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CLOSURE SEALING APPARATUS

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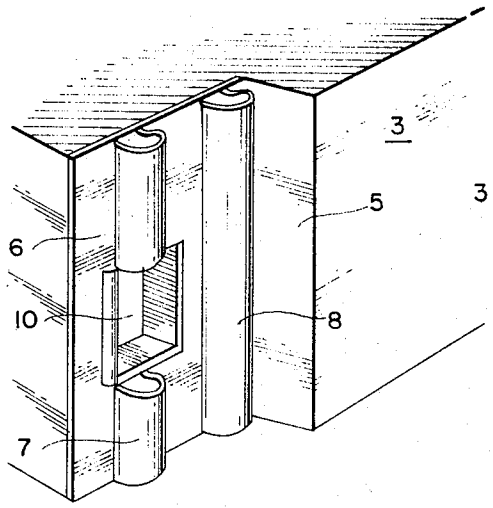


FIG. 1

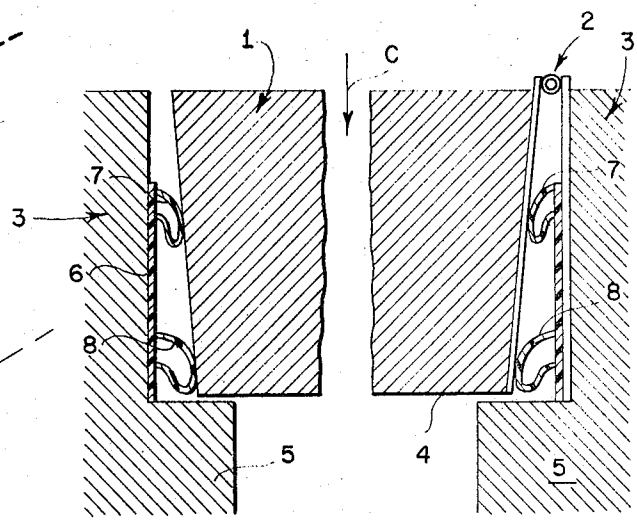


FIG. 2

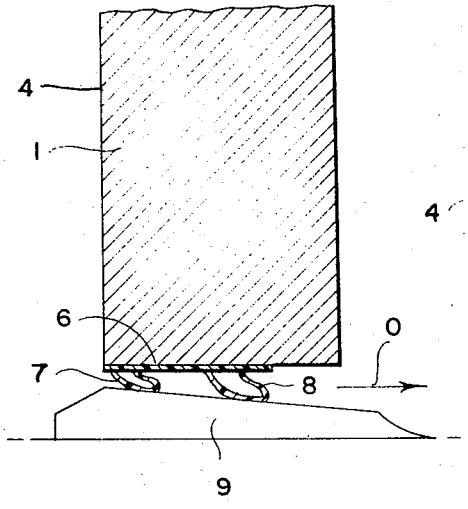


FIG. 3

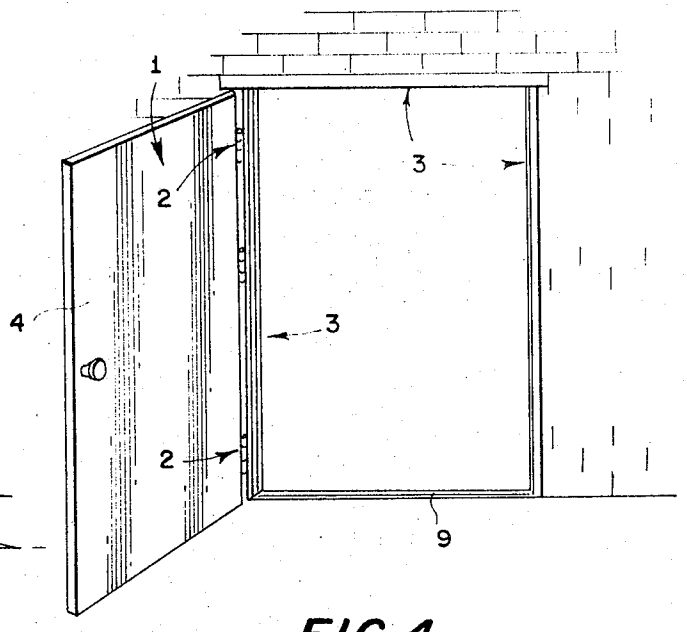


FIG. 4

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CLOSURE SEALING APPARATUS

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ABSTRACT OF THE DISCLOSURE

Closure sealing apparatus employing a gasket having a stiff backing strip and parallel resilient bubbles or loops integral therewith. The gasket may be mounted upon the frame surrounding the periphery of the closure with the bubbles projecting from the backing strip in the direction of closing of the closure, and mounted upon the bottom of the closure with the bubbles projecting in the direction of opening of the closure. Contact of the frame-mounted bubbles and the closure is restricted to the periphery of the closure. When the frame is provided with a latch cutout, one of the bubbles may be interrupted but not the other. Bevelling of the closure edges facilitates closing and opening of the closure while retaining a good seal.

BACKGROUND OF THE INVENTION

This invention relates to closure sealing apparatus, and, more specifically, to sealing constructions adapted for such purposes as enabling the effective acoustical and/or weather stripping of doors and similar structures.

For many decades numerous different types of sealing gaskets, resilient strippings, weather linings, and the like have been applied to windows, doors and similar closures to enable the space and cracks between the closure and the frame receiving the same to be effectively closed off, blocking the entry or escape of air carrying with it acoustic energy or temperature variations. In the particular case of sealing devices suited to sound-proof closure various types of air-containing compressible gaskets have been employed along the peripheral borders of the closure and/or its frame. A very successful arrangement of this character is described, for example, in U.S. Letters Patent No. 3,059,287, issued Oct. 23, 1962, to Jordan J. Baruch and Bill G. Watters for "Apparatus for and Method of Sound-proof Closure Sealing," assigned to the assignee of the present application, Bolt Beranek and Newman Inc. In such systems, tubular gaskets are interposed between the closure and frame and are expanded by mechanical means after the closure has been seated within the frame. Such highly effective sealing operation, however, requires the use of rather complicated and costly internal mechanisms for expanding and retracting the gaskets which, in the case of inexpensive sound-proof closures, is not feasible of attainment. Other prior art gaskets have almost without exception been mounted, at least in part, against stops bordering the inner ends of the frame, such gaskets becoming compressed as the closure is brought into abutment thereagainst. Unfortunately, however, the act of closing the door requires the compressing of the complete gasket at one time, requiring considerable pressure or force to effect the closure and tending, in use to warp the door as a result of this force. Any warpage in the door or other closure, moreover, may prevent complete sealing; and, instead, in the case of doors or other closures operating within frames that do not have peripheral stops, such gaskets are highly ineffective.

BRIEF DESCRIPTION OF THE INVENTION

An object of the present invention, accordingly, is to provide a new and improved and highly inexpensive, although effective, closure-sealing apparatus that shall not be subject to any of the above-described disadvantages; but that, rather, shall enable the effective closing of closures with minimal force, with highly effective sealing completely about the closure and irrespective of irregularities in the closure edges or the frame surfaces, and that exerts no damaging or other warping forces upon the closure structure itself.

Another object of the present invention is to provide closure sealing apparatus of the foregoing character which provides sealing at multiple regions along the same edges of the frame and closure to increase the sound transmission loss and which simplifies sealing conditions at the location of the closure latch.

A further object is to provide a novel door seal and the like.

Other and further objects will be explained hereinafter and will be more particularly pointed out in the appended claims.

In summary, however, the invention contemplates apparatus for sealing a closure, such as, for example a door, within a frame of predetermined depth corresponding at least substantially to the width of the closure and having, in combination, gasket means comprising a stiff backing strip and spaced resilient bubbles or loops integral therewith and folded back over the backing strip along one side thereof to provide a pair of enclosure air spaces. The width of the gasket means is preferably less than that of the closure, and the gasket means is mounted by its backing strip upon predetermined peripheral edges of the closure and/or the surrounding peripheral edges of the frame within which the closure is received. The loops of the gasket means mounted on the frame and those on the closure edges respectively project in the direction of closing and opening of the closure. The frame-mounted gasket terminates short of the frame stop, or, more generally, short of the edge of the frame surface that becomes aligned with the forward edge of the closure when it is fully closed within the frame. Preferred constructional details are hereinafter set forth.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in connection with the accompanying drawings, illustrating a preferred and exemplary embodiment of the invention, and wherein:

FIG. 1 is a perspective view illustrating gasket means in accordance with the invention applied to a door jamb and showing the sealing conditions in the region of the latch cutout;

FIG. 2 is a contracted horizontal sectional view illustrating the cooperation of frame-mounted gasket means with a door closed against a door stop;

FIG. 3 is a vertical sectional view illustrating a detail of the seal at the bottom of the door; and

FIG. 4 is a perspective view illustrating an example of a type of door to which the invention may be applied.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings, the invention is illustrated in connection with its application to doors and door frames although it is to be understood that the novel features herein may similarly be applied to other types of closures where similar results are desired. A door 1 is shown pivotally mounted, by means of hinges 2, in a door frame 3 of depth corresponding substantially to the door thickness and that, in this example, is provided with a peripheral stop 5. When the door 1 is fully closed and

thus received within the frame **3**, its peripheral edges are surrounded by corresponding edges of the frame, with a marginal portion of one side of the door abutting against the stop **5**. The stop may have portions at the sides and top of the door engaging corresponding marginal portions of one face **4** of the door.

Unlike some of the above-mentioned prior art gaskets that extend along the region of the stop surface facing the said marginal edge portions of the door and that require considerable force to effect sealed closure and that also exert warping forces upon the door structure itself, the present invention effects sealing completely between the peripheral edges of the door and the corresponding surrounding edges of the frame. The gasket means itself is shown comprising a backing strip **6** and a pair of resilient longitudinally extending bubbles or loops **7** and **8** each enclosing an air space therewithin. In the preferred form the gasket is a dual-hardness extrusion, of plastic such as polyvinyl chloride for example, with the resilient bubbles **7** and **8** integral with and extending from the relatively stiff backing strip **6** at one side thereof. The base strip material may be 80 Durometer ±5, Shore D reading, while the more flexible bubbles may be 70 Durometer ±5, Shore A reading. The bubbles are generally U-shaped with legs which are spaced apart where they join the backing strip and which converge away from the strip. The bubbles project away from and transversely along the strip in one direction so as to overlap the strip cantilever fashion. The shape of the bubbles and their inclination provide greater flexibility away from the base strip and promote effective sealing and ease of closure movement.

Gaskets are preferably mounted upon the sides of the frame, as shown in FIG. 2, and also upon the header of the frame, with the bubbles projecting along the backing strip in the direction C of closing of the door. A gasket is preferably also mounted upon the bottom edge of the door as shown in FIG. 3, with the bubbles projecting along the backing strip in the direction O of opening of the door. The space between the peripheral edges of the door and the surrounding edges of the frame (including the threshold 9) is predetermined so that in the closing of the door the side and top edges of the door engage the frame-mounted gaskets and compress the bubbles somewhat, while the theshold engages the door-mounted gasket and similarly compresses the bubbles thereof. For ease in closing the door the side and top door edges are preferably bevelled to provide increasing space approaching the door stop **5**, and the threshold is preferably bevelled to provide increasing space in the direction of opening of the door. The gasket loops **8** located in the wider portions of the space are somewhat larger to ensure the desired seal.

The width of the gaskets (measured in the direction of thickness of the door) is less than the thickness of the door. The side and top gaskets may be mounted upon the frame with one edge of the backing strip abutting the door stop, the bubble adjacent to the stop being positioned upon the backing strip so as to terminate short of the door stop even when the door is closed. Any suitable fasteners, such as nails or screws or adhesive, may be used to secure the backing strip to the frame or the door.

As the door is closed, the peripheral side and top edges of the door will gradually ride along the tapered loops, gradually compressing the same resiliently, and the marginal portion of the forward face of the door will proceed beyond the compressed loops and abut against the stop. At the bottom of the door the loops or bubbles will engage the inclined surface of the threshold and become gradually compressed. The compressed loops will thus effect sealing within the peripheral edge of the frame, exerting no pressure against the lateral sides of the door.

It will be noted that to pass this seal airborne sound will have to penetrate two double layers of resilient gasketing material provided by the walls of the partially

collapsed loops, as distinguished from the single layer of mere open weather stripping flaps and the like that have previously been employed. In addition, because of the construction of the gasket, again as distinguished from mere weather stripping flaps, each individual point longitudinally along the resilient gasket will be substantially independently compressed and acted upon by adjacent points of the door edge or threshold. This provides for independent sealing at each successive point and obviates the mass bending of a large section of flaps that occurs with weather stripping flaps and consequently enables gaps to result. The gasket design is thus one which is very nearly point reacting, at least much more so than most gaskets; that is, the point-to-point compliance in the horizontal direction is large so that if there is a bump on the edge of the door, the seal closes well around that bump without leaving a large hole.

In view of the sealing action between the front and rear surfaces of the door and of the frame, the present invention is equally useful with closures that have no peripheral stops, strips or other means. In addition, the invention enables use of the same gasket on all edges of the frame of the door and also permits effective use with door thresholds. Corners present no problem, because the gasket strips are merely abutted.

The invention is especially useful in providing a solution to the plaguing problem of sealing the region of the latch of the door, which may be of the conventional type including a bolt which is spring-projected from a side edge of the door into a recess or cutout in the adjacent edge of the frame.

As in FIG. 1, the latch cutout **10** may interrupt one of the bubbles, **7**, of the gasket strip, but not the other. Thus there is no interference with the operation of the latch and yet sufficient seal is provided by the uncut bubble at the region of the latch cutout.

The novel construction of the invention has been proven to provide very effective acoustical sealing on many different types of closures used in conjunction with precisely the same type of gasket.

Further modifications will also occur to those skilled in the art and all such are considered to fall within the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. Apparatus for sealing a closure within a frame, said closure having peripheral edges defining the outer periphery thereof and surrounded by corresponding peripheral edges of said frame when said closure is closed, said apparatus having, in combination, gasket means comprising a base portion and a pair of resilient longitudinally extending loops spaced in the direction of the thickness of said closure, each loop enclosing an air space, said base portion being mounted upon at least one peripheral edge of said frame with said loop projecting therefrom in the direction of closing of said closure, said loops terminaing short of the frame surface that abuts with the forward face of the closure when fully closed within the frame, the spacing between said one peripheral edge of the frame and the corresponding peripheral edge of the closure being such that said loops are engaged by said closure and compressed thereby as the closure is closed within the frame, the edge of said closure engaging said loops being bevelled away from the corresponding edge of said frame to provide increased space between such edges adjacent the forward face of the closure, one of said loops being adjacent to said forward face and being larger than the other loop.

2. The apparatus of claim **1** wherein said one edge ceiving means interrupting one of said loops, but not the other.

3. The apparatus of claim **1**, said base portion comprising a flat strip integral with said loops.

4. The apparatus of claim **1**, one of said loops being

adjacent to the frame surface that abuts with the forward face of the closure but terminating short of that surface.

5. The apparatus of claim 1, each of said loops comprising legs spaced apart at and affixed to said base portion, the legs of each loop extending transversely along said base portion as well as away from said base portion and converging away from said base portion.

6. The apparatus of claim 1, wherein said gasket means is a dual-hardness plastic extrusion, said base portion is a stiff backing strip of said extrusion, and said loops comprise bubbles extending obliquely from one side of said backing strip integrally therewith.

7. The apparatus of claim 6, wherein each said bubble is substantially U-shaped and has legs secured to said backing strip in spaced relation and extending laterally away therefrom in substantially the same direction, the bubbles extending transversely along said backing strip predominantly in a single direction.

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