

May 3, 1960

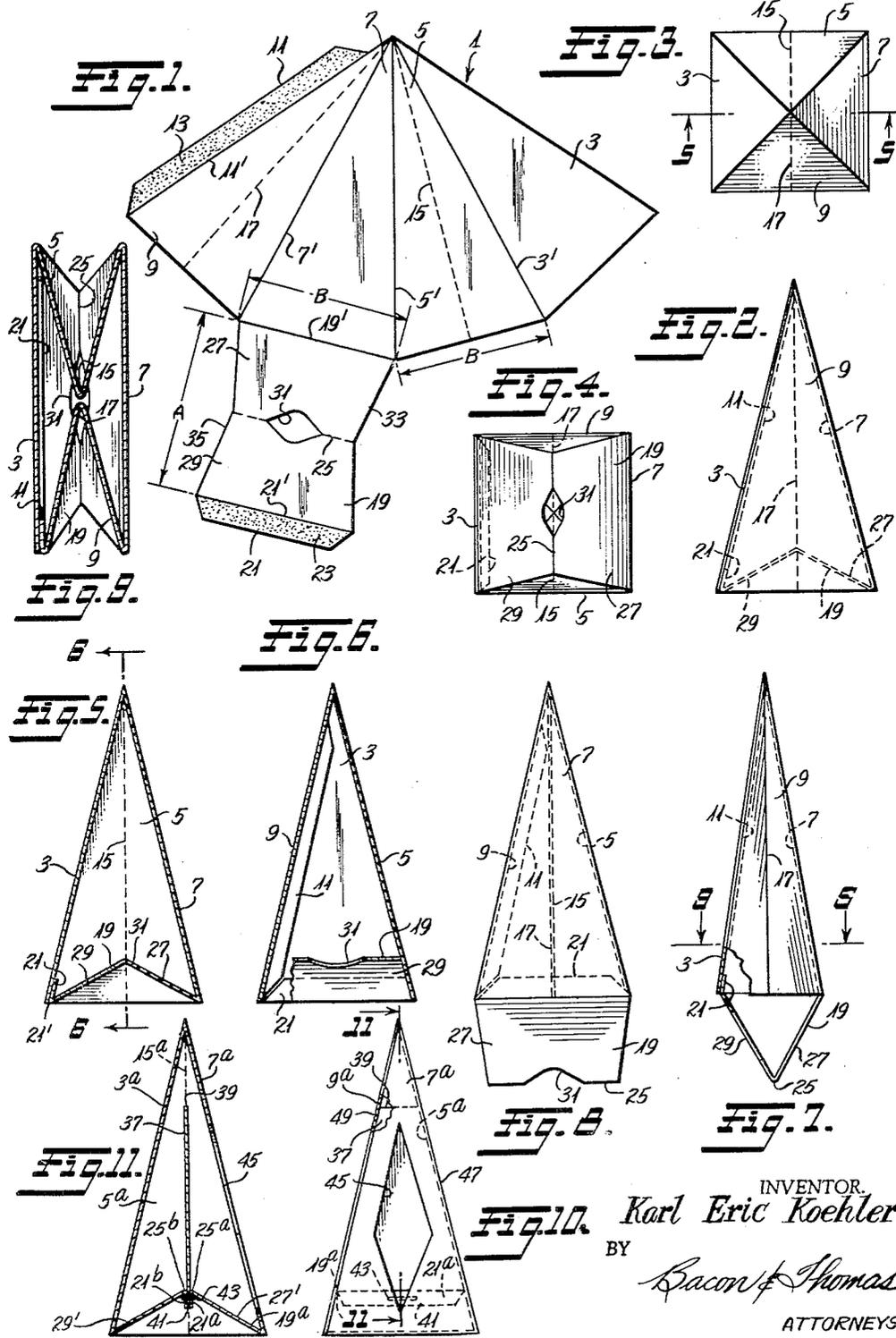
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2,935,238

COLLAPSIBLE PYRAMID STRUCTURES AND BLANKS THEREFOR

Filed Jan. 30, 1958

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

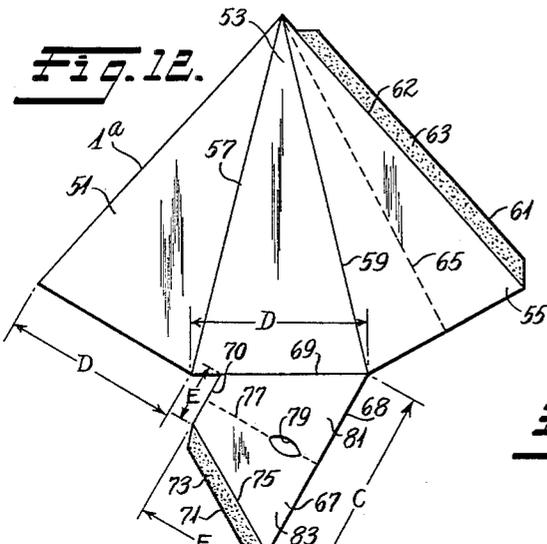


Fig. 12.

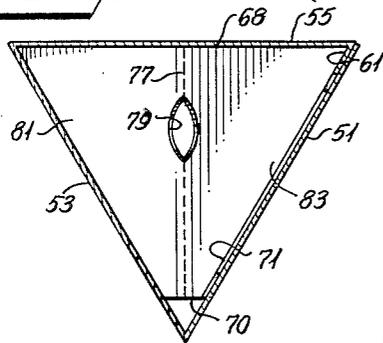


Fig. 13.

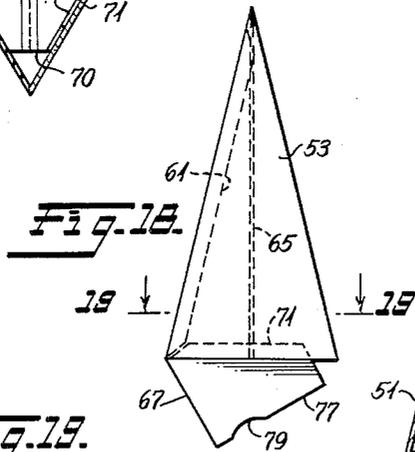


Fig. 14.

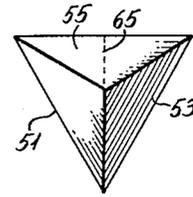


Fig. 15.

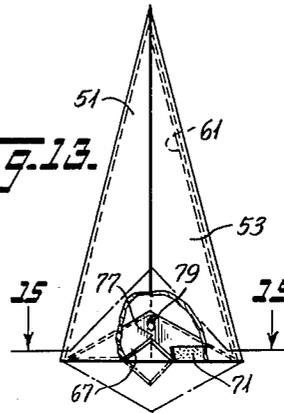


Fig. 16.

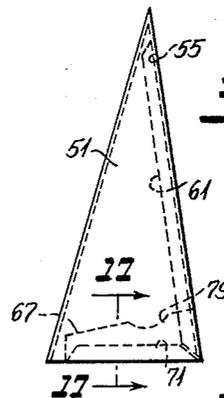


Fig. 17.

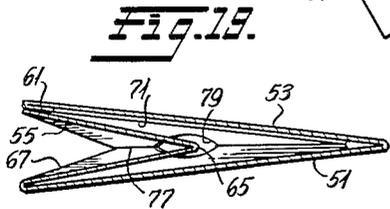


Fig. 18.

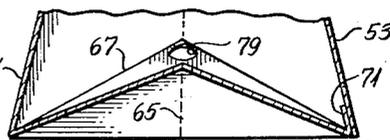


Fig. 19.

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1

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**COLLAPSIBLE PYRAMID STRUCTURES AND  
BLANKS THEREFOR**

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Application January 30, 1958, Serial No. 712,167

19 Claims. (Cl. 229—22)

The present invention relates to collapsible and expandable pyramid structures and blanks from which the same can be made, and more particularly to such structures that can be printed, artistically decorated or otherwise embellished, and used as greeting cards, calendars, containers, advertising novelties, displays, geometric educational devices, etc.

The principal object of the invention is to provide collapsible structures of desired pyramidal configuration that can be readily caused to assume their intended solid geometric appearance and which can with equal facility be collapsed to a flat form.

A more specific object is to provide a collapsible pyramid structure may have three, four or more sides, but which, nevertheless, is adapted to be readily converted from a flat condition to one simulating a geometric solid and which can be again collapsed whenever desired.

Another object is to provide a collapsible structure, preferably of pyramidal configuration, which is versatile and adapted for various uses, including use as a greeting card, display device, etc.

Another object is to provide a collapsible pyramid structure that can be made from a suitably cut blank of fairly stiff sheet material such as paper, metal foil, or other material, and printed or decorated in any suitable manner to serve any desired purpose.

Another object is to provide a collapsible pyramid structure useful for greeting cards and many other purposes and which can be mailed or shipped in a collapsed or flat condition and readily converted into a self-sustaining, solid-appearing geometric structure.

Another object is to provide a collapsible greeting card or display structure having a solid geometric appearance when erected but wherein a window or opening is provided in one side wall of the structure and an element to be viewed through said window is automatically moved to viewing position as an incident to converting the structure from a collapsed to an expanded condition.

Another object is to provide a collapsible card or display device of desired geometric form which includes at least one collapsible side wall and a collapsible bottom wall arranged so that the collapsed side, or sides, is, or are, automatically extended when the bottom wall is moved from its collapsed to its extended position.

Another object is to provide a collapsible pyramid having a bottom wall arranged to positively hold the side walls of the pyramid in erected position by a sort of toggle action.

Other objects and features of the invention will be apparent from the following description taken in conjunction with the accompanying drawings, in which:

Figs. 1 to 9, inclusive, illustrate one embodiment of the invention, wherein Fig. 1 is a view of a stamped blank, or cutout, that can be folded to form a collapsible and expandable four-sided pyramid structure;

Fig. 2 is a front elevational view of a pyramid formed from the blank shown in Fig. 1;

2

Fig. 3 is a plan view of the pyramid shown in Fig. 2; Fig. 4 is a view of the bottom of the pyramid shown in Fig. 2;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 3;

Fig. 6 is a sectional view taken on line 6—6 of Fig. 5; Fig. 7 is an elevational view of the pyramid similar to Fig. 2, but showing the bottom wall withdrawn from inside the pyramid, and with two of the side walls in a partially collapsed condition;

Fig. 8 is a side view of the partially collapsed pyramid shown in Fig. 7;

Fig. 9 is a sectional view taken on the line 9—9 of Fig. 7;

Fig. 10 is an elevational view of a modified form of a four-sided pyramid, wherein one of the side walls is provided with an opening and a mobile panel member attached to the bottom wall of the pyramid is automatically moved into position for viewing through said opening when the bottom wall of the pyramid is moved into its active position;

Fig. 11 is a vertical sectional view taken on the line 11—11 of Fig. 10;

Figs. 12 to 19 illustrate another modification in which principles of the invention are embodied in a three-sided pyramid. More specifically, Fig. 12 is a view of a blank from which the three-sided pyramid can be formed;

Fig. 13 is a front elevational view of the pyramid with a portion of two adjacent side walls broken away to facilitate illustration of certain details of construction of the bottom wall of the pyramid;

Fig. 14 is a plan view of the pyramid shown in Fig. 13;

Fig. 15 is an enlarged sectional view taken on the line 15—15 of Fig. 13, and particularly illustrating certain details of the bottom wall of the pyramid;

Fig. 16 is a right side view of the pyramid shown in Fig. 13;

Fig. 17 is a fragmentary vertical sectional view taken on the line 17—17 of Fig. 16;

Fig. 18 is a left side view of the pyramid showing the bottom wall withdrawn to effect collapse of one of the side walls of the pyramid; and

Fig. 19 is a sectional view taken on the line 19—19 of Fig. 18 showing the collapsible side wall in a partially collapsed condition.

Referring now to the embodiment shown in Figs. 1 to 9 of the drawings, Fig. 1 illustrates a cut or stamped blank 1 that is adapted to be folded to form a four-sided pyramid. The blank 1 may be made of light weight cardboard, heavy metal foil, or other sheet material and comprises 4 side panels, 3, 5, 7, and 9, each in the form of a triangle, all of the triangles being of the same size and joined along fold lines 3', 5' and 7'. The panel 9 carries a flap 11 that is coated with adhesive 13 and joined to panel 9 along fold line 11'. The flap 11 is adapted to be secured by the adhesive 13 to the inner face of and along the free edge of the panel 3, as shown in Figs. 6 and 9. The panels 5 and 9 are collapsible and in this connection, the panel 5 is provided with a score line 15 which extends from the apex to the medial portion of the base of the panel. The panel 9 is provided with a similar score line 17.

The blank 1 further includes an extension of the panel 7 which is adapted to form a collapsible base or bottom wall 19 for the pyramid. The bottom wall 19 is joined at one end to the panel 7 along a fold line 19' and has a flap 21 along its edge remote from the panel 7, said flap extending along fold line 21' and being coated with adhesive 23. The flap 21 is adapted to be secured by the adhesive 23 to the inner face of the panel 3 adjacent to the base of said panel. The length of the side of the

3

bottom wall 19, indicated by the letter A, is substantially greater than the length of the base of the panel 5, for example, indicated by the dimension B.

The bottom wall 19 is provided at its midpoint with a score line 25 extending parallel to the base of the panel 7. The purpose of the score line 25 is to permit the bottom wall 19 to flex or fold along said score line. The dimension A of the bottom wall 19 is purposely made greater than the dimension B so that when the bottom wall is moved into position within the pyramid, portions 27 and 29 thereof on opposite sides of the score line 25 slope inwardly and upwardly from the base of the triangular panels 1 and 7, as shown in full lines in Fig. 5. An opening 31 is formed centrally in the bottom wall 19 so that the wall can be engaged by a finger of the hand to facilitate manipulation of the bottom wall from its active position to its inactive position exteriorly of the pyramid and vice versa. In order to provide support for the collapsible panels 5 and 9 and to hold them in their extended position, the side edges of the bottom wall portions 19 and 27 are cut so that they converge toward each other as indicated at 33 and 35 to provide a medial portion coinciding with the score line 25 that is of less length than the fold lines 19' and 21'.

Figs. 7 to 9 illustrate the pyramid structure in a partially collapsed condition. That is to say, the panels or side walls 5 and 9 are shown folded and partially collapsed along the score lines 15 and 17, and the bottom wall 19 is shown extending downwardly from the panels 3 and 7 and folded and partially collapsed along the score line 25. It is to be understood, however, that the pyramid can be collapsed to a completely flat condition in which the confronting faces of the folded side panels 5 and 9 are in engagement and in which the inner confronting faces of the portions 27 and 29 of the bottom wall 19 are in engagement.

In order to convert the pyramid from its expanded condition to a collapsed condition, it is only necessary to exert a force on the bottom wall 19 to move it in a direction away from the apex of the pyramid from the position illustrated in Fig. 5 to that illustrated in Fig. 7. This can be easily done by inserting a finger in the opening 31 and pulling downwardly on the bottom wall 19. The material from which the pyramid is made has sufficient flexibility to permit the bottom wall 19 to buckle slightly as the bottom wall portions 27 and 29 are moved through "dead center" position, that is, through a horizontal plane coinciding with the plane of the base of the collapsible side walls 5 and 9.

Manipulation of the bottom wall 19 from the position shown in Fig. 7 automatically causes the collapsed side walls 5 and 9 to be moved from their folded position to their fully extended position. The bottom wall 19, of course, must pass through its "dead center" position as it is moved into the pyramid, the bottom wall portions 27 and 29 hinging about the score line 25 as an axis. Once this axis has been moved to a position above the plane of the base of the side walls, the bottom wall portions 27 and 29 provide a toggle action that positively holds the attached side walls 3 and 7 in fully expanded position and also exerts force that flattens out the side walls 5 and 9. The side edge portions 33 and 35 of the bottom wall 19 are then engaged with the inner face of the side walls 5 and 9 and hold them in their extended position. Thus, the simple manipulation of the bottom wall 19 in the manner described above will automatically convert the pyramid from a fully collapsed condition into a fully extended condition representing a geometrical solid.

Figs. 10 and 11 illustrate a modified form of four-sided pyramid structure that may be formed from a blank similar to that shown in Fig. 1, but modified by forming the bottom wall 19a from extensions 27' and 29' extending from the base of side walls 7a and 3a, respectively. The bottom wall portion 27' terminates in

4

a flap 21a and the bottom wall portion 29' terminates in a similar flap 21b. The flaps 21a and 21b are joined to their associated bottom wall portions along score lines 25a and 25b, respectively. An inner element or panel 37, which has a configuration corresponding generally to that of the side walls of the pyramid, has its apex removed to provide a flat end 39. Its lower end 41 is disposed between the flaps 21a and 21b and is preferably secured thereto by a conventional staple 43.

The side wall 7a is shown provided with an opening 45 through which the panel 37 is viewable, it being noted from Fig. 10 that the side edges 47 and 49 of said panel are in supporting engagement with the collapsible side walls 5a and 9a, respectively, of the pyramid. Thus, the panel 37 cooperates with the bottom wall portions 27' and 29' to hold the pyramid structure in expanded position. The flaps 21a and 21b facilitate the positioning of the panel 37 in a true vertical position within the pyramid, aligned with the fold line 15a.

Fig. 11 shows the relationship of the bottom wall portions 27' and 29' with respect to the base of the pyramid when they are in their extended position holding the pyramid erected. These bottom wall portions are manipulatable in the same manner as the bottom wall portions 27 and 29 of Fig. 5, except that the flaps 21a and 21b can be conveniently grasped by the fingers of the hand to effect movement of said bottom wall portions from their expanded position to their collapsed position and vice versa. It will be noted from both Figs. 4 and 11 that the score lines 25 and 25a-25b, respectively, are substantially perpendicular to the foldable side walls 5-9 and 5a-9a, respectively.

It will be understood that the bottom wall 19 of the pyramid of Figs. 1 to 9 may be formed in the same manner as the bottom wall 19a of the pyramid of Figs. 10 and 11, if desired. It will also be understood that the opening 45 and the inner panel 37 of Figs. 10 and 11 may be omitted with their loss of function.

Figs. 13-19 illustrate a third embodiment of the invention in the form of a collapsible and expandable three-sided pyramid structure.

Fig. 12 illustrates a blank from which the three-sided pyramid may be formed. As is here shown, the blank 1a comprises three like triangular panels 51, 53, and 55 joined together along fold lines 57 and 59. The side edge of the panel 55 has a flap 61 connected thereto along a fold line 62. The flap 61 is coated with adhesive 63 so that it can be secured to the inner face of the free side edge of the panel 51, as shown in Fig. 15. The panel 55 has a score line 65 that extends from a point medially of its base to its apex. An extension from the base of panel 53 forms a bottom wall 67 for the pyramid. The bottom wall is joined at one end to the triangular panel 53 along a fold line 69 and has a flap 71 at its opposite end coated with adhesive 73 and joined to the bottom wall 67 along a fold line 75. The bottom wall 67 has the general outline of an isosceles trapezoid with its longest side 68 having a dimension C substantially greater than the length D of the base portion of the triangular panels 51, 53, and 55. The long side 68 of the bottom wall 67 is about 4½ times the length of its short side 70, indicated by the dimension E, and the width F of said bottom wall is about ⅓ of the dimension D. The bottom wall 67 has a score line 77 and an opening 79 lying along said score line. The opening 79 is adapted to receive the end of a finger that can be used to manipulate the bottom wall 67 to automatically effect collapse of the pyramid structure or to expand the same from a collapsed condition to that of a geometrical solid in the same manner as the bottom wall 19 of Fig. 5.

Figs. 13 to 15 illustrate the pyramid in its expanded condition, that is to say, with the bottom wall 67 in its active position in which its portions 81 and 83 on either side of the score line 77 exert a toggle force against the side panels 51 and 53 to hold them apart and to hold

5

the collapsible panel 55 in its expanded position. It will be noted that the bottom wall portions 81 and 83 extend upwardly and inwardly toward the score line 77 from the base of the side panels 51 and 53 and thus obtain toggle leverage. In other words, the bottom wall 67 thus forms a sort of arch which prevents collapse of the pyramid. Moreover, the edge 68 of the longer side of the bottom wall 67 engages the inner surface of the collapsible panel 55 to positively hold it in expanded position. The pyramid structure can be readily collapsed by inserting a finger in the opening 79 and exerting a pull on the bottom wall 67 in a direction away from the apex of the pyramid. The application of such force will cause the bottom wall 67 to pass through its "dead center" position and assume the position indicated in Fig. 19, it being understood that this figure illustrates the wall 55 in only a partially collapsed condition and that the pyramid is adapted to be collapsed to a fully flat condition. Fig. 18 illustrates the position of the bottom wall 67 when the pyramid is fully collapsed.

It is to be understood that the several forms of pyramid structures disclosed herein may have a calendar, greeting or other matter printed thereon or be decorated with artistic or advertising material to enable the same to be used as greeting cards, advertising displays, containers, etc. It will be further understood that the face of the panel 37 viewable through the opening 45 may be appropriately decorated or printed to provide any illustrative artistic or advertising matter desired to be viewed through said opening, the effect of the opening being to focus attention upon the matter viewable therethrough.

By way of example, and not limitation, the base of the triangular side panels of the several pyramids disclosed herein may be about  $3\frac{1}{2}$ " long, corresponding to the dimensions B and D. The length of the bottom wall 19 corresponding to the dimension A is about  $\frac{1}{8}$  greater, namely about 4". The dimension C of the long side 68 of the bottom wall 67 is about 4". On the other hand, the length of the short side 70 indicated by the dimension E is about  $\frac{7}{8}$ ", so that C is about  $4\frac{1}{2}$  times E. The width F of the bottom wall 67 is about  $2\frac{15}{16}$ " or about  $\frac{5}{6}$  of the dimension D. The altitude of the several pyramids is about  $6\frac{1}{2}$ ".

It will also be understood that while certain dimensions have been set forth herein with respect to the pyramids disclosed, such dimensions as well as the details of constructing said pyramids may be varied as desired without departing from the principles of the invention or the scope of the annexed claims.

I claim:

1. A blank for forming a collapsible and expandable pyramid structure, comprising: a sheet having at least three triangular like panels joined at their adjacent sides along a fold line, at least one of said triangular panels having a score line extending from the midpoint of its base to its apex, one of said non-scored triangular panels having an extension joined thereto along a fold line at its base adapted to form a bottom wall of the pyramid, said bottom wall having a midpoint of less length than said fold line and having a score line extending along said midpoint.

2. A blank as defined in claim 1, in which the bottom wall has a V-shaped side edge of a length greater than that of the base of the triangular panel adjacent thereto.

3. A blank as defined in claim 1 having four triangular panels and wherein two alternate panels have score lines extending from the midpoint of their base to their apex, and wherein the bottom wall extends from a non-scored triangular panel.

4. A blank as defined in claim 1, in which the side

6

edges of the bottom wall converge toward the score line of said bottom wall.

5. A blank for forming a collapsible and expandable pyramid structure, comprising: a sheet having four triangular panels joined at their adjacent sides along a fold line, two alternate triangular panels having a score line extending from the midpoint of their base to their apex, the non-scored triangular panels each having an extension of a length slightly greater than one-half the length of the base of the unscored triangular panels joined thereto along a fold line at its base and adapted to form a portion of a bottom wall of the pyramid, the width of each extension at the end thereof remote from its associated fold line being less than the length of the fold line, whereby said bottom wall portions extend upwardly and inwardly from their respective fold lines.

6. A blank for forming a collapsible and expandable pyramid structure, comprising: a sheet having at least three triangular panels joined at their adjacent sides along a fold line, one of said triangular panels having a flap extending from its free side edge adapted to be adhesively secured to the free side edge of the triangular panel most remote therefrom, at least one of said triangular panels having a score line extending from the midpoint of its base to its apex, another of said triangular panels having an extension joined thereto along a fold line at its base adapted to form a bottom wall of the pyramid, said bottom wall having at least one side of a length greater than that of the base of said scored triangular panel and having a midpoint of a width less than the length of said fold line and having a score line extending thereacross at said midpoint, said bottom wall also having a flap at its edge most remote from said last-mentioned fold line adapted to be adhesively secured to the inner face and along the base of another of said triangular panels, whereby said bottom wall assumes a V-shaped configuration within the pyramid and sustains the scored panel against collapsing inwardly.

7. A collapsible and expandable pyramid structure, comprising: at least three triangular panels forming side walls of said pyramid, at least one of said triangular panels having a score line extending from the midpoint of its base to its apex and a bottom wall having connected portions, each of a length greater than one-half the length of the base of said scored triangular panel and being connected with one other of said triangular panels, said portions being joined along a line medially of said bottom wall and being foldable along said line of juncture, the width of said portions along said line of juncture being less than that of the length of the base of the triangular panels to which said bottom portions are connected.

8. A pyramid structure as defined in claim 7, in which said bottom wall portions extend inwardly and upwardly from their associated triangular side panels.

9. A collapsible and expandable pyramid structure, comprising: at least three triangular panels forming side walls of said pyramid, at least one of said triangular panels having a score line extending from the midpoint of its base to its apex; and a bottom wall connected with two other of said triangular panels, said bottom wall having a midpoint of less width than the length of the base of any of said triangular panels score line extending along said midpoint and disposed generally perpendicular to said scored triangular panel.

10. A pyramid structure as defined in claim 9, in which the bottom wall has a side edge of a length substantially greater than that of the base of the scored triangular panel.

11. A collapsible and expandable pyramid structure, comprising: four triangular panels forming side walls of said pyramid, two opposed triangular panels having a score line extending from the midpoint of their base to their apex; and a bottom wall having a portion connected with the other two triangular panels, said portions being joined along a line medially of said bottom wall

and being of less width along said line of juncture than the length of the base of the triangular panel connected thereto and being foldable along said line of juncture to a position in which said line of juncture is within said pyramid.

12. A pyramid as defined in claim 11, in which the bottom wall portions have side edges that converge toward said line of juncture.

13. A collapsible and expandable pyramid structure, comprising: at least three triangular panels forming side walls of said pyramid; at least one of said triangular panels having a score line extending from the midpoint of its base to its apex; and a bottom wall connected with two other of said triangular panels, said bottom wall having a midpoint of less width than the length of the base of any of said triangular panels and having a score line extending along said midpoint and disposed generally perpendicular to said scored triangular panel with its score line disposed within the pyramid, said bottom wall being adapted to be folded along its score line and having finger-engageable means to effect folding of said bottom wall along its score line, whereby upon movement of the scored portion of said bottom wall from within said pyramid and in a direction away from said triangular side panels, said bottom wall will collapse and automatically effect collapsing of said pyramid structure by causing the scored triangular panel to collapse along its score line.

14. A pyramid structure as defined in claim 13, in which the finger-engageable means is an opening formed in the bottom wall.

15. A pyramid structure having triangular side walls

and a bottom wall, said bottom wall including portions attached to the base of two of said side walls and extending inwardly and upwardly within said pyramid, each of said bottom wall portions having a downwardly extending flap at its inner end, each bottom wall portion being of less width at its inner end than the length of the base of its associated side wall; and means connecting said flaps together.

16. A pyramid structure as defined in claim 15, in which at least one of the side walls is generally perpendicular to the flaps of said bottom wall and has a score line extending from a point medially of its base to its apex.

17. A pyramid structure having side and bottom walls, one of said side walls having an opening extending therethrough; and an inner panel extending upwardly from said bottom wall and being viewable through said opening.

18. A pyramid structure as defined in claim 17, in which the bottom wall includes portions extending inwardly and upwardly toward said inner panel.

19. A pyramid structure as defined in claim 18, in which said bottom wall portions each have a flap at their inner end and said inner panel has its lower end positioned between said flaps.

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