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F. H. GROESBECK ET AL
FLEXIBLE HINGE

2,526,129

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2 Sheets-Sheet 1

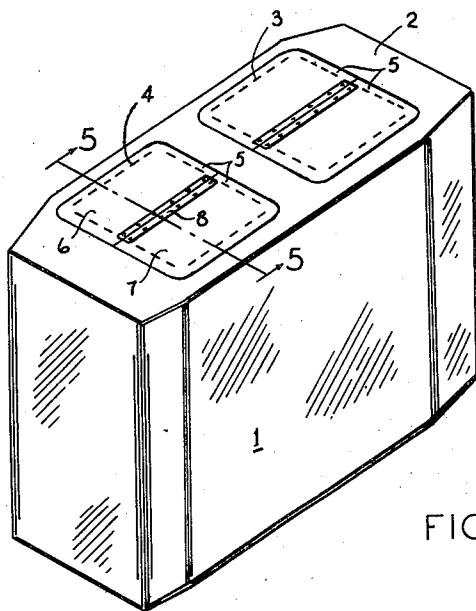


FIG. 1

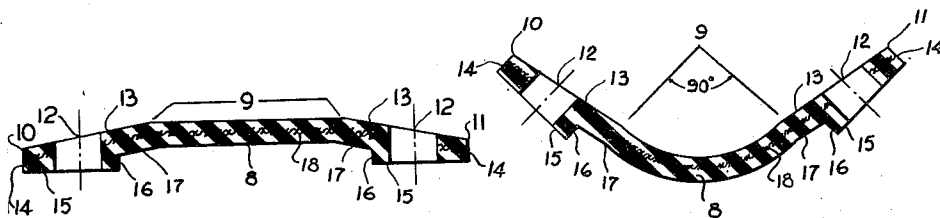


FIG. 3

FIG. 2

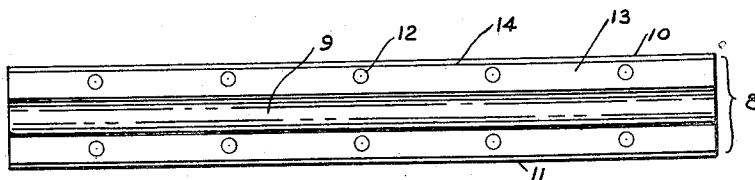


FIG. 4

INVENTORS
FRANK H. GROESBECK &
BY HERBERT A. STEWART
Chapin & Neal
ATTORNEYS

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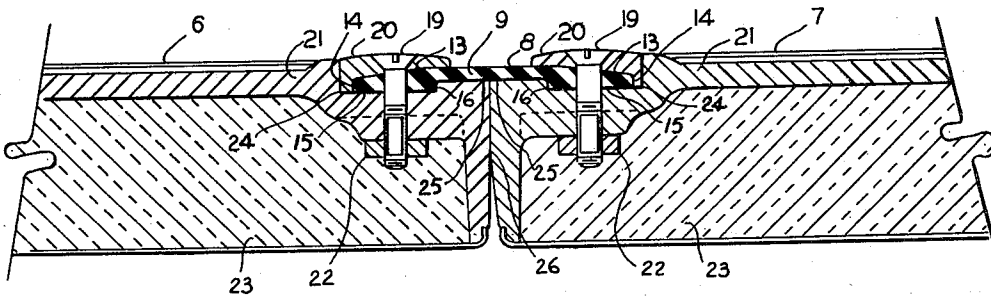


FIG. 5

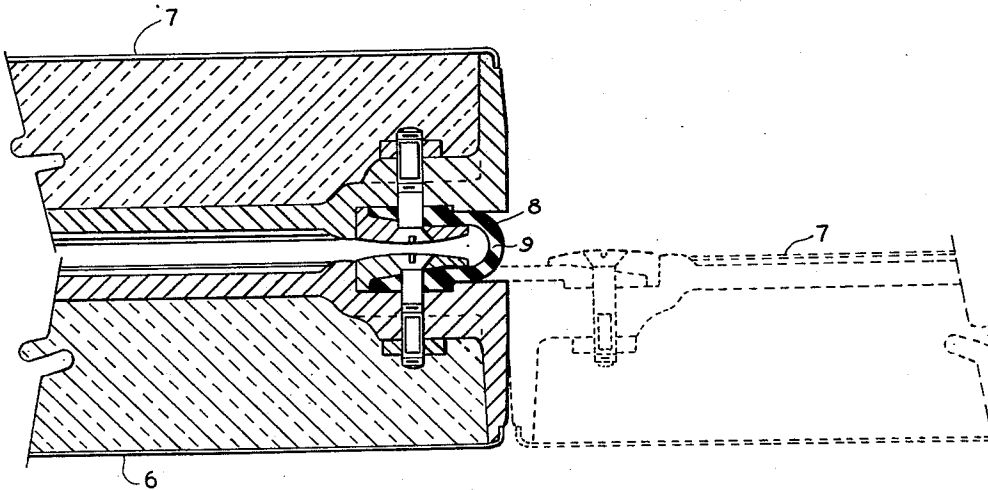


FIG. 6

INVENTORS
FRANK H. GROESBECK &
BY HERBERT A. STEWART
Chapin & Neal
ATTORNEYS

UNITED STATES PATENT OFFICE

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FLEXIBLE HINGE

Frank H. Groesbeck, Ilion, and Herbert A. Stewart, Utica, N. Y., assignors to Savage Arms Corporation, Utica, N. Y., a corporation of Delaware

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1 Claim. (Cl. 16—150)

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This invention relates to flexible hinges and particularly to flexible hinges for lids on ice cream or frozen food cabinets provided to afford access to the cabinet.

On such structures generally, and on ice cream cabinets in particular, hinge wear is severe. The almost constant opening and closing of the lid in busy periods soon exceeds the elastic limits of the most ruggedly built, conventionally mounted, hinges of the flexible, one piece, strap type. Nevertheless, hinges of this type are preferred to metal ones for such usage because of the excellent insulating properties of the rubber or other flexible material of which they are made. They are also preferred due to the rapid mechanical wear and possibility of damage to the pivoting parts of a metal hinge.

This preference for hinges of the flexible type has resulted in the general use of elastic materials, and in attempts at fitting hinges to lids in such a manner that the internal stresses produced by the bending of the hinge are substantially lessened. In testing strengths of materials, it has generally been conceded that there is a definite limiting range of stress which can be withstood for a given number of cycles without fracture of the material ensuing. There are examples well known in the art of various attempts to mount flexible hinges in such a way as to confine internal stresses to this range. It is also old in the art to provide a resilient reinforcing fiber layer, variously positioned, to strengthen the material and prevent tearing of the hinge.

One of the objects of the present invention is to provide a molded hinge made as one integral, inherently curved, piece of flexible material, adapted for mounting in such a manner as will in use reduce the strain put upon the flexible material in the nature of stretch or compression of its material in the top and bottom portions.

In carrying out this primary object, however, it is also an object, by so making and mounting the hinge, to avoid any special care in positioning a fiber layer such as a cloth reinforcement in the hinge material and even discarding such a fiber layer without materially affecting the life of the hinge.

To these and other ends the invention resides in specific improvements and features, all as will be hereinafter more fully described, the novel features being pointed out in the claim at the end of the specification.

In the drawings:

Fig. 1 is a perspective of a refrigerated ice cream cabinet having the invention embodied therein;

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Fig. 2 is an enlarged cross sectional view of the hinge of my invention showing the shape as molded and an optionally insertable single ply fabric in the center of the section, the scale in this view being about double actual size;

Fig. 3, drawn to the same scale as Fig. 2, is an enlarged cross sectional view of the hinge in the position its molded shape will assume when clamped in place;

Fig. 4 is a plan view, reduced to about half size, of the hinge shown in Figs. 2 and 3;

Fig. 5 is a full scale broken transverse fragmentary sectional view taken on line 5—5 of Fig. 1, of one of the double doors or two-membered lids of the refrigerated cabinet in closed position and movably secured together by a hinge constructed in accordance with the present invention; and

Fig. 6 is a view similar to Fig. 5 showing the position of the hinge when one member of the double door is raised from its closed position and thrown back onto the top of its companion member to provide access to the interior of the refrigerated cabinet.

In the hinge as shown in Figs. 5 and 6, the reinforcing cloth strip indicated in Figs. 2 and 3 is omitted.

Similar reference characters refer to similar parts in the several views.

Referring to the drawings, a refrigerator cabinet of the type used to store and merchandize ice cream or frozen foods is shown in Fig. 1 as an illustration of a structure in which the invention can be practiced. This cabinet is generally designated by the numeral 1. Cabinet 1 contains a top insulated wall member 2, having two rectangular-shaped openings 3 and 4 provided therein. Openings 3 and 4 are each normally covered by a two-membered, similarly shaped, rectangular, removable double door structure, generally designated hereafter by the one number 5. The double door structure 5 consists of two half-doors 6 and 7, connected together by a one-piece hinge 8 to permit movement of either half-door relative to its companion half.

The present invention lies in the construction of hinge 8 with relation to the structure in which it is used and the novel features built into this hinge for use when mounted to provide a flexible pivot, such as for the two half-doors 6 and 7. Hinge 8 is made of non-rigid, non-metallic, flexible material, preferably a highly resilient homogeneous rubber compound such as a chloroprene rubber sold under the trade name "Neoprene."

A high grade, high flexing compound with a crude

rubber base may also be used. An example of the latter in the trade is "Compound No. 123" of The Tyer Rubber Company, being a 3300 lb. tensile stock with a 570% elongation. It is molded to the shape shown in Fig. 2, or a similar shape, wherein the central portion 9 is concave crosswise forming a 90° arc and lies normally below the highest points of the edges or lateral extremities 10 and 11. Each of the lateral extremities 10 and 11 contains: holes 12; a top or upper surface 13; an edge surface 14; and bottom surface 15 connected to central portion 9 by surfaces 16 and 17. All of these surfaces are preferably flat. A single ply or multiple ply fabric 18 may be provided in the center of the hinge structure if so desired but its position in the hinge does not materially effect the principals involved in this invention.

When mounted, hinge structure 8 assumes the position shown in Fig. 3 with central portion 9 no longer concave or forming an arc, but stretched or flattened, and surface 15 of both lateral extremities 10 and 11 is in the same directional plane as the surface areas of central portion 9.

Retaining or fastening holes 12 (see Fig. 4) are spaced in such a manner as to uniformly distribute the stress from the bolts 19 (see Fig. 5). Bolts 19 pass through retaining strip 20, through wall portion 21 of door members 6 and 7, and are secured by a nut 22 in the insulation-filled space 23. The heads of bolts 19 are countersunk into the retaining strip 20. Retaining strip 20 clamps hinge structure 8 to door members 6 and 7 by direct bearing on surface 13; by butting against the flat edge of surface 14; and by holding surfaces 15 and 16 of the cleat shaped lateral extremities into the groove 24 provided in door members 6 and 7. With the door members 6 and 7 in closed position and hinge structure 8 held down in the secured portions by retaining strip 20, the under surface of central portion 9 lies flat against surface 25 of door members 6 and 7 immediately adjacent the hinge line 26. Anchoring means other than the preferable one disclosed can be used to secure the ends of the hinge, for example bolts and washers alone.

When either door member 6 or 7 is moved relative to the other into the open position (see Fig. 6), the edges of the flexible hinge structure 8 tend to move to a position wherein central portion 9 may resume its normal concave 90° arc shape, and when the door member is halfway open the normal molded shape or "free position" has been gained and no internal stresses due to the opening exist in the hinge structure. On full or 180° movement of a door member, the hinge structure assumes the position shown in Fig. 6. In this position the strain put on the flexible hinge is of the same magnitude as when both door members are in the closed or parallel adjacent position shown in Fig. 5.

The advantage of such an arrangement is that it reduces the stretch or compression put upon the top and bottom portions of the flexible hinge material since the free position of the hinge as molded is between the extreme positions the hinge must assume in its normal operation, namely when a door member is open and when it is closed.

It can readily be seen now that the hinge of this invention is never subjected to the magnitude of strain set up in a conventionally made and mounted flat hinge. Such a conventional flat flexible hinge has internal stresses continually multiplying through the 180 degrees of rotation

that one half of the hinge is forced to traverse. Either half of this hinge structure has but 90 degrees of travel during which stresses are being built up.

A further advantage in this invention is that the flexible hinge will lie tight and flat against the door members when the door members are in closed position. This prevents any passage of warm air into the cabinet, or cold air from the cabinet, which otherwise would pass between the door members at their hinge line. In addition to the sealing function, the hinge of this invention, when anchored to two door members as described, will perform a constant spring clamping function to hold such door members together in their closed position. When the molded arc in the hinge is flattened to any degree, and particularly when completely flattened, the tautness of the transverse hinge will force or squeeze together the door members to which the edges of the hinge are secured. This tautness of the hinge is due to the tendency of the hinge material to regain its molded, unstressed, inherently curved shape, the distance between the anchors on the door members relative to the unsecured portions of the hinge being substantially the same. Such a clamping force, continually exerted when the door members are adjacent in closed position, will provide better insulation for the cabinet. Thus a two-fold insulating feature will be added to any refrigerated cabinet on which such a hinge is applied. Heat conduction will be held to a minimum and a tighter closure at the hinge line will be effected.

Internal stresses in this hinge being less, because of the particular way in which the angle through which they are set up as a door member rotates is reduced, the need for a reinforcing fiber insert is substantially lessened. Also, because of its taut condition when stretched flat, tearing of the hinge material is less likely to occur. In any event, the leverage afforded by the door members for tearing the hinge will not be as effective in tearing as long as the fulcrum is kept broad by the tendency of the taut hinge to hold door members flat and flush at the hinge line. Lateral forces or impacts against the door members can thusly be withstood with less likelihood of damage to the hinge.

Altogether the specific hinge will operate better and last longer than the conventional flexible hinge.

It may be added that considering one door member as a stationary wall structure and the other door member as a movable single door structure will not alter the functioning of the hinge but will disclose without further illustration or elaboration that the invention can also be practiced in a cabinet having an opening which is covered by a one-membered door structure.

Having disclosed our invention, we claim:

A flexible hinge for refrigerator lids of the type described, comprising a strip of highly resilient flexible material having the central body portion of the strip concave in lateral cross section in unmounted and unstressed condition, said central portion lying normally in an arc of about ninety degrees, and integral laterally disposed extensions lying in planes divergently angled with respect to one another and extending outwardly from each lateral edge of said central portion substantially in a tangential direction from the ends of the arc, said lateral extensions having anchoring means for attachment to a refrigerator lid and the like, said central body portion of the

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strip when said extensions are operatively attached by said anchoring means and in mounted position with the anchoring means in a common plane, lying in flattened stressed condition with the portions of the said central body adjacent the upper surface tensioned and the portions adjacent the lower surface thereof under compression.

FRANK H. GROESBECK.
HERBERT A. STEWART.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,241,101	Teeter -----	May 6, 1941
2,321,753	King -----	June 15, 1943
2,331,512	Siedschlag -----	Oct. 12, 1943