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HINGE APPARATUS

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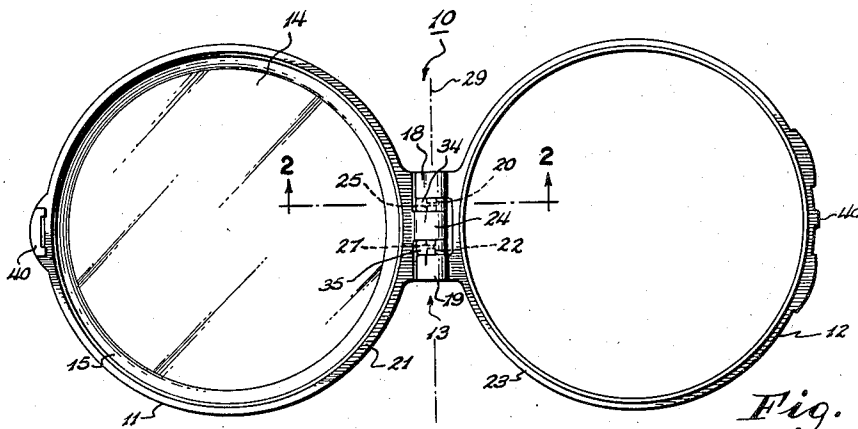


Fig. 1.

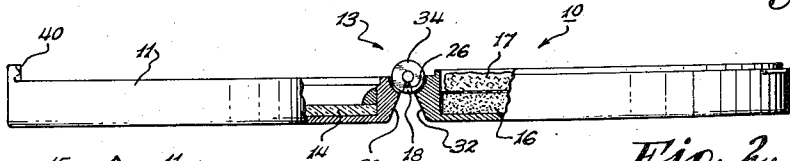


Fig. 2.

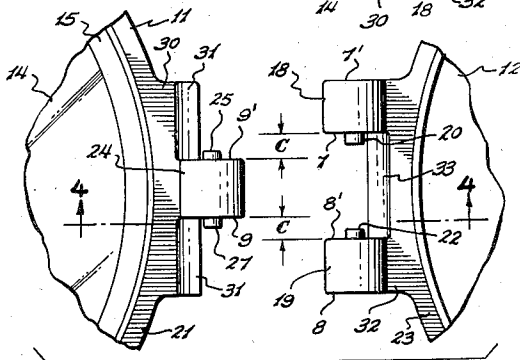


Fig. 3.

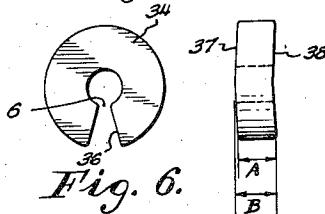


Fig. 6.

Fig. 7.

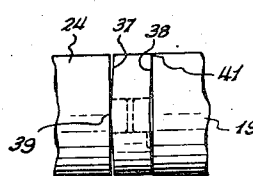


Fig. 8.

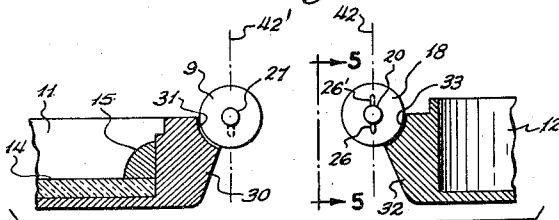


Fig. 4.

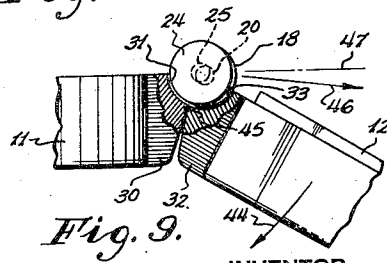


Fig. 9.

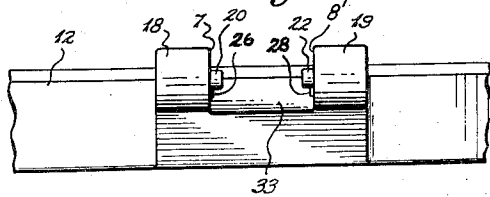


Fig. 5.

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HINGE APPARATUS

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8 Claims. (Cl. 16—128)

This invention relates to novel hinge apparatus, and in particular a novel hinge structure made of and adaptable for plastic articles.

The prior art hinge in one form or another consists of two plates having juxtaposed edges which approach each other to form the swinging joint. The joint, in turn, consists of cylindrical bearing collars which register in longitudinal alignment so that a bearing pin can be inserted into the inner aligned bores of the engaged collars to permit one body to turn with respect to the other. With the advance of the art of making articles of manufacture out of plastics instead of metal, it has become the practice to make as much of the article, and if possible the whole article including its hinges, if any, out of plastic. The plastic hinge structure used heretofore is still the familiar prior art design above described.

It has become increasingly evident that the prior art hinge structure in plastic form is both troublesome and relatively expensive to manufacture. Since economy of manufacture has been the principal reason for the conversion of articles of manufacture from metal to plastics, the economical advantages of using plastics is partially offset by the difficulties besetting the hinge structure used to date. This prior art hinge when made in plastic requires the use of an expensive mold to form the hinge structure with a degree of precision to ensure that the cylindrical collars fall into alignment so that they can be drilled. Secondly, the drilling operation in order to make the inner aligned bores requires a drilling fixture and careful drilling to prevent the drill from drifting off center and breaking through or splitting the hinge collars. Since plastic articles are now made in one piece and include the hinge, splitting or breaking through the hinge collars destroys the whole article. In spite of the manufacturing precautions observed, many pieces of plastic articles must be discarded in manufacture solely because the hinge collar is split or cracked during the drilling operation. This is known as shrinkage in the art.

It is therefore a principal object of the instant invention to provide a novel hinge structure which does not require an inner bearing bore and therefore eliminates entirely the drilling operation common to the manufacture of the prior art hinge.

It is a main object of the instant invention to provide a novel hinge design in which the entire cylindrical sleeve or collar of the hinge structure may be molded or otherwise made as part of a one piece article, which is simple to assemble and which avoids the troublesome features of prior art plastic hinges and appreciably improves the economy of manufacture of hinge structure.

It is another object of the instant invention to provide a hinge design of plastic manufacture such that manufacturing shrinkage caused by the splitting of the bearing collars is substantially eliminated.

It is another object of the instant invention to provide a hinge structure of increased strength by virtue of having the bearing collars thereof of solid material.

It is another object of the instant invention to provide

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a hinge structure having solid cylindrical bearing collars which are outfitted with juxtaposed and aligned end protrusions about which split resilient washers are engaged.

It is another object of the instant invention to provide a plastic hinge structure having solid cylindrical bearing collars outfitted at their adjacent ends with protrusions and having split resilient washers of plastic material adapted to engage the juxtaposed protrusions of adjacent collars to hold same in alignment.

It is a further object of the instant invention to provide a plastic hinge structure having solid cylindrical bearing collars outfitted at their adjacent ends with protrusions with certain of the protrusions having holding keys so oriented that split resilient washers of plastic material encircle a pair of protrusions of the aligned collars and at the same time engage said keys to prevent the hinge from coming apart.

It is a further object of the instant invention to provide a novel hinge structure designed so that one element rotatably connected to the hinge can be set and remains at any desired opened angular position without the need of being held in such set position in spite of the fact its weight normally would tend to cause said element to rotate from its set position.

Other objects and advantages will become apparent from the following description and figures in which:

Fig. 1 is a plan view looking into the interior of a compact incorporating a hinge structure built in accordance with the principles of the instant invention;

Fig. 2 is a side view of Fig. 1, partly in section;

Fig. 3 is an enlargement of Fig. 1 but confined to the details of the hinge structure except that in this view the components are disassembled;

Fig. 4 is a sectional view taken along 4—4 of Fig. 3;

Fig. 5 is a plan view showing the details of the hinge structure of body 12 and taken along 5—5 of Fig. 4;

Fig. 6 is a front plan view of a washer used to join the hinge components of the instant invention;

Fig. 7 is a side view of Fig. 6;

Fig. 8 shows how the washer engages a pair of juxtaposed protrusions of adjacent hinge collars; and

Fig. 9 is a plan view partly in section and serves to accommodate the description hereinafter to explain disengagement of the hinge structure for certain orientations of the holding keys.

Referring now to the figures, a cosmetic compact 10 is made up of two all plastic bodies 11 and 12 each being a one piece unit of construction. Bodies 11 and 12 are joined by a hinge 13 incorporating the improvements of the instant invention. The one piece plastic units 11 and 12 are made by any conventional plastic mold process. Each body 11 and 12 has a flat wall face surrounded, respectively, by a circular rim, 21 and 23. One of the bodies such as 11 is provided with a mirror 14 fastened to the inner surface of its flat wall by a ring 15 force fitted along the inside surface of rim 21. Because mirror 14 is fastened to body 11, this unit will be deemed to be the top or cover of compact 10. The other body 12 is adapted to carry a cake of cosmetic powder 16 and a powder puff 17. Rims 21 and 23 are provided with correspondingly engaging edges of conventional design so that the compact can be closed tightly. A conventional snap lock 40 is provided to keep the compact 10 closed while not in use.

Hinge 13 joins and holds together bodies 11 and 12 and thus permit compact 10 to be opened and closed at will. The part of hinge 13 that is an integral part of body 11 consists of a solid, cylindrical bearing collar 24 and a solid reinforcing rib 30 both protruding outwardly from and along rim 21. Collar 24 extends axially along axis 29 and terminates with flat end surfaces 9 and 9'. Rib 30 serves to strengthen the structure of

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collar 24 where they coextend along rim 21. The ends of rib 30 project beyond the ends of collar 24 to co-extend alongside the collars of body 12 and thus balance the appearance of the hinge structure and also serve as a protective shield for the collars of body 12 which would otherwise remain exposed thereat. The inside surface 31 of rib 30 is curved to correspond to the cylindrical shape of the collars of body 12.

Similarly two spaced apart, solid, cylindrical and longitudinally extending bearing collars 18 and 19 protrude outwardly from and along rim 23 as part of the one piece body 12. Collars 18 and 19 also terminate with flat end surfaces 7, 7', 8 and 8'. Body 12 is further provided with a solid reinforcing rib 32 protruding outwardly from and along rim 23 which rib 32 coextends with collars 18 and 19. The inside surface 33 of rib 32 between collars 18 and 19 is curved to correspond with the cylindrical side wall of collar 24. Rib 32 serves to reinforce collars 18 and 19 and also shield what would otherwise be the exposed side of collar 24. Curved surface 33 of rib 32 is adapted to register in close spaced relationship with longitudinally coextending collar 24 upon assemblage of hinge 13. A similar relationship exists between collars 18, 19 and the correlated portions of surface 31 on either side of collar 24.

The collars are oriented so that upon assemblage of hinge 13, collars 18 and 19 are in longitudinal and aligned register with collar 24 with the latter occupying the space between collars 18 and 19.

Solid aligned protrusions 20, 22, 25 and 27 project from the juxtaposed flat end walls of collars 18, 19 and 24. Protrusions 20, 22, 25 and 27 are preferably cylindrical in shape, and extend axially along longitudinal axis 29. Each protrusion is concentric with the collar from which it extends and projects axially toward the juxtaposed protrusion to form pairs; protrusions 20 and 25 make up one pair and protrusions 22 and 27 make up the other pair. The ends of the adjacent protrusions terminate close to each other but with a clearance therebetween to prevent one of the pair from binding with the other of the pair which would interfere with opening and closing of compact 10.

Holding keys 26 and 28 are, respectively, an integral part of protrusions 20 and 22. Holding keys 26, 28 are little solid pimples of any convenient shape which extend along and transversely from the surface of the respective protrusions from which they extend. Moreover, it is preferable that keys 26, 28 also be made integral with end walls 7 and 8' respectively to strengthen the key structure to avoid breakage of same.

Bodies 11 and 12 are actually held together by a pair of similar split washers 34 and 35 which are made of resilient, plastic material, preferably nylon. Since washers 34, 35 are identical, only one washer is shown in Fig. 6 to accommodate the description to follow. Washers 34 and 35 are circular, doughnut shaped with a section thereof removed at cutout 36. Cutout 36 may be tapered with its narrower end nearer the center of washer 34. Upon fitting or assembling bodies 11 and 12 together, washers 34, 35 are snapped over and around a respective pair of adjacent protrusions such as 22 and 27 (as illustrated in Fig. 8) so that cutout 36 engages holding key 28 of protrusion 22. The width of cutouts 36 is slightly less than the diameter of the protrusions; as can best be seen from Fig. 6 in which the diameter of the center hole of cutouts 34, 35 are substantially equal to the diameter of the protrusions. This prevents the washers escaping from the protrusions after being snapped on. In spite of the fact that the width of cutout 36 at area 9 is smaller than the diameter of the protrusions, the material of the washers is resilient enough to permit the washers to be snapped over the protrusions. The thickness of the washers is such that each washer extends around and engages both protrusions of the pair, note Fig. 8. Thus collars 18, 19 and 24 are held in registered

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longitudinal alignment. From Fig. 7 it is seen that in thickness, washers 34, 35 (only one washer is shown because they are similar) are preformed with arched side faces 37, 38. For example, in the illustrated embodiment side face 38 is concaved while side face 37 is convex. Washers 34, 35 bear against the adjacent flat end walls of collars 18, 19 and 24 such as at pressure contact points 39, 41 when the washers are snapped on the protrusions. The arched washers 34, 35 react as resilient springs when bearing against the flat end walls of collars 18, 19 and 24. The thickness of washers are chosen so that the bearing pressure of the washer against the collars is not enough to bind the washers 34, 35 against the flat end walls of the adjacent collars which would prevent cover 11 from being opened and closed. Although each washer does not bind to the respective collars, the pressure is sufficient to cause enough friction so that cover 11 once set at some opened position remains there without the need of being held by the woman using compact 10. Thus compact 10 can be opened and cover 11 set at any desired angular position for use with the assurance that it will remain in such position without the need of being so held; thus convenient use can be made of mirror 14.

If the means were not provided, such as arching the side faces of the resilient washers, the weight of cover 11 if left in its opened position would cause it to fall, i. e. rotate and close; or if opened to an angular position greater than ninety degrees from body 12, cover 11 would then rotate back and down in the opposite direction with the result that mirror 14 would not be in a convenient position for use. In either situation the woman, to overcome such an unstable cover, would have to hold the cover with her free hand which is clearly not desirable because her other hand is already occupied by holding the other half of compact 10, body 12.

In order to obtain a hinge design in which the cover remains in fixed position once set without the need of being held, it was found that the following dimensions of thickness worked satisfactorily for a nylon washer: dimension A was made .060 inch, dimension B was made .070 inch and the longitudinal spacing, reference C, between the juxtaposed flat end surfaces of two adjacent collars was made .062 inch. These dimensions are given as an illustrative example and should not be taken in any limited sense.

In the illustrated embodiment, resilient washers 34, 35 are arched to ensure bearing against the end walls 7, 9' and 9, 8', respectively, of collars 18, 19 and 24. It would be entirely within the principle of the instant invention to provide washers with flat side faces and to arch or corrugate the correlated end walls of collars 18, 19 and 24. The latter embodiment will also provide the friction pressure which would hold cover 11 at a desired opened position. The structure described hereinbefore may be simplified still further with respect to providing the friction pressure to hold cover 11 at set opened positions. In its simplest version, washers 34, 35, of resilient material such as nylon, are provided with flat side faces of a thickness slightly greater than the spacing between the juxtaposed end walls of the adjacent collars. In one preferred form of this simplified embodiment, the thickness of the washers is .068 of an inch, which would be dimension A of Fig. 7. The washers are inserted between juxtaposed end walls spaced apart .062 of an inch, which is shown as dimension C in Fig. 3.

For an article of manufacture such as compact 10, the use of keys 26, 28 as a part of hinge 13 is desirable. Upon assembly of hinge 13, keys 26, 28 are in locked engagement within the side edges of cutouts 36. This is illustrated clearly in Fig. 2. Keys 26, 28 are designed to extend transversely from protrusions 20, 22 and along axis 42 (note Fig. 4). When cover 11 is set to its maximum opened position, the rear walls of ribs 30, 32 bear against each other as shown in Fig. 9. Any further force

applied in the direction of arrow 44 would tend to force body 12 further back and thus cause body 12 to pivot about axis 45; axis 45 extends perpendicular to the plane of the paper. As body 12 pivots about axis 45, collars 18 and 19 move outwardly in the direction of arrow 46 which is substantially in the direction of axis 47. If by chance cutouts 36 of washers 34, 35 are oriented to extend substantially in alignment with arrow 46, while body 12 is being pivoted about axis 45, then the outwardly moving collars 18 and 19 will cause washers 34, 35 to disengage and escape from the protrusions. Compact 10 would then come apart. To prevent disengagement of the washers, keys 26 and 28 are oriented to extend along axis 42, which axis is perpendicular to axis 47. With keys 26, 28 so oriented, the engaged cutouts 36 of washers 34, 35 are prevented from lining up with arrow 46 and therefore cannot be removed from the protrusions. Accordingly, washer 34, 35 will always resist the pull-out force tending to separate hinge structure 13.

It will be noted also that keys 26, 28 are shown to be on the side of protrusions 20, 22 facing the flat back wall of body 12. Keys 26, 28 are shown pointing downwardly in Figs. 2 and 5. It will be keeping within the principle of the instant invention to orient keys 26, 28 along axis 42 but extending upwardly, as shown by the dotted outline 26' in Fig. 4. This arrangement will also serve to resist disengagement of washers 34, 35; but solely for the purpose of improving the appearance of compact 10, it is preferred that keys 26, 28 are oriented to extend downwardly and toward the flat back wall of body 12. Should keys 26, 28 be oriented in the upwardly direction, this is illustrated by 26' of Fig. 4, cutouts 36 also would be exposed to view every time the woman opens compact 10 to use same. This phenomenon can be observed clearly by referring to Fig. 2. In Fig. 2, cutout 36 cannot be observed when one looks into the opened compact 10 from the top which is the usual situation when compact 10 is being used. In this instance, cutout 36 extends downwardly towards the back flat wall of body 12. Were key 26 formed along the same axis but displaced 180 degrees (shown as 26') cutout 36 which is engaged to the key also would face upwardly and be in the direct line of sight of the person using compact 10. Accordingly, when oriented along axis 42, but downwardly, cutouts 36 are not exposed to view when compact 10 is held in its customary position while being used. The cutouts can be observed, but only when compact 10 is closed and the user deliberately turns compact 10 around to look at the rear of hinge structure 13. Furthermore, any orientation of the keys other than along axis 42 but substantially displaced from axis 46 will also serve to prevent washers 34, 35 escaping from keyed engagement with the protrusions.

It is also keeping within the principle of the instant invention to have keys 26, 28 made an integral part of cover 11 instead of an integral part of body 12. As part of cover 11, keys 26, 28 would be oriented along axis 42', shown in dotted outline in Fig. 4, and made integral with protrusions 25, 27.

Furthermore, it will be understood that for different articles of manufacture, keys 26, 28 may be oriented to extend radially from its protrusions at some other angle depending entirely upon the design of the article; or moreover, eliminated completely if the disengaging force is not present.

Hinge 13 is assembled by resting bodies 11 and 12 on their flat back surfaces, the position assumed when compact 10 is in an opened position while resting on a flat surface as shown in Fig. 2. Collar 24 is registered in longitudinal alignment with and between collars 18 and 19. Washer 34 is lowered from above and snapped about protrusions 20 and 25 with the sides of its cutout 36 engaging key 26, and similarly washer 35 is engaged with protrusions 22 and 27.

When cutouts 36 of washers 34, 35 engage holding

keys 26, 28, the washers are caused to rotate about axis 29 in unison with the body 11 or 12, as the case may be, integral with the keys to which the washers are engaged. For example, in the instant disclosure the washers will move in unison with body 12 when the latter is moved about axis 29.

It will be understood that the disclosure of the hinge structure as part of a compact should be taken as illustrative and not in any limiting sense, and that the principles of the instant invention are applicable to other types of articles of manufacture.

What is claimed is:

1. A hinge structure for a plastic article of manufacture comprising, a first hinge element of plastic material having longitudinally aligned spaced apart bearing collars terminating with end walls, a second hinge element of plastic material having a bearing collar terminating with end walls, said last mentioned collar being registered in longitudinal alignment with and between a pair of spaced bearing collars of said first element, a pair of longitudinally aligned protrusions between the juxtaposed end walls of the registered adjacent bearing collars, each protrusion of said pair being integral with and extending longitudinally from a respective one of said juxtaposed end walls toward the other of said pair but terminating short of each other, and a resilient washer of plastic material squeezed between said adjacent collars and encircling said pair of protrusions thereof and thereby holding same in alignment, said washer having a section thereof removed to form a cutout to permit said washer to be snapped on said encircled protrusions, said washer having side walls abutting against respective end walls of the adjacent collars, certain ones of said walls being bowed to create a slidable friction grip whereby one of said hinge elements is held at a desired angular position spaced from the other hinge element.

2. A hinge structure comprising, a pair of rotatable hinge elements, a plurality of longitudinally registering aligned and spaced apart bearing collars integral with respective ones of said elements, adjacent ones of said collars having juxtaposed end walls, a pair of longitudinally aligned protrusions between said juxtaposed end walls, each protrusion extending outwardly from a respective one of said end walls toward the other protrusion of said pair but terminating short of each other, a washer squeezed between adjacent collars and encircling said pair of protrusions and thereby holding same in alignment, said washer having a cutout, and a holding key extending from one of said protrusions, said key being engaged by said cutout, whereby angular rotation of the collar integral with said key causes the engaged washer to move in unison therewith.

3. A hinge structure comprising, a first hinge element having a plurality of longitudinally aligned and spaced apart bearing collars having end walls, a second hinge element provided with a bearing collar having end walls, said bearing collar of said second hinge element being in longitudinal alignment between two of said spaced apart bearing collars of said first hinge element, a pair of aligned protrusions between juxtaposed end walls of adjacent bearing collars, each protrusion of said pair extending longitudinally and outwardly from a respective one of said juxtaposed end walls and projected toward but terminating short of the other protrusion of said pair, a washer squeezed between adjacent collars and encircling said pair of protrusions and thereby holding same in alignment, said washer having a section thereof opened to form a cutout to permit said washer to be snapped over said protrusions encircled thereby, and a holding key extending from one of said protrusions, said key being engaged by said cutout, whereby angular rotation of the collar integral with said key causes said washer to move in unison therewith.

4. A hinge structure comprising, a plurality of longitudinally aligned and spaced apart bearing collars, ad-

5 adjacent ones of said collars having juxtaposed end walls, a pair of longitudinally aligned protrusions between said juxtaposed end walls, each protrusion being integral with and extending outwardly from a respective one of said end walls toward the other protrusion of said pair but terminating short of each other, a washer of resilient material squeezed between said adjacent collars and encircling said pair of protrusions and thereby holding same in alignment, said washer having bowed side faces abutting against the end walls of said adjacent collars, said washer having a section thereof opened to form a cutout, and a holding key extending from one of said protrusions and being engaged by said cutout whereby angular rotation of the collar integral with said key causes said washer to move in unison therewith.

5 10 15 20 25 30 35 40 45 50 55 60
5. A hinge structure comprising, a plurality of longitudinally aligned and spaced apart bearing collars, adjacent ones of said collars having juxtaposed end walls, a pair of longitudinally aligned protrusions between said juxtaposed end walls, each protrusion being integral with and extending from a respective one of said end walls toward the other protrusion of said pair but terminating short of each other, one of said protrusions of said pair having a holding key extending therefrom, a circular shaped washer of resilient material between said adjacent collars and encircling said pair of protrusions and thereby holding same in alignment, said washer having a section thereof opened to form a cutout to permit said washer to be snapped over the protrusions encircled thereby, said cutout also being engaged by the holding key of said encircled protrusion, said washer being bowed whereby it bears against the end walls of said adjacent collars.

6. A hinge structure for a plastic article of manufacture comprising, a first hinge element of plastic material having longitudinally aligned spaced apart bearing collars terminating with end walls, a second hinge element of plastic material having a bearing collar terminating with end walls, said last mentioned collar being registered in longitudinal alignment with and between a pair of spaced bearing collars of said first element, a pair of longitudinally aligned protrusions between the juxtaposed end walls of the registered adjacent bearing collars, each protrusion of said pair being integral with and extending longitudinally from a respective one of said juxtaposed end walls toward the other of said pair but terminating short of each other, and a resilient washer of plastic material between said adjacent collars and encircling said pair of protrusions thereof and thereby holding same in alignment, said washer having a section thereof removed to form a cutout to permit said washer to be snapped on said protrusions, one of said protrusions of said pair having a holding key extending therefrom, said key being engaged by the cutout of said washer whereby angular rotation of the collar integral with said key causes said washer to move in unison therewith.

7. A hinge structure for a plastic article of manufacture comprising, a first hinge element of plastic material having cylindrically shaped bearing collars terminating with end walls, said collars being longitudinally aligned and spaced apart, a second hinge element of plastic material and having a cylindrically shaped bearing collar terminating with end walls, said last mentioned collar

being registered in longitudinal alignment with and between a pair of spaced apart collars of said first element, a pair of longitudinally aligned protrusions between the juxtaposed end walls of the registered adjacent collars, each protrusion of said pair being integral with and extending longitudinally from a respective one of said juxtaposed end walls toward the other protrusion of said pair but terminating short of each other, and a circularly resilient washer of plastic material between said adjacent collars and encircling said pair of protrusions thereof and thereby holding same in alignment, said washer having a section thereof removed to form a cutout to permit said washer to be snapped over said protrusions, said first element having a reinforcing rib at the rear of and integral with said pair of bearing collars thereof, said rib extending longitudinally the length of said pair of collars, the portion of said rib between said collars having an inner curved surface adapted to register in close spaced relationship with said collar of said second element, said second element having a reinforcing rib at the rear of and integral with said bearing collar thereof and extending longitudinally beyond the end walls thereof a distance coextensive with said pair of collars of said first element, the portions of said last-mentioned rib coextensive with said collars of said first element having an inner curved surface adapted to register in close spaced relationship with said pair of collars, one of said protrusions of said pair having a holding key extending transversely therefrom, said key being on the side of said one protrusion adjacent the rib integral therewith, said key being engaged by the cutout of said washer whereby angular rotation of the collar integral with said key causes said washer to move in unison therewith.

8. A hinge structure comprising, a first hinge element having a plurality of longitudinally aligned and spaced apart bearing collars having end walls, a second hinge element provided with a bearing collar having end walls, said bearing collar of said second hinge element being in longitudinal alignment between two of said spaced apart bearing collars of said first hinge element, a pair of aligned protrusions between juxtaposed end walls of adjacent bearing collars, each protrusion of said pair extending longitudinally and outwardly from a respective one of said juxtaposed end walls and projected toward but terminating short of the other protrusion of said pair, and a washer squeezed between adjacent collars and encircling said pair of protrusions and thereby holding same in alignment, said washer having a section thereof opened to form a cutout to permit said washer to be snapped over said protrusions encircled thereby, said washer having side walls abutting against the juxtaposed end walls of said adjacent collars, respective ones of said abutting walls being bowed whereby upon rotation of one hinge element about its longitudinal axis with respect to the other hinge element, the bearing pressure of said washer against said end walls creates sufficient friction grip to hold the rotated element at a desired angular displacement.

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