my invention, it will be understood that these are by way of illustration only and that various changes and modifications may be made within the contemplation of my invention and the following claims.

I claim:

1. A blank for forming a multi-sided container, comprising a substantially rectangular sheet of material divided, by fold lines, into panels for forming the bottom wall, side walls and end walls of the container, said bottom wall forming panel being connected to said side wall forming panels by fold lines, one of said panels for forming each end wall having a tab which may be secured to the edge of the other panel for forming the same end wall and being joined by score lines to said side wall forming panels, said bottom wall forming panel having a medial fold line in alignment with slits separating triangular portions which are joined to said bottom wall forming panel by fold lines, each of said triangular portions having joined thereto, by a fold line, a complementary triangular portion which is joined, by a fold line, to an end wall forming panel, whereby in the assembled collapsed container, said bottom wall forming panel will be folded upwardly along its medial fold line and sandwiched between said side wall forming panels, and whereby when said end wall forming panels are pushed toward each other, said first mentioned triangular portions will curl and enlarge the width of said slits while said second mentioned triangular portions will continuously lie flat against the adjoining end wall forming panels so that said curled portions will eventually effect a snap action and flatten to lock the container in its expanded position, and a container lid forming panel attached, by a fold line, to one of said side wall forming panels and being of identical construction to the bottom forming panel, inclusive of said first and second triangular portions, to provide a completely enclosed container with snap-acting lid and bottom forming panels.

2. A container having side walls, end walls, and a bottom wall, said bottom wall having a medial score line and having, at each end, two upwardly extending right triangular extensions connected to each opposite end of said bottom wall through score lines, the triangular extensions on each side being separated by a slit which is in alignment with said medial score line, the hypotenuse of each of said triangular extensions extending in the plane of one of said end wall forming panels, whereby when said container is collapsed with said bottom wall folded upwardly along said medial score line so as to be sandwiched between said side walls, movement of said end walls toward each other will cause downward unfolding movement of said bottom wall and curling of said triangular extensions until finally said triangular extensions will suddenly become flattened and effect snap action to lock the container in its expanded position, and a lid of identical construction to said bottom wall including said triangular extensions whereby both the bottom and lid will snap to become locked in the expanded position.

3. A blank for forming a six-sided container of a height which may differ from the widths of the sides, comprising a substantially rectangular sheet of material divided, by fold lines, into panels for forming the bot-

tom wall, two side walls and four end walls of the container, each of said panels having laterally and longitudinally extending edges said bottom wall forming panel being connected along its longitudinally extending edges to said side wall forming panels by two of said fold lines, each of said side wall forming panels having an end wall forming panel connected to each of its laterally extending edges by a fold line, said end wall forming panels comprising two pairs of laterally spaced panels, one panel of each of said pairs of panels having an adhesive flap attached to a laterally extending edge thereof by a fold line, the longitudinal dimension of each of said end wall forming panels being greater than one-half the lateral dimension of the bottom wall forming panel, said bottom wall forming panel having a medial fold line in alignment with slits separating triangular portions for forming angularly downwardly extending portions of the end walls and which are joined to said bottom wall forming panel by fold lines, each of said triangular portions having joined thereto, by a fold line, a complementary triangular portion adapted to lie flat against an end wall and which is joined, by a fold line, to an end wall forming panel, whereby in the assembled collapsed container, said bottom wall forming panel will be folded upwardly along its medial fold line and sandwiched between said side wall forming panels, and whereby when said end wall forming panels are pushed toward each other, said first mentioned triangular portions will curl and enlarge the width of said slits while said second mentioned triangular portions will continuously lie flat against the adjoining end wall forming panels so that upon predetermined curling movement said curled portions will eventually effect a snap action and flatten to lock the container in its expanded position.

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