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HINGED PLASTIC BOX

Filed Dec. 24, 1963

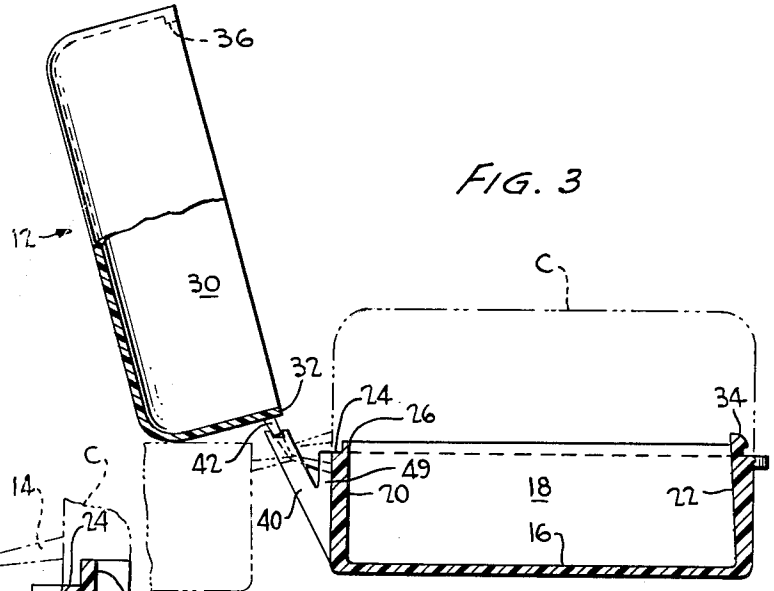


FIG. 3

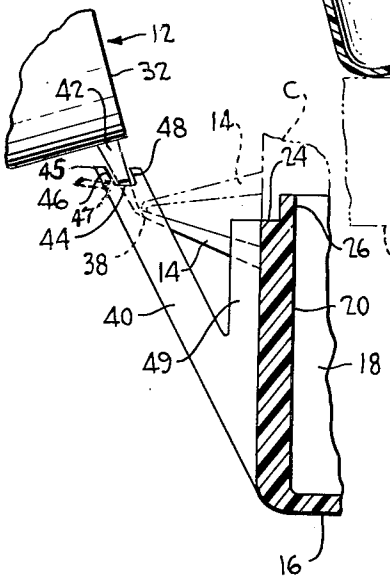


FIG. 4

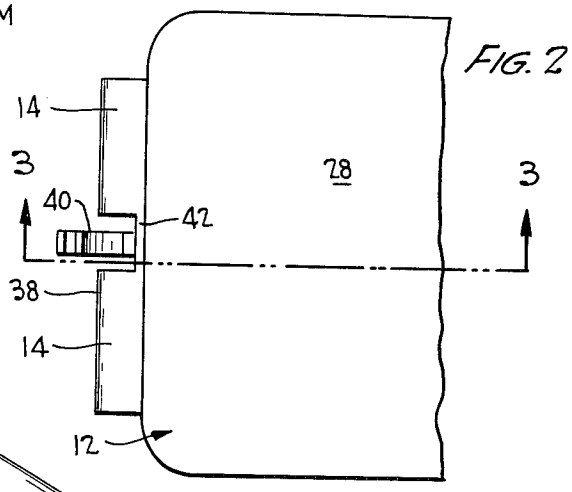


FIG. 2

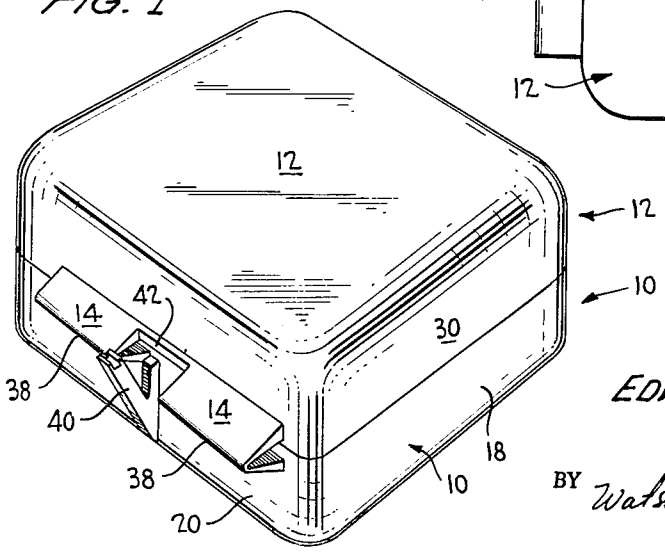


FIG. 1

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HINGED PLASTIC BOX

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This invention relates to improvements in hinged plastic box structures of the class in which the hingedly connected box members and their hinge straps are molded of a flexible plastic material as integral parts of a unitary box structure.

More particularly the invention relates to the provision in such box of positioning means for retaining the box lid in an open display position.

In the production of such boxes it has been customary to mold the box body and lid in relatively open or swung apart positions in which they are interconnected by hinge straps. Thereafter, following removal of a box from the mold, in order to close the lid on the box body it has been necessary to swing the lid from its initial molded position into vertically registering and closing relation with the box body.

Such boxes are often used for jewelry and small articles in connection with the sale of which it is desirable to maintain the box lid opened to approximately a vertical position to permit inspection of the box contents by potential purchasers.

Boxes of the class here involved have been somewhat unsatisfactory for such displays due to the tendency of the plastic hinge strap either to return the box lid to the position in which it was originally molded, or in response to increase in ambient temperature to permit closing movement of the lid.

It is accordingly a primary object of the invention to provide such a box with positioning means formed integrally with the rest of the box structure as a homogeneous portion thereof for limiting the opening movement of the lid beyond a desired display position.

It is a further object to provide such a positioning means which is capable of retaining the lid in a predetermined open display position in which further opening movement is positively resisted and closing movement is yieldably resisted.

It is a still further object to provide such a positioning means which will permit movement of the box lid and the body member from their initially molded open positions to positions in vertically registering closed relation without damage to said positioning means or other portions of the box structure, and which thereafter will positively resist the opening of the lid beyond a predetermined angular position with respect to the box body.

Also it is an object to provide such a positioning means in which one of the stop faces or surfaces is that of a free-ended lug or projecting portion of the stop element arranged to yield and flex rearwardly responsive to the exertion of an excessive amount of opening force and the lid, and in so flexing to yield about a fold line which thereafter acts as a permanent hinge yieldably connecting the lug to the stop, with the lug projecting into the path of movement of the detent on the lid to thereafter serve as a yielding abutment for yielding engagement with the detent.

In order to achieve the foregoing objects, the positioning means of the invention comprises a stop element molded as an integral portion of the box structure and carried by one of the box members, said stop element having a free end projecting across the axis defined by the hinges or hinge straps interconnecting said members and into the path of angular movement about said axis of a detent carried by the other member and projecting radially toward such axis. At least one of these elements is sufficiently resiliently flexible and yieldable, and the elements are relatively so shaped, as to freely deflect and override each other without damage as the members are initially moved angularly from their original molded positions into closed relationship.

To positively resist subsequent opening of the box lid beyond the desired display position, the stop element is provided with an abutment or stop face extending generally transversely across the path of angular opening movement of the lid for abutting engagement with the said detent, the detent presenting a similarly disposed cooperating face or surface.

For retaining the lid in its predetermined display position as above mentioned, the stop element may be formed with a notch adapted for reception of said detent with one sidewall of the notch defining the stop face for positively resisting further opening movement of the lid, the other sidewall of the notch being disposed and proportioned to yieldably resist closing movement of the lid by engagement with said detent.

The foregoing as well as other incidental objects and advantages are attained by the structure illustrated by way of example only in the accompanying drawings, in which:

FIGURE 1 is a perspective view of a box to which the invention is applied;

FIGURE 2 is a fragmentary plan view of the hinged end of the box;

FIGURE 3 is a vertical section on the line 3—3 of FIGURE 2, in which the lid is shown in full lines in its display position, and is shown in broken lines, both in its fully opened position as when initially taken from the mold, and in its closed position; and

FIGURE 4 is an enlarged fragmentary view of the interconnected hinged portions of the box body and lid, showing the lid in full lines in its display position and in broken lines in its closed position.

Referring now in detail to the accompanying drawings, the invention is shown as applied to a generally conventional molded plastic box structure comprising a box body member **10** and cooperating box cover or lid member **12** connected to the body member by hinges in the form of the plastic hinge straps generally designated **14**. All of said parts as well as the further parts hereinafter described are integrally interconnected to form a unitary structure adapted to be molded of a suitable resiliently flexible plastic material, for which purpose a polypropylene plastic has been found admirably adapted due to its resistance to fatigue under flexing.

The body member **10** of the box may be of a conventional configuration including a rectangular flat bottom **16** surrounded by marginal upstanding sidewalls **18—18** and end walls **20** and **22** respectively. These walls are interconnected and formed to provide a continuous upwardly presented shoulder **24**, at the inner periphery of which is preferably located a continuous upwardly projecting positioning flange **26** for reception within the cover or lid **12** in usual manner as same is seated upon the shoulder **24** to close the box.

The lid or cover **12** of the structure is of generally similar configuration to the body **10**, including a generally horizontal panel **28** surrounded by the generally vertical continuous marginal wall structure **30**, having a coplanar upper edge or lip **32** adapted to encircle the upstanding flange **26** and to seat upon the abutting surface **24** of the box body in the closed condition of the box. In the drawings the box body is shown as provided with integral snap catch means exemplified by the upwardly projecting catch or hook **34** formed integrally with the end **22** of the box body for cooperation with the inwardly projecting lip

or tab **36** carried adjacent the lower edge of the corresponding wall portion of the cover or lid.

In order to best adapt the hinges **14—14** for use with the present invention there are two such relatively spaced hinges or hinge straps **14**, each integrally connected at its opposite ends to the respective box members **10** and **12**. These hinges define a common axis **38** of relative angular movement between the box members **10** and **12** in the plane of the relatively abutting upper wall edges or shoulders **24** and **32** of the respective members. The axis **38** is located midway between said members in the position in which they are initially formed or molded, wherein said members and hinges are relatively aligned with each other in a common plane. The two relatively foldable halves or portions of each hinge member **14** are integrally connected to each other along a fold line **38** which defines the axis above mentioned. It will be seen that each section of each hing **14** is of maximum thickness at its juncture with its associated box member, and then progressively decreases to a minimum thickness at the fold line **38** in accordance with known practice.

It has been common practice to form such a box structure by molding same as a unitary device in which the parts are formed or molded with the lid **12** opened. For instance it may be opened fully to a position at 180° to and in a common plane with the body **10**, such position of the lid being indicated at M in FIGURE 3, though it may, as initially molded, be in other angular positions with relation to the box body, as will be apparent.

The improvement of the present invention consists in the combining with such a box structure of positioning elements **40** and **42** which are also formed or molded of the same material as and constitute integral portions of the unitary box structure.

For the purpose of insuring accurate coaction between these elements incident to their relative angular movement about the axis **38**, it is desirable, though not essential, to locate them in the space between the two hinges **14—14**, as in the illustrated embodiment. However, such elements will normally cooperate satisfactorily so long as they are located in reasonable proximity to the hinge structure which defines their axis of relative angular movement.

The positioning element **40** which is sometimes hereinafter referred to as the stop element, is in the form of a free ended tab or finger having its base integrally affixed to the box body member **10** medially of the end wall **20** thereof. This stop element or finger **40** projects across the axis **38** so that its free end is directed radially away from the axis on the opposite side of said axis from the box body **10**, and is located in the path of angular movement of the cooperating positioning element **42**, sometimes herein referred to as the detent element.

Detent element **42** is formed at a suitable location on the box cover or lid **12** as a radial inward projection having its free end or edge directed toward the axis **38**. Obviously the relative positions of the free ends of the said elements **40** and **42** will be so chosen as to cause their inter-engagement at the point where it is desired to arrest the opening swinging movement of the lid **12**. Normally this will be such that the inter-engagement will occur after the lid **12** has swung open through approximately 90° or slightly more, at which time the end edge of detent **42** will abut against the free end of stop **40**. As is shown best in FIGURE 4, the free end face of the stop **40** is formed with a radially opening retainer notch **44** for holding reception of the radially inner extremity of the detent **42**, one face or sidewall **46** of the notch being presented generally radially to the axis **38** and thus transversely to the opening angular movement of the lid, whereby to positively resist same. The other sidewall **48** of the notch is preferably of somewhat lesser height than the sidewall **46** so that the sidewall **48** will but yieldingly resist and avoid damage resulting from the return or closing movement of the lid as contrasted to the more positive action

of the sidewall or abutment **46** which preferably offers positive resistance to swinging of the lid. Obviously, however, the height and the angular disposition of the sidewall **48** relative to the path of angular movement of the detent element **42** may be varied as desired to achieve either a positive or a yielding opposition to such movement.

The finger or tab **40** which defines the stop preferably is tapered outwardly toward its free end and is of sufficiently small cross-section as to be stiffly flexible or yieldable in a direction transverse to its length. It will be noted that the stop **40** in the preferred embodiment has or includes a reinforcing web **49** extending upwardly from its base but terminating at or below the level of the axis **38** and the shoulder **24** on which the lid seats, thus to avoid interference with the detent **42** when the lid **12** is closed on the box body **10**. The detent element **42** may be formed of sufficiently thin cross-section to permit slight flexing about its connection to the lid as said elements override each other.

In the operation of the invention, after the box is first formed and taken from the mold, the box members **10** and **12** will lie in the same plane and will be relatively spaced apart equidistantly on opposite sides of the axis **38** defined by their connecting hinge straps **14—14**. The position of the lid at this time is indicated by the broken line showing M in FIGURE 3. In order to assemble the lid **12** onto the box body **10**, the lid **12** is swung through an angle of 180° around the axis **38** to the position illustrated by the broken line showing C in FIGURES 3 and 4. During this movement, the detent **42** will engage and ride over the free end of the stop **40** with resulting resilient radial deflection of one or both members or elements **40** and **42** in such manner that they pass over each other without damage to either.

At the end of this angular movement, the lid **12** will have been seated upon the box body **10** with the flange **26** received within the lid walls **30**, and the lip or flange **36** of the lid will have snapped into operative position beneath the catch **34** carried by the body, to thus retain the parts in their closed relationship all as indicated in the broken line position C of the lid in FIGURE 3. Release of the catch **34** when it is desired to open the box, may be caused in usual manner simply by pressing inwardly on the end wall **22** to deflect the catch **34** inwardly and disengage it from the flange **36**, whereupon a certain amount of opening movement will normally be automatically produced due to the elasticity of the hinges **14**.

Where it is desired to hold the lid open to approximately 90° in a display position, such as is shown in full lines in FIGURE 3, the lid will be swung open until the detent **42** is received in notch **44** with one radially presented face abutting against the generally radially presented sidewall or face **46**, following which the tendency of the hinges **14** to resume their initial rectilinear configuration will normally maintain such engagement. Obviously the disposition of the abutting face **46** of the stop will firmly oppose any tendency of the hinges **14** to urge the lid **12** further toward its fully opened or aligned position with the body **10**. At the same time the face or sidewall **48** of the notch will yieldingly oppose movement of the lid toward closed position.

In the event however that an excessive opening force is exerted on the top or lid **12** to move it and its detent element **42** beyond the stop face **46**, this will result in a yielding of the stud or projection **45** on which the face **46** is formed. In such event the stud will yield and be folded rearwardly as shown in broken lines in FIGURE 4 while nevertheless remaining integrally connected to the stop element **40** along a fold line **47** which will be created at the time incident to such yielding movement and which will thereafter constitute a permanent resilient hinge connection between the stud **45** and stop element **40**. This is due to the peculiar qualities of the resiliently flexible plastic material such as a polypropylene plastic from

which the box structure in its entirety is formed. After the initial creation of such a fold line or hinge 47, the stud 45 will still be operative to function as a yieldable means for resisting opening of the lid therepast and will of course permit movement of the lid therepast to closed position.

In this application I have shown and described only the preferred embodiment of the invention. However, I recognize that the invention is capable of still further embodiments and that its various details may be modified in obvious ways, all without departing from the invention as defined in the appended claims.

Having thus described my invention, I claim:

1. A hinged box structure having all of its hereinafter stated parts integrally interconnected and forming homogeneous portions of a unitary structure of resiliently flexible material, comprising a box body member, a box cover member, hinge means interconnecting said members for relative swinging movement into and from a closed position about an axis spaced equidistantly from the respective members and outside of said box structure, positioning elements fixedly carried by the respective members, one of said elements being positioned wholly on one side of said axis, and having a free end projecting toward but spaced from said axis to move in an arc therearound incident to relative swinging of said box members, the other said element projecting across the said axis and having a free end positioned to intersect the arcuate path of movement described by the free end of said one element at a suitable point in the relative swinging movement of said members, one of said elements being resiliently radially yieldable relative to said axis and of a length to permit free ends of said elements to override each other without damage incident to the exertion of a sufficient swinging force on said members.

2. A hinged box structure as defined in claim 1 in which one of said elements is formed with a radially opening retainer notch in its free end for holding reception of the radial extremity of the other said element to yieldably maintain the said box members in a predetermined position of relative angular adjustment about said axis.

3. The combination of claim 2 in which the said detent element is formed of sufficiently thin cross-section to permit flexing and radial outward displacement of its inner edge as said elements override each other.

4. A hinged box structure comprising a box body member and a box closure member, hinge means interconnecting said members for relative swinging movement through 180° into and from a closed registering position about an axis spaced equidistantly from the respective members, a detent element affixed to one of said members and having a free inwardly projecting end directed radially toward and spaced from said axis, and a stop element affixed to the other said member, said stop element having a free end on the remote side of said axis from said member to which it is affixed, said free end of the stop element being directed away from said axis and positioned in the arcuate path described by said detent element incident to relative swinging movement of said members, one of said free ends being formed with a retainer notch for reception of said free end, one of said elements having a resiliently radially yieldable free end portion for deflection away from said arcuate path incident to the exertion of a sufficient swinging force on said members.

5. A hinged box structure comprising a box body member and a closure member, relatively spaced hinges interconnecting said members for swinging movement through substantially 180° into and from registry with each other in the closed position of the structure and about an axis equidistantly spaced from the respective members, the combination with said box structure of a detent element affixed to one said member between said hinges and projecting radially therefrom with a free end directed inwardly toward said axis but spaced radially from said axis, and a stop element affixed to the other said member between said hinges, said stop element having a free end portion projecting into the arcuate path of movement of said free end portion of the detent element to arrest the arcuate movement of said stop element and its associated box member, said free end of the stop element being resiliently yieldable to a nonobstructing position to permit movement of the detent element therepast as the members are swung toward relatively closed position, said box members, hinges, detent and stop elements all being integral parts of a unitary structure of stiffly resilient plastic material.

6. A hinged box structure of the class in which all portions of said structure, including a box body member and a box cover member, hinges interconnecting said members, and the parts hereinafter enumerated are initially molded as an integral unitary structure of homogeneous resiliently flexible material throughout, with the body and cover members initially in relatively open spaced relation and integrally interconnected by said hinges, said hinges defining an axis midway between said members about which said members may be swung to a relatively closed and vertically registering position, a detent element affixed to said cover element and projecting radially toward said axis, and a stop element affixed to said body member and projecting across said axis, said stop element having a free end directed away from said axis and located in the path of swinging movement of said detent element, said stop element being formed of stiffly resiliently flexible material adapted for deflection of its free end out of the path of said detent element to permit forcing therepast of the detent element.

7. A hinged box structure as defined in claim 6 in which said stop element and said detent element are provided at their free ends with circumferentially opposed faces extending predominately radially to said axis for abutting engagement to positively limit the relative opening movement of said members.

8. A hinged box structure as defined in claim 7 in which said stop element is formed with a notch in its free end opening away from said axis for latching reception of the free end of said detent element.

9. A hinged box structure as defined in claim 6 in which said stop element is formed with a hinged lug at its free end projecting normally into the path of movement of said detent element to yieldingly resist opening movement of the lid.

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