Jan. 26, 1965 J. B. KRUGER ETAL 3,167,207

PLASTIC CONTAINER WITH FLEXIBLE HINGE

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FIG. 1

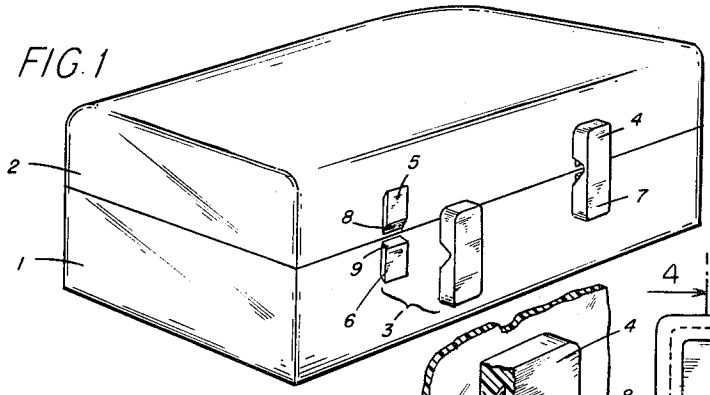
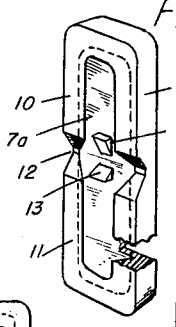


FIG. 2



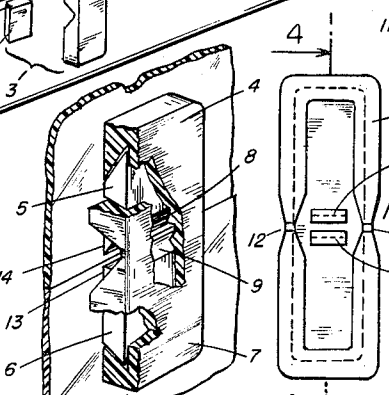


FIG. 3

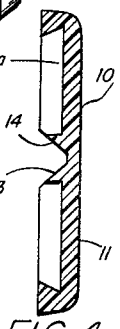


FIG. 4

FIG. 5

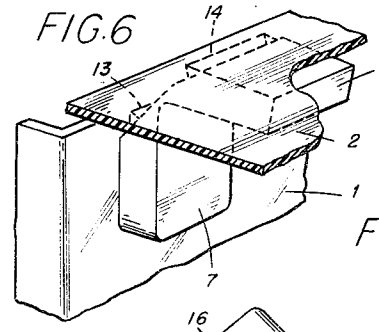


FIG. 6

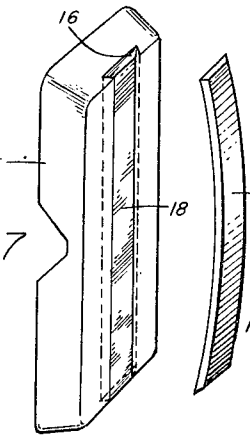


FIG. 7

FIG. 8

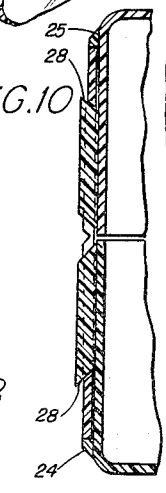


FIG. 10

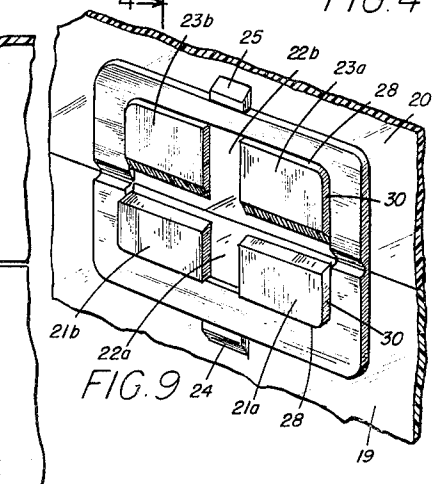


FIG. 9

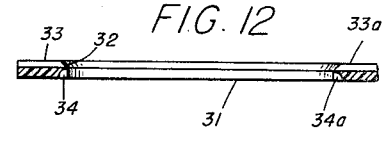


FIG. 12

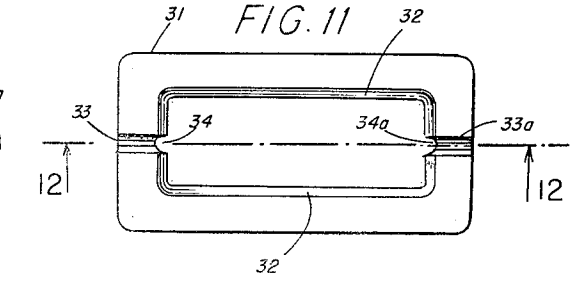


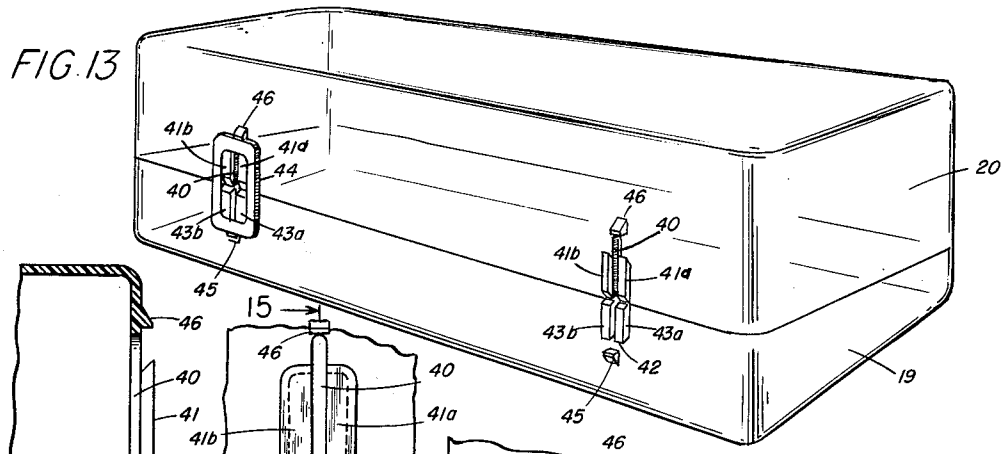
FIG. 11

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FIG. 13



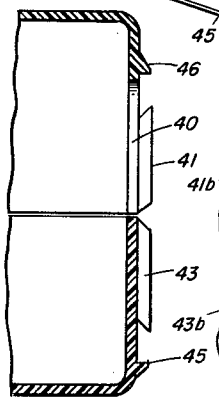


FIG. 15

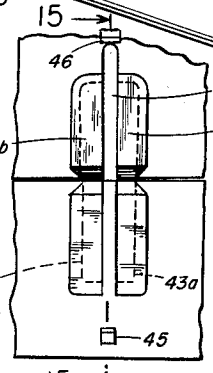


FIG. 14

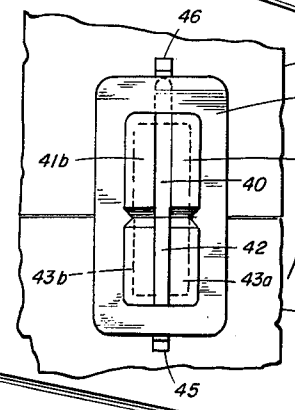


FIG. 16

FIG. 17

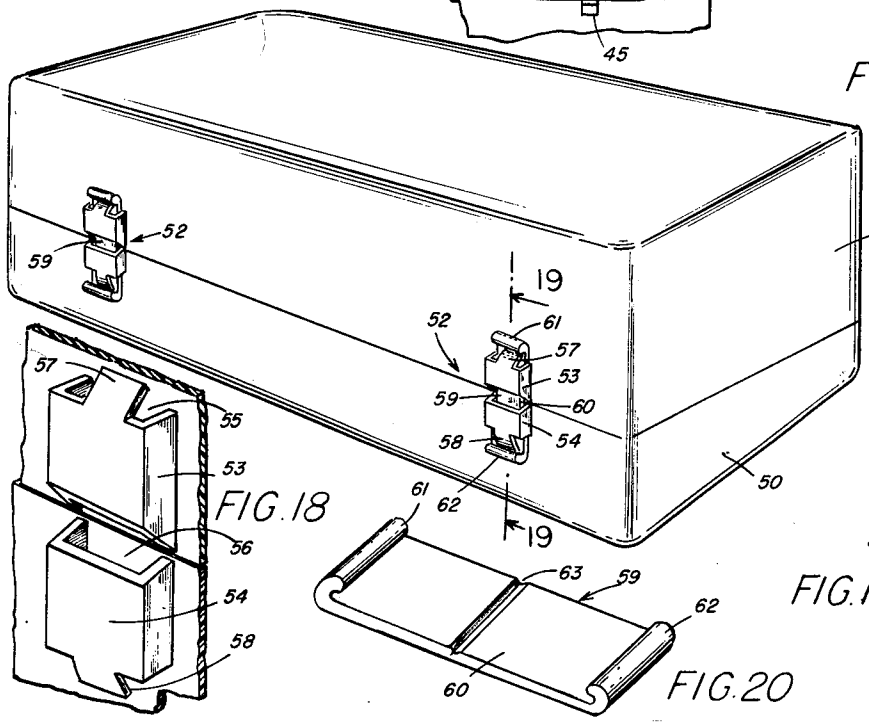


FIG. 18

FIG. 20

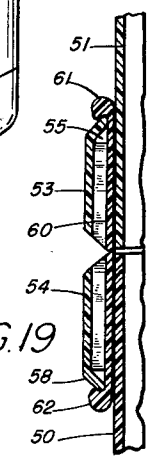


FIG. 19

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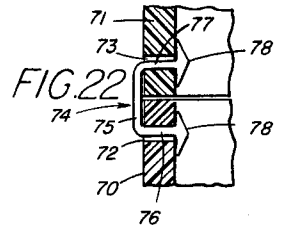


FIG. 22

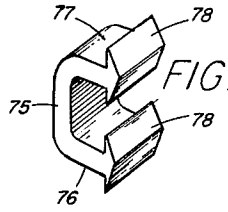


FIG. 23

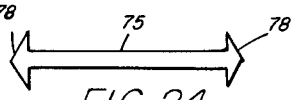


FIG. 24

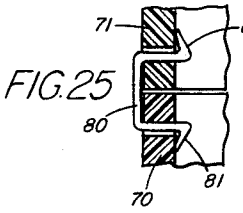


FIG. 25

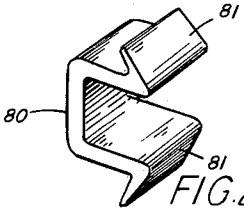


FIG. 26

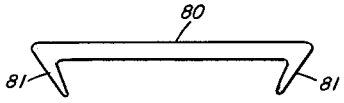


FIG. 27

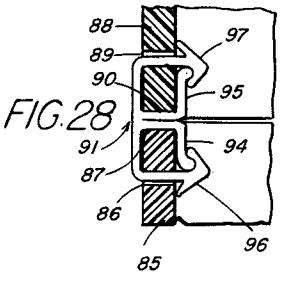


FIG. 28

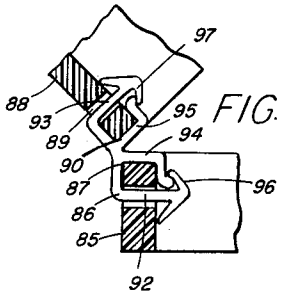


FIG. 29

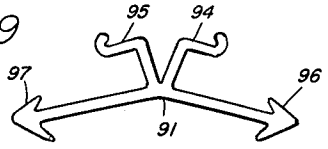
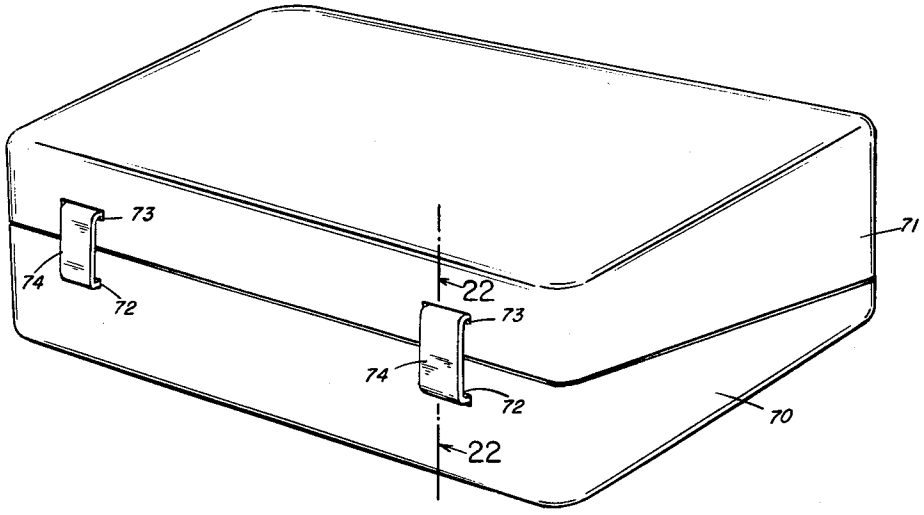


FIG. 30

FIG. 21



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3,167,207

PLASTIC CONTAINER WITH FLEXIBLE HINGE

James B. Kruger and Paul A. Braginetz, Staunton, Va., assignors to Philip Morris Incorporated, New York, N.Y., a corporation of Virginia

Filed May 23, 1962, Ser. No. 196,953
5 Claims. (Cl. 220—31)

This invention relates to a plastic container having a base section connected to a cover section by means of an improved hinge assembly. More particularly, the present invention relates to an easily assembled plastic container comprising a base section and a cover section connected together by means of a separate flexible hinge.

A need has existed in the art for an inexpensive, readily assembled plastic container and a great variety of constructions have been employed or suggested. In some cases the hinge arrangements have been relatively complex. Many require auxiliary fastening means such as glue, screws, bolts or the like. Some have embodied relatively rigid hinge assemblies which were easily snapped off or otherwise broken. Difficulties have been encountered in providing a suitable but simple hinge means particularly where it is desired that one or both of the sections comprising the base and cover be made of transparent material. It has heretofore been proposed to cast the hinge as an integral part of the container but this encounters the disadvantage, in many cases at least, that any one material may not be compatible or suitable for the different properties required or desired for the sections of the main container and the hinge means respectively.

It is a primary object of the present invention to provide a readily assembled inexpensive container in which the parts or elements are especially adapted for their respective functions or properties. The base section and the cover section may each be made of a material which possesses the desired properties such as rigidity, transparency or opaqueness, or of a selected color. The hinge proper, however, may be selected for other properties such as flexibility, long life under repeated flexing, and ease of manufacture.

It is a further object of the present invention to provide an improved hinge assembly for connecting the cover section of a container to the base section of a container which is of simple construction and which is easily assembled without the use of auxiliary fastening devices.

It is a further object of the present invention to provide a plastic container and hinge assembly which are of attractive appearance and which possess good wearing qualities, whereby the hinge can be repeatedly flexed for long periods of time.

Other and more specific objects and advantages of the present invention will be apparent from the detailed description which follows, when taken in connection with the accompanying drawing. The drawing illustrates, by way of example, certain preferred embodiments of the invention. It should be understood, however, that the drawing is solely for the purposes of illustration and it is not intended to restrict the invention to the particular embodiments shown.

In the drawing:

FIG. 1 is a perspective view of a container in accordance with this invention showing a tray or base section, a cover section and hinge assemblies, one of which is shown disassembled.

FIG. 2 is a partially cut away, enlarged, perspective view of the hinge portion of a hinge assembly shown in FIG. 1.

FIG. 3 is an elevational view of the inner face of the hinge of FIG. 2.

FIG. 4 is a sectional side view of the hinge of FIG. 3 taken on the plane 4—4 thereof.

FIG. 5 shows a section of the container and hinge assembly of FIG. 1, with the hinge assembly partially cut away to reveal the position of the parts when the base and cover are in closed position.

FIG. 6 is a partial view of the container of FIG. 1, showing the hinge assembly and portions of the base and cover, when the base and cover are in an open position.

FIG. 7 is a perspective view of a modification of a hinge in which a biasing member has been incorporated.

FIG. 8 is a perspective view of the biasing member of FIG. 7.

FIG. 9 is a perspective view of another container in accordance with this invention, showing a base section, a cover section and hinge assemblies.

FIG. 10 is a partial sectional view of the container of FIG. 9, showing the cross-section of the base and cover portions of the container and of a hinge assembly.

FIG. 11 is an elevational view of the outer base of the hinge shown in FIG. 10.

FIG. 12 is a horizontal sectional view of the hinge of FIG. 11 taken on the plane 12—12 of FIG. 11.

FIG. 13 is a perspective view of another container in accordance with this invention, showing a base section, a cover section and hinge assemblies, one of which has had the hinge removed to reveal the inner construction.

FIG. 14 is a partial elevational view of the container of FIG. 13, with the hinge removed, showing the hinge engaging elements.

FIG. 15 is a partial elevational view of the container of FIG. 13, showing the hinge assembly with the hinge in place.

FIG. 16 is a partial elevational sectional view of the container of FIG. 14 along the plane 16—16, showing the cross-section of the front portions of the base and cover and the anchoring lug portions of the hinge assembly.

FIG. 17 is a perspective view of another container in accordance with this invention, showing a base section, a cover section and hinge assemblies.

FIG. 18 is a perspective view of a portion of the container of FIG. 17 showing the loop portions of the hinge assembly.

FIG. 19 is an elevational cross-sectional view of a portion of the container of FIG. 17 taken on the plane 19—19 of FIG. 17.

FIG. 20 is a perspective view of the hinge portion of the hinge assembly shown in FIG. 17.

FIG. 21 is a perspective view of another form of the invention, showing a base section, a cover section and hinges anchored into slots in both the box and cover sections of the container.

FIG. 22 is an elevational cross-sectional view of a portion of FIG. 21 taken on the plane 22—22 of FIG. 21.

FIG. 23 is a perspective view of the hinge shown in FIG. 21.

FIG. 24 is a cross-section of a hinge like that of FIG. 23 as originally cast.

FIG. 25 is a partial elevational cross-sectional view of a container of the type in FIG. 21, showing a modification of the hinge assembly.

FIG. 26 is a perspective view of the hinge shown in FIG. 25.

FIG. 27 is a cross-section of a hinge like that of FIG. 26 as originally cast.

FIG. 28 is an elevational cross-sectional view of a portion of a container of the type shown in FIG. 21, showing another modification of the hinge assembly.

FIG. 29 is an elevational view of the hinge shown in FIG. 28 with the cover partially opened.

FIG. 30 is a cross-section or end view of a hinge like that of FIG. 28 as originally cast.

Referring to the drawings in further detail, a novel container embodying the present invention is shown, either in whole or in part in FIGS. 1–6, inclusive, which container comprises a tray or base section, a cover section, and hinge assemblies, said hinge assemblies comprising anchoring means which are integral with the box, anchoring means which are integral with the cover and a plastic hinge comprising a flexible central section and integral terminal anchor members which are adapted to be inter-engaged and self-locking with the anchoring means of the base section and the cover section. The entire base section of the container, including the anchoring means which are integral therewith, can be constructed of any desired plastic material either opaque or transparent or semi-transparent. It can be a rigid or semi-rigid plastic material, such as polystyrene, cellulose nitrate derivatives, cellulose acetate, cellulose acetate butyrate, acrylate resins and the like. The cover section including the anchoring means may also be constructed of any one of various materials similarly to the base section. It is advantageous in many cases, particularly for display purposes, to make the cover section of transparent material and the base section of opaque material.

The separate hinge is composed of a suitable plastic material having good flexibility and tensile strength and possessing high resistance to fatigue failure, for example polyethylene, polypropylene, copolymers of ethylene and propylene, other polyolefin resins, such as 1-olefin polymers and copolymers and vinyl resins and the like. Since the hinge may be of a different material than either the cover or the box sections of the container, it can be made of a material having ideal properties with regard to tensile strength, flexibility and resistance to fatigue failure, without regard to its transparency. Thus, the problem which has long faced the art that materials having such desirable properties as hardness, smooth finish and transparency have not had desirable flexibility, tensile strength and fatigue resistance, is overcome by the present invention. Since the hinges are relatively small, the type of plastic of which they are made would not substantially affect the over-all appearance of the container. Plastic containers of the type contemplated by the present invention may be readily manufactured and assembled, since the components involve simple construction and since the hinges are easily anchored to the base and cover sections to produce the completed container.

The embodiment of the present invention shown in FIGS. 1 to 6 comprises a tray or base section **1**, a cover section **2**, and hinge assemblies **3** and **4**, hinge assembly **3** being shown disassembled in FIG. 1 to reveal anchoring lug **5** in the form of a boss having laterally projecting means on at least one side and forming an integral part of cover **2**, and anchoring lug **6** in the form of a boss having laterally projecting means on at least one side and forming an integral part of base **1**. Hinge **7** of the hinge assembly **5** is shown removed. Hinge assembly **4** which is shown assembled is generally similar to hinge **3** and includes similar anchoring lugs **5** and **6**. The anchoring lugs **5** and **6** in the particular embodiment of the invention shown in FIGS. 1 to 6 are constructed with an undercut on three sides to form a dovetail cross-section and with a beveled surface on the fourth side comprising the respective opposed ends **8** and **9**. These beveled surfaces facilitate the initial application and assembly of the hinge members **7** as will be noted below.

FIGS. 2, 3 and 4 show the hinge member **7** of the hinge assemblies **3** and **4**. Hinge **7** comprises an undercut frame portion **10** attached to undercut frame portion **11** by a central section of reduced cross-section produced by the V-grooves **12** defining the hinge line. Detents or tabs **13** and **14** are located on and extend outwardly from the inner surface **7***a* of the hinge member **7**. The undercut frame portions **10** and **11** are adapted to engage over and lock with anchoring lugs **5** and **6**.

In assembling the detents **13** and **14** are initially bent toward the hinge line and when the hinge is fully in position the detents flex up behind the corresponding edge **8** or **9**, and thereafter serve to prevent the cover or base section sliding inwardly off the hinge when the container is fully open. The functioning of tabs **13** and **14** can be more fully understood by referring to FIG. 6, which shows the cover of the box in open position.

The hinge members **7** being initially formed in the shape indicated in FIGS. 2, 3 and 4, and being composed of resilient plastic material, normally urge the cover to closed position. However, they may if desired be initially formed in a shape such as normally to bias the cover to open position, and releasable latch means provided to hold the cover closed.

In any case the resilient restoring force may be amplified by auxiliary means such as indicated in the modified form of hinge shown in FIGS. 7 and 8. In this form hinge **15** is provided with a dovetail groove **16** in its back surface **17** and biasing member **18**, having a complemental dovetail cross-section, extends the length of groove **16**. Biasing means **18** may be made of suitable semi-rigid, resilient, flexible material, for example a plastic material such as Delrin, or a metal such as spring steel. Groove **16** and biasing member **18** may have other cross-sections than the dovetail cross-section shown in FIGS. 7 and 8, so long as biasing member **18** is anchored firmly in the hinge part. FIG. 8 shows biasing means **18** of FIG. 7 in a normally bowed position which it would normally assume when unassembled. Accordingly, the cover is normally biased to closed position but as above indicated this effect may be reversed.

FIGS. 9 to 12 show another embodiment of the invention. The figures depict one hinge only and fragments of the container but it will be understood that normally there will be a pair of hinges. A container base is indicated at **19** and a cover part at **20**. The hinge means includes a lug formation integral with the base which preferably is divided into two portions **21***a* and **21***b* by a channel **22***a*. The cover similarly has a lug formation integral therewith divided into two portions **23***a* and **23***b* by an intervening channel **22***b* which coincides with the channel **22***a*. The channels **22***a* and **22***b* enable the addition of auxiliary stop lugs **24** and **25** to be formed on the base **19** and cover **20** respectively and still produce the base and cover by convenient molding technique. The lug parts **21***a*, **21***b*, **23***a* and **23***b* are beveled on their edges adjacent the hinge line as indicated at **26** and **27** and the lug parts are undercut at their edges opposite the hinge line as indicated at **28** and at their outer edges as indicated at **30** to provide a dovetail as in the case of the form of FIGS. 1 to 6. The hinge member **31** shown separately in plan view in FIG. 11 and in cross-sectional view in FIG. 12, is in the form of a flat rectangular frame, the inner edges around the central opening being beveled as shown at **32** to fit the undercut edges of the lugs on the cover and base. V-notches **33** and **33***a* provide a reduced thickness determining the hinge line. Also cut-out notches **34** and **34***a* still further reduce the material at the hinge line and serve the additional function of facilitating the assembly of the hinge on the container parts.

It may be noted that the notches **34** and **34***a* provide a span across the inner opening of the hinge equal to the widest dimension of the lugs **21***a*, **21***b* and **22***a*, **22***b* and in assembling the hinge it is first slid over the lugs on one of the container parts and then bent at the hinge line to an angle of at least 90° and slid over the lugs on the other container part. The auxiliary lugs **24** and **25** each acts as a stop against the outer edge of the hinge **31** and ensures against the hinge backing off from the main lugs if the cover should be opened to an extreme angle. The auxiliary lugs **24** and **25** require some additional distortion of the hinge member **31** in assembling but because of its flexibility and thin cross-section that can be readily accomplished.

A modification of the form of FIGS. 9 to 12 is shown in FIGS. 13 to 16. In FIG. 13 the hinge is omitted at the right and in FIGS. 14 and 15 to show that a slot 40 is provided which extends through the wall of the cover 20 and through the lug 41, which is thereby divided in two parts 41*a* and 41*b*; and that a slot 42 extends through the lug on the base dividing the lug into two parts 43*a* and 43*b*. The remainder of the container is like that illustrated in FIGS. 9 and 10. The hinge 44 is generally of a rectangular frame in shape similar to the hinge 31 of the preceding form. In assembling the hinge to the container parts the lower half is first applied over the lugs 43*a* and 43*b* and squeezed behind the stop lug 45 and then by compressing together the upper lug parts 41*a* and 41*b* the hinge is snapped thereover and behind the stop lug 46 the portions 41*a* and 41*b* thereafter returning to their former position to anchor hinge 44 in place. The hinge 42 may be provided with reduced areas at the hinge line similar to that produced by the V-notches in the hinge 31.

FIGS. 17 to 21 show still another embodiment of the invention. In FIG. 17 the container comprises a base part 50 and cover part 51, both of which may be constructed of rigid transparent plastic material, and hinge assemblies 52. The hinge assemblies each comprises anchoring loops 53 which are integral with cover part 51 and anchoring loops 54 which are integral with the base 50 and which form, respectively, channels 55 and 56. Anchoring loops 53 and 54 are provided with flexible inclined detents or tabs 57 and 58 respectively. Hinge 59 comprises a strap section 60 and integral end head portions 61 and 62. In applying the hinge 59 it is threaded through the loops 53 and 54 by flexing the tabs 57 and 58 which then spring back into locking position behind the respective heads 61 and 62. Preferably the strap portion 60 of the hinge is provided with a transverse groove 63 defining a hinge line of reduced thickness.

The forms of containers and hinges thus far described result in containers having walls which are substantially free of openings and capable of holding materials such as powders. Where the matter of holes through the walls is not important other forms may be employed, and FIGS. 21 to 25 show an embodiment of the invention whereby the hinges are connected to both the base and cover parts of the container by means of anchoring means extending through openings in the walls of the container parts. In this embodiment, FIGS. 21 and 22 show a container with a base portion 70 and a cover portion 71 having anchoring slots 72 and 73 respectively, positioned in adjacent relationship to each other whereby hinge 74, having strap portion 75 and anchoring head portions 76 and 77 can be inserted through the respective slots and be anchored in place by means of barbs 78. The hinges just described may be formed advantageously and economically in a long strip of which a cross-section is shown in FIG. 24 and then cut into individual hinge sections. In this form the container is normally biased to open position.

FIGS. 25 to 27 show a modification and the hinge member 80 has a single barb 81 at each end in place of the double barbs which are shown in FIGS. 22 to 24.

FIGS. 28 to 30 show still another embodiment of the present invention. As appears in FIGS. 28 and 29 the container base section 85 is provided with a closed slot 86 and an open notch 87 at each hinge, and cover section 88 is similarly provided with a closed slot 89 and an open notch 90 at each hinge. Hinge 91 has straps 92 and 93 extending through slots 86 and 89, and auxiliary straps 94 and 95 extend through notches 87 and 90 respectively and have ends which engage under a barb or hook 96 and 97 of the respective arms 92 and 93.

Although more complicated in shape the hinges 91 nevertheless may be initially cast in long strip form having a cross-section such as that shown in FIG. 30.

It will be apparent from the preceding description in connection with the drawings, that the present invention encompasses a plastic container which is particularly well adapted to employ rigid plastic base sections and cover sections and that each may be of a material appropriate to the desired characteristics and different from the hinge material. The containers of the present invention can be fitted with suitable means for keeping them in a closed position. However, since these means do not form any part of the present invention, they have, for simplicity, not been shown in any of the drawings.

The hinge may be made of a material which possesses the most desirable combination of flexibility, long life and tensile strength, without regard to its transparency, thus overcoming the disadvantages of integral hinges which would sacrifice one or more of these properties for transparency or which would sacrifice transparency in the component in the top or bottom of the box of which they are an integral part in order to obtain flexibility and strength. The arrangement of the present invention also eliminates the necessity for attaching means, such as adhesives, nails, screws and the like and provides containers which are assembled in an extremely simple manner.

It is to be understood that further modifications and variations of the present invention are possible without departing from the scope of the invention.

We claim:

1. A container having a base section and a cover section and hinge means therefor comprising a separate hinge section of flexible plastic material of high resistance to fatigue failure under repeated flexing, said base section and said cover section being preformed with integral loops, each of said integral loops comprising a pair of substantially parallel side walls and a connecting wall, the lower edges of a first pair of said side walls abutting said base section and the opposite edges of said first pair of side walls abutting a first connecting wall to define a first passage which is substantially rectangular in cross-section, the lower edges of a second pair of said side walls abutting said cover section and the opposite edges of said second pair of side walls abutting a second connecting wall to define a second passage which is substantially rectangular in cross-section, said first passage and said second passage being substantially aligned, said hinge section comprising a strap portion and a plurality of complemental integral enlarged heads, one of which is adapted to be interengaged and self-locking with the loop of said base section and another of which is adapted to be interengaged and self-locking with the loop of said cover section without the aid of auxiliary fastening means, whereby said base section and said cover section are connected together by said hinge section.

2. A container having a base section and a cover section and hinge means therefor comprising a separate hinge section of flexible plastic material of high resistance to fatigue failure under repeated flexing, said base section and said cover section being preformed with integral loops, each of said integral loops comprising a pair of substantially parallel side walls, a connecting wall and a flexible, inclined detent attached to said connecting wall, the lower edges of a first pair of said side walls abutting said base section and the opposite edges of said first pair of side walls abutting a first connecting wall to define a first passage which is substantially rectangular in cross-section and which has two openings, one of said openings being remote from said cover section, a first detent extending in front of the opening in said first passage which is remote from said cover section, the lower edges of a second pair of said side walls abutting said cover section and the opposite edges of said second pair of side walls abutting a second connecting wall to define a second passage which is substantially rectangular in cross-section and which has two openings, one of said openings being remote from said base section, a second detent extending in front of the opening in said second passage which is remote from said base section, said first passage and said

second passage being substantially aligned, said hinge section comprising a strap portion and a plurality of complemental integral enlarged heads, one of which is adapted to be interengaged and self-locking with the loop of said base section and another of which is adapted to be interengaged and self-locking with the loop of said cover section without the aid of auxiliary fastening means, whereby said base section and said cover section are connected together by said hinge section.

3. A container having a base section and a cover section and hinge means therefor comprising a separate hinge section of flexible plastic material of high resistance to fatigue failure under repeated flexing, said base section and said cover section being preformed with integral anchoring lugs, each of said anchoring lugs being in the form of a boss having four sides, three of which are undercut and the fourth of which has a beveled surface, said anchoring lugs being so positioned on said base section and said cover section that the beveled surface of one anchoring lug is separated from but opposed to the beveled surface of the other anchoring lug whereby the assembly of said hinge means is facilitated, said hinge section comprising a frame having four sides, said frame being adapted to be interengaged and self-locking with the anchoring lugs of said base and cover sections without the aid of auxiliary fastening means, whereby said base section and cover section are connected together by said hinge section.

4. A container having a base section and a cover section and a hinge means therefor comprising a separate hinge section of flexible plastic material of high resistance to fatigue failure under repeated flexing, said base section and said cover section being preformed with integral anchoring lugs, each of said anchoring lugs being in the form of a boss having four sides, three of which are undercut and the fourth of which has a beveled surface, said anchoring lugs being so positioned on said base section and said cover section that the beveled surface of one anchoring lug is separated from but opposed to the beveled surface of the other anchoring lug whereby the assembly of said hinge means is facilitated, said hinge section comprising a frame having four sides, each of which is undercut, said frame being adapted to be interengaged and self-locking with the anchoring lugs of said base and cover sections without the aid of auxiliary fastening means, whereby said base section and cover section are connected together by said hinge section.

5. A container having a base section and a cover section and hinge means therefor comprising a separate hinge section of flexible plastic material of high resistance to fatigue failure under repeated flexing, said base section and said cover section being preformed with integral anchoring lugs, each of said anchoring lugs being in the form of a boss having four sides, three of which are undercut and the fourth of which has a beveled surface, said anchoring lugs being so positioned on said base section and said cover section that the beveled surface of one anchoring lug is separated from but opposed to the beveled surface of the other anchoring lug whereby the assembly of said hinge means is facilitated, said hinge section comprising a frame having four sides, each of which is undercut, and a back, said frame being adapted to be interengaged and self-locking with the anchoring lugs of said base and cover sections without the aid of auxiliary fastening means, whereby said base section and said cover section are connected together by said hinge section and said anchoring lugs are substantially completely enclosed by the back and four sides of said frame.

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