Aug. 29, 1961 W. HOLMES 2,998,157

COLLAPSIBLE BOXES, CRATES AND THE LIKE

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FIG. 1.

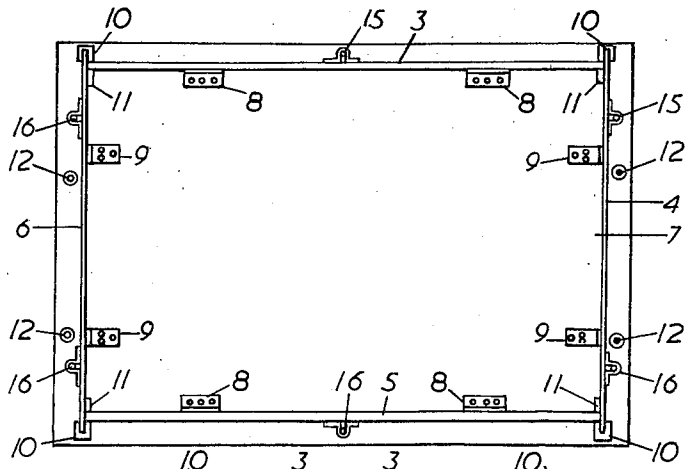


FIG. 2.

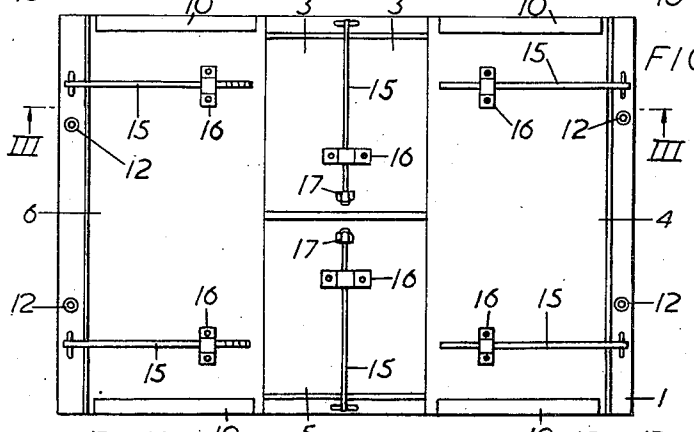


FIG. 3.

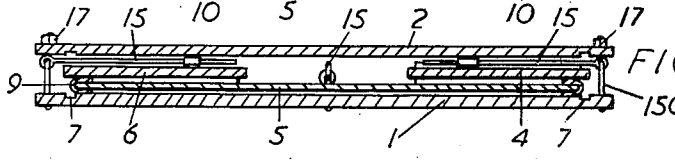


FIG. 3a.

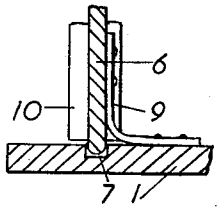
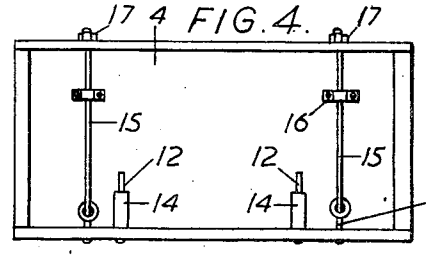


FIG. 4.



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FIG. 5.

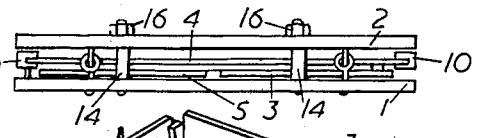


FIG. 6.

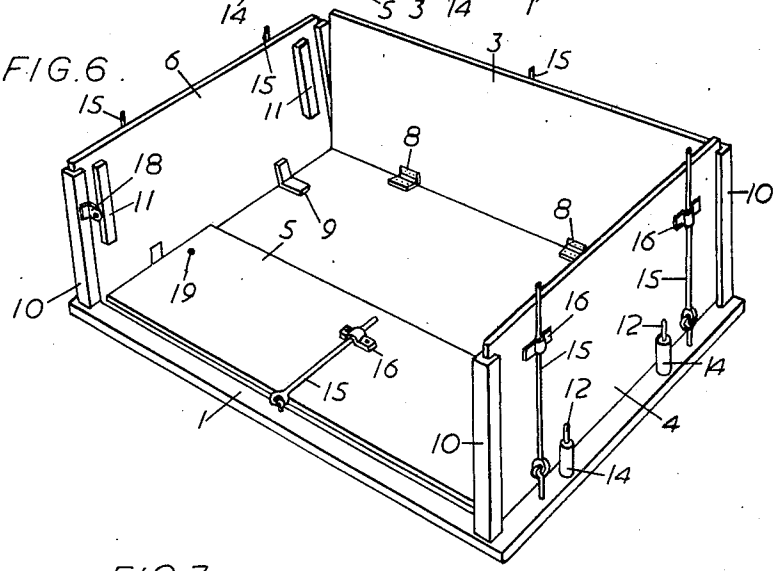


FIG. 7.

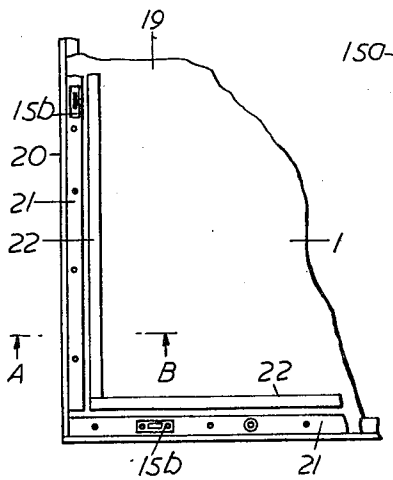


FIG. 8.

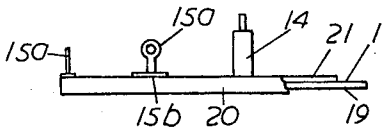
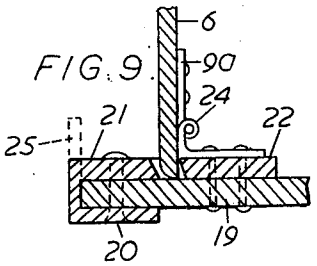


FIG. 9.



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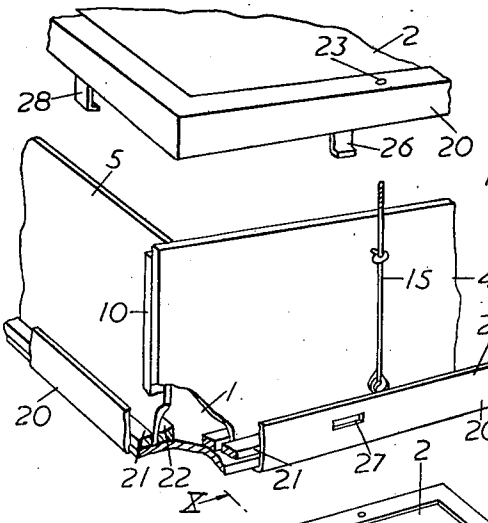


FIG. 10.

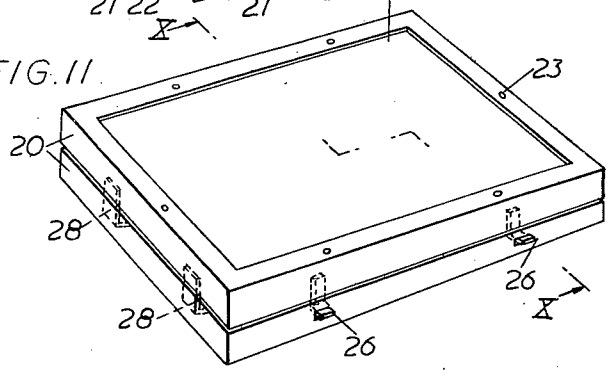


FIG. 11.

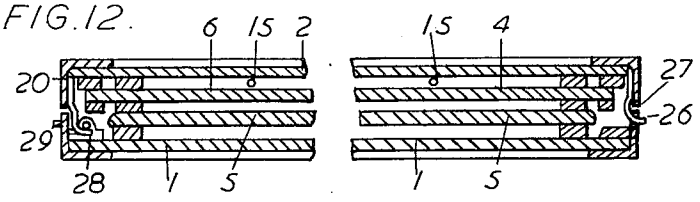


FIG. 12.

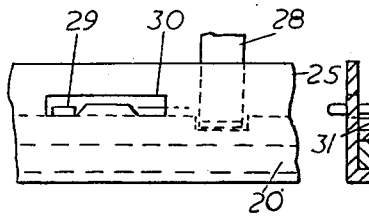


FIG. 13.

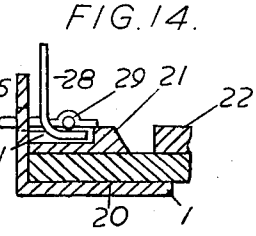


FIG. 14.

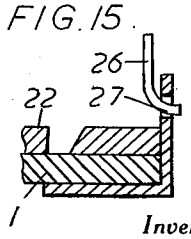


FIG. 15.

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2,998,157

COLLAPSIBLE BOXES, CRATES AND THE LIKE

Warren Holmes, "Hillside," Glenageary Hill, Dun Laoghaire, Ireland

Filed Apr. 8, 1959, Ser. No. 805,013
7 Claims. (Cl. 220—6)

This invention concerns collapsible boxes, crates and similar containers of the kind in which the four side members together with the top and bottom member are adapted to be fitted together in assembled position to form the container with the aid of grooves in certain of said members to receive the edges of contiguous members, and to be secured in such assembled position by means of bolts, or the like, whereas when in the collapsed condition the sides may be folded down or laid substantially flat between the top and bottom members which may then be fastened to enclose the various parts for convenient storage or transport.

With such containers as hitherto constructed, it has been customary not only to make the top removable, but also two of the sides (the other two sides being hinged to the bottom member), in order that when assembled the edges of the members satisfactorily fit into the grooves provided to receive them. Collapsible containers having all four sides hinged to the bottom have not embodied the feature of grooves such as above mentioned wherever the edge of a member makes contact with an adjacent member so that said edge fits into a groove when the container is assembled. This feature is of great importance because, not only is the container immensely strengthened by the interfitting of the edge and groove extending along each angle of the container, where two adjoining members meet, but the interior of the container, although not necessarily entirely airtight, is well protected against the entry of dust, dirt and foreign matter generally.

The object of the invention is to provide a construction of container which combines in a practical form the most desirable features of the known constructions above mentioned, thereby affording a light, strong and inexpensive container which can be collapsed and packed when desired for transport without the risk of any parts being lost or mislaid, and which may be quickly and easily set up when desired for use. It is also an essential feature of the invention that, when assembled and closed, the top and bottom of the container shall be held in position by bolts or the like extending directly between them.

A container of the kind referred to constructed according to the invention has all four side members hinged to the bottom member, the latter is provided close to its periphery with a groove to receive the lower edges of all four side members, the top member is similarly provided with a groove to receive the upper edge of said side members, and one pair of opposite side members is provided with grooves to receive the end edges of the other pair of side members. The grooves may be formed by metal channels affixed to the bottom, top and/or side members respectively. Alternatively the grooves may be formed by attaching around the margin of the member to be grooved two parallel strips of material, e.g. thin strips of wood, metal, plastic or hardboard, of a thickness equal to the desired depth of the groove, spaced apart a distance equal to the thickness of the container wall, the edge of which is required to enter said groove. Alternatively, instead of employing two parallel strips a single outer marginal strip may be employed, the portions of the walls forming the interior or the container being covered with an additional layer of sheet material of appropriate thickness. On the two side walls the strips which lie inside the container when erected or the additional layers of material used in place of said strips terminate substantially short of the bottom of the container for a reason hereinafter explained.

In order to permit one opposite pair of side walls to fold on top of the other pair of side walls when the container is collapsed, the hinges used to hinge one pair of opposite side walls to the bottom of the container advantageously consist of strips of flexible material e.g. leather or flexible plastic material. Such hinges permit the side to be raised slightly as it is being folded down, so that it may rest flat on top of the other pair of sides which may be hinged to the bottom by conventional box hinges. If desired, suitably offset hinges may be used instead of flexible hinges.

The bolts by which the top and bottom members of the container are held in position when the container is closed are also secured to the bottom member in a permanent manner, but so as to permit them to fold down with the side of the container adjacent which they are respectively located. For this purpose each bolt is formed in two portions linked or hinged together, one portion being securely fastened to the marginal portion of the bottom member which extends beyond the sides, and forming a hinge connection for the other portion of the bolt which is of sufficient length to pass through a hole in the marginal portion of the top member of the container, and is loosely held to the adjacent side of the container by passing the bolt through an eye, staple or the like, affixed to said side of the container. The length of the bolt portion or connection fixed to the bottom member is such that when the sides are folded down said bolt portions or connections do not project appreciably above the level of the folded sides. Such bolts are preferably provided on all four sides of the container.

Short bolts fitted with distance pieces are also preferably provided to enable the top and bottom members to be securely held together with the side members folded between them for transport or storage, in which case said short bolts are mounted on the marginal portions of the bottom member adjacent to the side members where the grooves are curtailed in length as above stated. Means may also be provided for detachably securing together adjacent side members to hold them in the erected position before application of the top member.

The invention is hereinafter described with reference to the accompanying drawings, wherein:

FIG. 1 is a plan of the container when erected, but without the top member.

FIG. 2 is a plan of the container folded and without the top member.

FIG. 3 is a sectional elevation on line III—III of FIG. 2 with the top member applied.

FIG. 3*a* shows a detail, partly in cross-section, to an enlarged scale.

FIG. 4 is an end elevation of the container when erected and closed.

FIG. 5 is an end elevation of the container in the folded condition.

FIG. 6 is a perspective view of the container in partly erected condition.

FIG. 7 is a plan of the bottom member of a container of slightly modified construction.

FIG. 8 is an end elevation of the base of the container shown in FIG. 7.

FIG. 9 is an enlarged view of a detail of FIG. 7, in cross section on line A—B of FIG. 7.

FIG. 10 is a perspective view of a corner portion of a container of modified construction in the erected condition.

FIG. 11 is a perspective view of the container shown in FIG. 10 in its closed condition.

FIG. 12 is a cross-section on line X—X of FIG. 11 to an enlarged scale, and

FIGS. 13, 14 and 15 are further enlarged views of details of FIG. 12, FIGS. 14 and 15 being cross-sections similar to FIG. 12, and FIG. 13 being a side elevation of FIG. 14.

Referring to FIGS. 1 to 6, the container shown comprises a bottom member **1**, top member **2** and side members **3**, **4**, **5** and **6**. The bottom member **1** is formed with a groove **7** close to its periphery to receive the bottom edges of the side members. The side members **3** and **4** are hinged to the bottom member **1** by ordinary box hinges **8**, while the end members **5** and **6** are hinged to the bottom member **1** by strips **9** of flexible material. Such strips, while serving to connect the side members **5** and **6** to the bottom member **1** and permit relative hinging movement thereof, also allow the bottom edges of the members **5** and **6** to enter readily into the groove **7** or to be removed therefrom when desired and thus enable the members **5** and **6** to be folded flat upon the members **3** and **4** when desired as shown in FIG. 3. The position of the hinge **9** when the sides of the container are erected is shown more clearly in FIG. 3*a*.

In order to strengthen the side members **4** and **6** and to provide grooves on the side members **4** and **6** to receive the end edges of the side members **3** and **5** in the erected position, the end portions of the members **4** and **6** are reinforced by grooved strips **10** of wood or metal permanently secured thereto and strips **11** are also attached to said members, spaced from the strips **10** a distance sufficient to receive the ends of members **3** and **5** between the parallel pairs of strips **10**, **11**. The strips **11** are somewhat curtailed in length as shown in FIG. 6 in order to permit the sides **3** and **5** to be moved past said strips when they are being hinged into or out of erected position. At such times the sides **4** and **6** may be tilted slightly outwards, as is the side **6** in FIG. 6, but such outward movement is limited by the short bolts or studs **12** mounted on the bottom member **1**, the primary purpose of which is to enable the top and bottom members **1**, **2** to be secured together when the box is folded as shown in FIG. 5, said studs being provided with appropriate distance pieces **14** as shown in FIGURES 4, 5, and 6.

The long bolts **15** by which the top member **2** and bottom member **1** are directly held together when the box is erected and closed are hinged to the bottom member **1** by eye pieces **15***a* and are slidably held to the adjacent box side by U-brackets **16**. This arrangement ensures that the bolts follow the hinging movement of the sides and when the sides are erected and the top member **2** applied thereto the bolts **15** are in correct position to pass through the apertures provided therefor in the top member **2**. On the other hand, when the sides are folded down the bolts **15** are securely retained in the folded position shown in FIGS. 2 and 3. Ordinary staples could obviously be used in place of brackets **16**.

It will be understood that the top member **2** is also formed with apertures suitably positioned to coincide with the studs **12** so that the studs will readily pass through said apertures when the top member **2** is applied with the sides in the folded position as shown in FIG. 3. If four of the nuts **17** are applied to said studs, while the remaining two nuts **17** are temporarily screwed upon the long bolts **15** associated with the sides **3** and **5** as shown in FIG. 2, all the parts of the container and its fastening means may be securely packed as one unit for transport in the collapsed condition and the container is immediately ready for erection and use as a container whenever desired. The parts cannot be mislaid.

In order to facilitate the erection and filling of the container, and to permit it to be used without the top member if desired a temporary fastening device is advantageously provided at each corner to hold the adjacent side members together in their erected position. Thus, as shown in FIG. 6 an angle piece **18** mounted on the strip **10** of the side member **6** is apertured to coincide with a perforation **19** in the adjacent side member **5**, so that a pin (not shown) may be passed through the aperture of the angle piece **18** and through said perforation to hold said side members in their erected position. Such a fastening device may be provided upon each of the strips **10**.

The materials of which the container is made may be chosen according to the weight and strength which it is desired to have. A particularly light and strong container may be constructed, however, having the side members of plywood, hardboard or light metal sheets, reinforced if desired, not only by strips such as the strips **10** and **11** above mentioned but by additional battens or additional layers of material of appropriate thickness. The top and bottom members are preferably of stronger material than the side members, but such material may be relatively thin if the marginal portions at least are reinforced. Such a construction is shown in FIGS. 7 to 9, in which the bottom member **1** comprises a base **19** of sheet material reinforced at the edges by a metal frame **20** of channel section, the groove **7** being formed by affixing strips **21**, **22** to the base **19**.

FIGS. 7 and 8 also show an alternative form of mounting for the eye pieces **15***a*, which are shown as consisting of an eye bolt secured to a plate **15***b* screwed or riveted to the margin of the bottom member **1**. Obviously other forms of swivelling or hinging devices could be employed in an equivalent manner if desired. Moreover, instead of using bolts to hold the top and bottom members together when the container is closed wire, clasps or chains could be employed in a similar manner.

FIG. 9 also illustrates the employment of off-set hinges **9***a* in place of the flexible hinges **9** above described. The pin **24** of the hinge **9***a* is located at a distance above the bottom member **19** to permit the side members **3** and **5** above mentioned to lie underneath the side members **4** and **6** when they are folded down in the position shown in FIG. 2. In this construction it is necessary for the sides of the groove **7** to be chamfered slightly to permit the lower edge of the side members to freely enter and pass out of said groove, as clearly indicated in FIG. 9.

The construction employing a frame of angle section to reinforce the edges of the top and bottom members also lends itself conveniently to the folding of the container into a box form with the nuts and bolts all safely stored and concealed therein and without any projections on the top or bottom, the bolts **12** being dispensed with. This is shown in FIGS. 10 to 15, in which the angle-shaped frame **20** is designed to provide an upstanding flange **25** around all sides of the bottom and top members **1** and **2**. The top member **2** is provided with tongues **26** at one end adapted to engage apertures **27** in the flange **25** of the bottom member **1**, and on the other three sides with spacing members **28** adapted to rest on the marginal strips **21** when the top member is superimposed on the bottom member as shown in FIG. 12, thus serving the purpose of the spacing collars **14** above described. One of the spacing members **28** is utilised for locking the top and bottom members together, by providing a sliding bolt **29** as shown more clearly in FIGS. 13 and 14. One end of the bolt **29** projects through a slot **30** in the flange **25** to enable the bolt to be manipulated and slid over the lower extremity of the spacing member **28** which rests in a recess **31** in the strip **21**, so as to lock the spacing member in that position, or to be retracted as shown in FIG. 13 to free the spacing member and thereby permit the top member to be lifted from the bottom member. Advantageously the bolt **29** may be spring loaded and the slot **30** suitably shaped to retain the bolt in its locking or unlocking position as the case may be, or it may be positively retained in such positions by means of a key, dowel or other convenient device, as will be obvious.

It will be appreciated that in this construction the bolts **15** which pass through apertures **33** in the top frame member **20** when the top member is applied to the erected container, are wholly concealed when the con-

tainer is folded as shown in FIG. 11, and if the nuts 17 are replaced on the bolts 15 before folding down the side members there is no danger of their being mislaid.

I claim:

1. A collapsible rectangular container comprising a bottom member, four side members hingedly connected to said bottom member for swinging movement about lines adjacent to and paralleling the peripheral edges thereof, said bottom member having grooves in its top face adjacent and paralleling its peripheral edges, said grooves receiving the adjacent bottom edges of side members when the container is in an erected condition, one pair of opposite side members having grooves paralleling their vertical edges and receiving the adjacent vertical edges of the other pair of opposite side members, a top member having grooves in its bottom face adjacent and paralleling its peripheral edges in which grooves the adjacent upper edges of said side members are disposed when the container is in the said erected condition, and fastening means for directly connecting said top and bottom members.

2. A collapsible rectangular container comprising a bottom member, a pair of opposite side members hingedly connected to the bottom member by conventional hinges for swinging movement about lines adjacent to and paralleling peripheral edges of the bottom member, another pair of opposite side members hingedly connected to said bottom member by flexible hinges for swinging movement about lines adjacent to and paralleling peripheral edges of said bottom member, said bottom member having grooves in its top face adjacent and paralleling its peripheral edges, said grooves receiving the adjacent bottom edges of the side members when the container is in an erected condition, one pair of opposite side members having marginal strips adjacent and paralleling their vertical edges providing grooves receiving the respectively adjacent vertical edges of the other pair of opposite side members, a top member having marginally disposed apertures therethrough extending in a direction perpendicular to said top member, marginal strips adjacent and paralleling said apertures and providing grooves to receive the upper edges of the four side members when the container is in the said erected condition, and bolts hingedly connected to the marginal portions of the bottom member and extendable into corresponding apertures in the top member, when positioned with the grooves of said top member engaged with the upper edges of the side members in the said erected position.

3. A collapsible rectangular container comprising a bottom member, a pair of opposite side members hingedly connected to the bottom member by conventional hinges for swinging movement about lines adjacent to and paralleling peripheral edges of the bottom member, another pair of opposite side members hingedly connected to said bottom member by flexible hinges for swinging movement about lines adjacent to and paralleling peripheral edges of said bottom member, said bottom member having grooves in its top face adjacent and paralleling its peripheral edges, said grooves receiving the adjacent bottom edges of the side members when the container is in an erected condition, one pair of opposite side members having marginal strips adjacent and paralleling their vertical edges providing grooves receiving the respectively adjacent vertical edges of the other pair of opposite side members, a top member having marginally disposed apertures therethrough extending in a direction perpendicular to said top member, marginal strips adjacent and paralleling said apertures and providing grooves to receive the upper edges of the four side members when the container is in the said erected condition, and bolts hingedly connected to the marginal portions of the bottom member and each slidably connected with the adjacent side member, and coincident with said apertures in the top member when the latter is positioned with the grooves therein engaged with the upper edges of the side members in their erected position.

4. A collapsible rectangular container comprising a bottom member, a pair of opposite side members hingedly connected to the bottom member by conventional hinges for swinging movement about lines adjacent to and paralleling peripheral edges of the bottom member, another pair of opposite side members hingedly connected to said bottom member by flexible hinges for swinging movement about lines adjacent to and paralleling peripheral edges of said bottom member, said bottom member having grooves in its top face adjacent and paralleling its peripheral edges, said grooves receiving the adjacent bottom edges of the side members when the container is in an erected condition, one pair of opposite side members having marginal strips adjacent and paralleling their vertical edges providing grooves receiving the respectively adjacent vertical edges of the other pair of opposite side members, a top member having marginally disposed apertures therethrough extending in a direction perpendicular to said top member, marginal strips adjacent and paralleling said apertures and providing grooves to receive the upper edges of the four side members when the container is in the said erected condition, bolts hingedly connected to the marginal portions of the bottom member and each slidably connected with the adjacent side member and coincident with and extendable into certain of the apertures in the top member, when the latter is positioned with the grooves therein engaged with the upper edges of the said members in their erected position and shorter bolts rigidly mounted in the marginal portions of the bottom member coincident with and extendable into others of the apertures in the top member in the collapsible position of said members.

5. A collapsible rectangular container comprising a bottom member, a pair of opposite side members hingedly connected to the bottom member by conventional hinges for swinging movement about lines adjacent to and paralleling peripheral edges of the bottom member, another pair of opposite side members hingedly connected to said bottom member by flexible hinges for swinging movement about lines adjacent to and paralleling peripheral edges of said bottom member, said bottom member having grooves in its top face adjacent and paralleling its peripheral edges, said grooves receiving the adjacent bottom edges of the side members when the container is in an erected condition, one pair of opposite side members having marginal strips adjacent and paralleling their vertical edges providing grooves receiving the respectively adjacent vertical edges of the other pair of opposite side members, a top member having marginally disposed apertures therethrough extending in a direction perpendicular to said top member, marginal strips adjacent and paralleling said apertures and providing grooves to receive the upper edges of the four side members when the container is in the said erected condition, bolts hingedly connected to the marginal portions of the bottom member and each slidably connected with the adjacent side member and coincident with and extendable into certain of the apertures in the top member when the latter is positioned with the grooves therein engaged with the upper edges of the side members in their erected position, shorter bolts rigidly mounted in the marginal portions of the bottom member coincident with and extendable into others of the apertures in the top member in the collapsible position of said members, and spacing collars on said shorter bolts.

6. A collapsible rectangular container comprising a bottom member, a pair of opposite side members hingedly connected to the bottom member by conventional hinges for swinging movement about lines adjacent to and paralleling peripheral edges of the bottom member, another pair of opposite side members hingedly connected to said bottom member by flexible hinges for swinging movement about lines adjacent to and paral-

leling peripheral edges of said bottom member, said bottom member having grooves in its top face adjacent and paralleling its peripheral edges, said grooves receiving the adjacent bottom edges of the side members when the container is in an erected condition, one pair of opposite side members having marginal strips adjacent and paralleling their vertical edges providing grooves receiving the respectively adjacent vertical edges of the other pair of opposite side members, a top member having marginally disposed apertures therethrough extending in a direction perpendicular to said top member, marginal strips adjacent and paralleling said apertures and providing grooves to receive the upper edges of the four side members when the container is in the said erected condition, bolts hingedly connected to the marginal portions of the bottom member and each slidably connected with the adjacent side member and coincident with and extendable into apertures in the marginal portions of the top member when the latter is positioned with the grooves therein engaged with the upper edges of the side members in their erected position, and a frame having an upstanding peripheral flange around all lateral edges of the top member and the bottom member.

7. A collapsible rectangular container comprising a bottom member, a pair of opposite side members hingedly connected to the bottom member by conventional hinges for swinging movement about lines adjacent to and paralleling peripheral edges of the bottom member, another pair of opposite side members hingedly connected to said bottom member by flexible hinges for swinging movement about lines adjacent to and paralleling peripheral edges of said bottom member, said bottom member having grooves in its top face adjacent and paralleling its peripheral edges, said grooves receiving

the adjacent bottom edges of the side members when the container is in an erected condition, one pair of opposite side members having marginal strips, adjacent and paralleling their vertical edges providing grooves receiving the respectively adjacent vertical edges of the other pair of opposite side members, a top member having marginally disposed apertures therethrough extending in a direction perpendicular to said top member, marginal strips adjacent and paralleling said apertures and providing grooves to receive the upper edges of the four side members when the container is in the said erected condition, bolts hingedly connected to the marginal portions of the bottom member and each slidably connected with the adjacent side member and coincident with and extendable into apertures in the marginal portions of the top member when the latter is positioned with the grooves therein engaged with the upper edges of the side members in their erected position, frames having an upstanding peripheral flange around all lateral edges of both the top and bottom members, means on the flange of one of said frames to engage the flange of the other of said frame in the collapsible position of said members, and locking means for detachably securing said frames together.

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