June 2, 1964 F. PALAZZOLO 3,135,456

FLEXIBLE HINGE DEVICE FOR CONTAINERS HAVING A CURVED SIDE

Filed Nov. 16, 1962

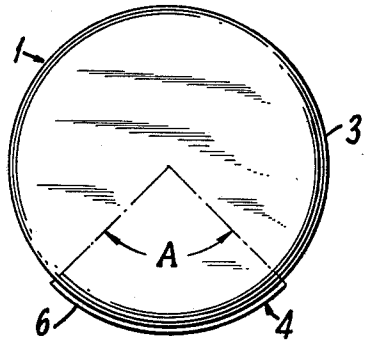


FIG. 1

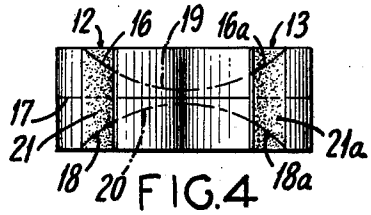


FIG. 4

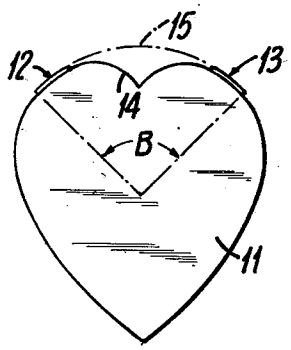


FIG. 5

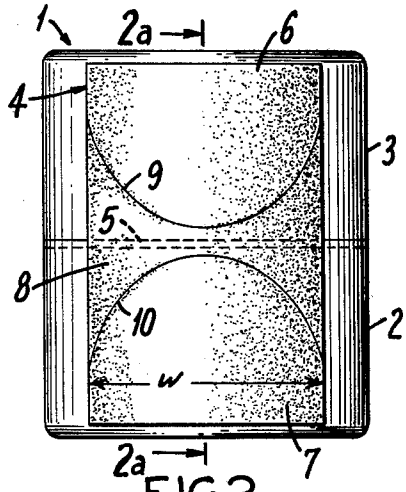


FIG. 2

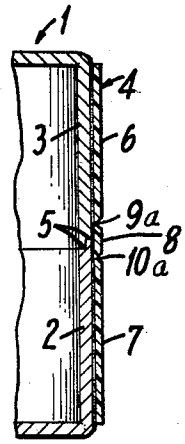


FIG. 2a

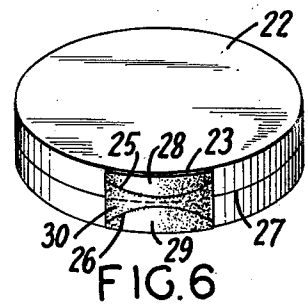


FIG. 6

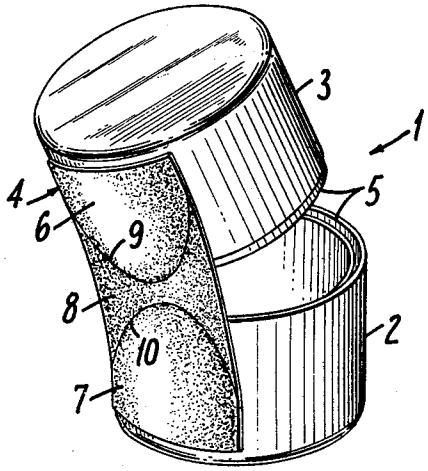


FIG. 3

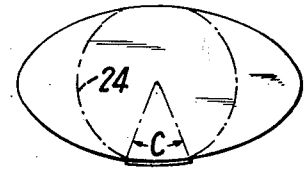


FIG. 7

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FLEXIBLE HINGE DEVICE FOR CONTAINERS HAVING A CURVED SIDE

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This invention relates to a flexible hinge device in combination with a container and cover having a mating curved side portion and, in particular, to a flexible hinge, container and cover combination in which the hinge is connected along a curved side surface of the container and of the cover.

The hinging of round containers presents a problem by conventional hinging means in that the hinge when applied along a curved side portion of the container and cover tends to render difficult the opening and closing of the hinged cover. Where the hinge is made of metal, it tends to loosen and pull away from its mounting.

I have found an improved hinge combination which overcomes the foregoing difficulty and which I find can be used with odd shaped containers having curved side portions as well as with round containers.

It is an object to provide a flexible hinge combination for use with containers and covers having mating curved side surfaces.

Another object is to provide a flexible hinge, container and cover combination, wherein the hinging effect is achieved along a curved side surface of the container and its mating cover.

These and other objects will more clearly appear from the following disclosure and the appended drawing, wherein:

FIGS. 1 to 3 show one embodiment of my novel hinge combination as applied to a container of substantially cylindrical configuration;

FIGS. 4 and 5 depict another embodiment of my improved hinge combination as employed on a container or utility box of heart-shaped configuration; and

FIGS. 6 and 7 illustrate the invention as applied to a container of substantially elliptical shape.

In its broad aspects, my improved hinge is employed in combination with a container and cover wherein each has a curved side portion which is coextensive with the other and abut at their common line of separation, the hinge member comprising flexible material which is connected across the coextensive curved side portions where it is desired to hinge the cover to the container. The flexible material spanning the line of separation is generally fixed at its opposite end portions to the cover and the container, except for a freely movable web portion intermediate the opposite end portions, the web portion terminating at the fixed end portions of the material along a pair of curved lines oppositely disposed from each other on each side of the line of separation of the coextensive curved surfaces, one line being substantially a mirror image of the other. Each of the oppositely disposed curved lines recede from the line of separation along the curved surfaces, whereby when the resulting flexible hinge is articulated by lifting the cover, a double hinge effect obtains at the curved scored lines due to the moving of the web of the hinge away from the curved side portions. Because of the receding nature of the curved lines away from the line of separation, the hinge is able to articulate more freely than if the score lines ran straight across the hinge material.

My invention will more clearly appear from FIGS. 1 to 3 which show my novel flexible hinge combination used with a metal box **1** of substantially cylindrical configuration comprising container **2** and top or cover **3**. The hinge comprises a strip of flexible material **4**, for example polypropylene, which is connected across the line

of separation **5** of the box and fixed to coextensive cylindrical surfaces of the box at end portions **6** and **7** by a suitable adhesive or suitable mechanical fixing means. The remaining intermediate portion of the strip remains as a freely movable web portion **8** which terminates at the fixed end portions on the coextensive cylindrical surfaces along curved lines **9** and **10** which are scored into the material as shown at **9***a* and **10***a* in FIG. 2*a*, which is a cross section of the edge of the box taken along line **2***a*—**2***a* of FIG. 2 across the hinge.

The manner in which the flexible hinge articulates as the cover is lifted is shown in the three-dimensional representation of FIG. 3, wherein the double hinging effect is depicted as occurring along curved scored lines **9** and **10** as the web portion **8** moves away from the curved surface of the box.

The radius of curvature of curved lines **9** and **10** should be sufficient to enable the obtaining of the double hinge effect without putting too large a strain on the flexible material as the cover is being removed from the container. For example, the radius of curvature of the scored lines may be in the neighborhood of the radius of curvature of the cylindrical side portion of the box embraced by the flexible hinge, the term "neighborhood" being understood to include variations in curvature below and above that of the curvature of the cylindrical side portion of the box and which will enable the hinge to articulate substantially freely when the cover is raised from the container.

The length of the hinge need not extend the full vertical height of the box, so long as sufficient flexible material is available to be fixed to the box at each side of the line of separation between the cover and the container and still provide a sufficient amount of web. The width W of the hinge (FIG. 2) will depend upon the angle A subtended by the arc of the curved surface portion the hinge material embraces. I have found that the angle subtended should be below 120° and preferably should not substantially exceed 90°. Where the flexible material is fairly elastic, the subtended angle may exceed 90°, provided it is maintained below 120°. In FIG. 1, the subtended angle is slightly below 90°.

As has been stated hereinbefore, my novel hinge combination may be employed with odd shaped boxes having a pair of coextensive curved side surfaces where a hinge would be employed. An example of such a box is shown in FIGS. 4 and 5 which depict a heart-shaped box **11** for use as either a utility box, e.g. a makeup kit, or a novelty box, or even a container for candy, etc.

Because of the configuration of this box, I would employ two hinge portions as shown which would be designed and which would operate as a single hinge element. Referring to FIG. 5, I have placed the two hinge elements **12** and **13** as shown on each side of the **V** portion **14** of the heart. Considering the two hinge elements together, the coextensive curved side portions of the box to be considered in designing the hinge would be the arc completed by the dotted line **15** as shown in FIG. 5, and thus, the angle subtended, assuming the hinge fully embraced the arc defined by the dotted line, would correspond to angle B which is shown to be slightly over 90°. In determining the placing of the scored lines on the flexible hinge material, the two hinge elements are treated as one with the middle missing.

Referring to FIG. 4 which is an end view of the box, scored lines **16** and **16***a* above the line of separation **17** and scored lines **18** and **18***a* below line **17** fall in an arc defined by dotted lines **19** and **20**, respectively. In other words, the scored lines while discontinuous are designed as in FIG. 2. The opposite end portions of the hinge elements are fixed to the curved side surface of the box as in FIG. 2, while the freely movable web portions **21**

and 21*a* terminate along the scored lines which recede away from each side of the line of separation of the box. In this case the two hinge elements make up the hinge combination.

As a still further embodiment, reference is made to FIGS. 6 and 7 which show an elliptically shaped box 22. The hinge 23 is provided along a curved side portion, the curvature of which corresponds substantially to that of a circle 24 shown in dotted line in FIG. 7. The angle subtended by the flexible hinge is indicated by angle C which is shown as being below 90°. Scored lines 25 and 26 are shown as curved lines which recede away from the line of separation 27 of the box, the opposite end portions 28 and 29 of the hinge being fixed to the coextensive curved side portions of the box leaving an intermediate freely movable web portion 30 which terminates along scored lines 25 and 26 as in the other hinges described herein. The radius of curvature of the scored lines may be in the neighborhood of the radius of circle 24 defining the radius of curvature of the curved side portion of the box.

The flexible material employed may be any material strip which flexes easily. Thus, in the case of throw-away boxes, e.g. candy boxes made of composition paper, the flexible hinge material may comprise strong laminated paper or similar material. However, I prefer flexible strip material having a certain amount of resilient properties, such as rubber-like material, for example natural or synthetic rubber, or plasticized vinyl acetate, or polyethylene, or polypropylene, or any other material which broadly has some elastomeric properties.

I particularly prefer polypropylene as this material has a fairly long life as a hinge. Normally some materials after continuous use tend to part along the scored lines of the hinge. However, polypropylene tends to resist such separation to a greater extent than most materials.

The type of containers to which my hinge combination is applicable include utility boxes, boxes for supplier's samples, novelty boxes, toy boxes, candy boxes, and in fact any type of container wherein a hinge would be employed along a curved side surface. Such containers may be constructed of composition paper, plastic, wood, metal, fiberglass or any other material of construction.

With regard to the flexible hinge, it may be produced as part of the container by a single molding operation. For example, assuming a container is made by injection molding of polypropylene, the mold can be designed to allow for the simultaneous formation of the hinge element configurated in accordance with my invention.

Of course, it will be appreciated that my invention need not be limited to use with containers but may be employed in situations involving two mating curved surfaces, where it is desired that one curved surface be in articulatable relationship with the other. Thus, where two curved surfaces mate along an edge with each other at their common line of separation, the hinge member would be connected across the two mated surfaces.

While the present invention has been described in conjunction with preferred embodiments, it is to be understood that modifications and variations may be resorted to without departing from the spirit and scope of the invention, as those skilled in the art will readily understand. Such modifications and variations are considered to be within the purview and scope of the invention and the appended claims.

What is claimed is:

1. The combination of two coextensively arranged curved surfaces which abut along an edge with each other at a common line of separation, and a hinge member connecting the two coextensive curved surfaces together across their common line of separation, said member being formed of flexible material fixed at its opposite end portions to each of the coextensive curved surfaces except for a freely movable web portion intermediate said fixed opposite end portions, said freely movable web portion terminating along a pair of oppositely disposed curved lines scored into the flexible hinge material at each side of the line of separation of the two surfaces, with each of said oppositely disposed curved lines receding from said line of separation on each of said coextensive curved surfaces, whereby when one curved surface is articulated relative to the other, a double hinge effect is achieved at and along the scored curved lines.

2. The combination of a container and a cover, each having a curved side portion coextensive with the other in abutting relationship along a common line of separation, and a hinge member connected across the mated curved side portions, said member being formed of flexible material fixed at its opposite end portions to the coextensive curved side portions of the cover and container except for a freely movable web portion intermediate said fixed opposite end portions, said freely movable web portion terminating at the fixed end portions along a pair of oppositely disposed curved lines scored into the flexible hinge material at each side of the line of separation formed by the cover and the container, with each of said oppositely disposed curved lines receding from said line of separation on each of said coextensive curved side portions, whereby when the cover is lifted from the container a double hinge effect is achieved at and along the scored curved lines.

3. The combination of a container and a cover, each having a curved side portion of cylindrical configuration coextensive with the other in abutting relationship along a common line of separation, and a hinge member connected across the abutting cylindrical side portions, the arc subtended by said hinge member being less than 120°, said member being formed of flexible resilient material fixed at its opposite end portions to the coextensive cylindrical side portions of the cover and container except for a freely movable web portion intermediate said fixed opposite end portions, said freely movable web portion terminating along a pair of oppositely disposed curved lines scored into the flexible resilient hinge material at each side of the line of separation formed by the cover and the container, with each of said oppositely disposed curved lines receding from said line of separation on each of said coextensive cylindrical side portions and having a radius of curvature in the neighborhood of the radius of curvature of the abutting cylindrical side portions, whereby when the cover is lifted from the container a double hinge effect is achieved at and along the scored curved lines.

4. The combination of claim 3, wherein the arc subtended by the hinge member does not exceed about 90°.

5. The combination of claim 3, wherein the flexible resilient hinge material has substantially elastomeric properties.

6. The combination of claim 3, wherein the hinge material is made of polypropylene.

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