

Feb. 24, 1970

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3,496,676

DOOR SEAL CONSTRUCTION

Filed Oct. 29, 1968

3 Sheets-Sheet 1

FIG. 3

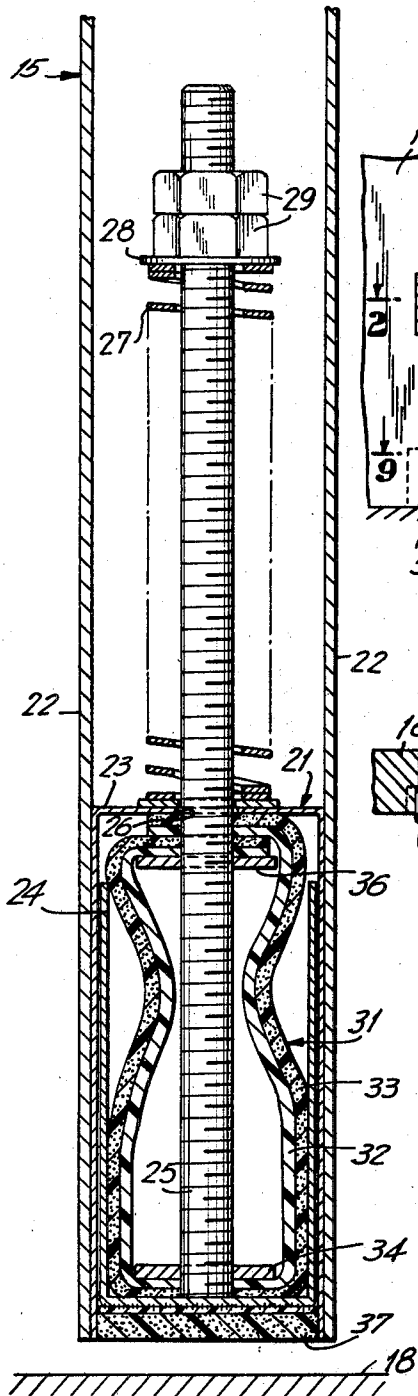


FIG. 1

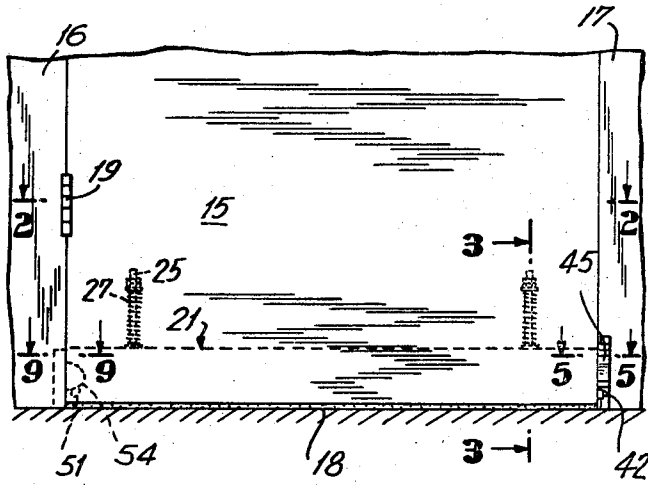
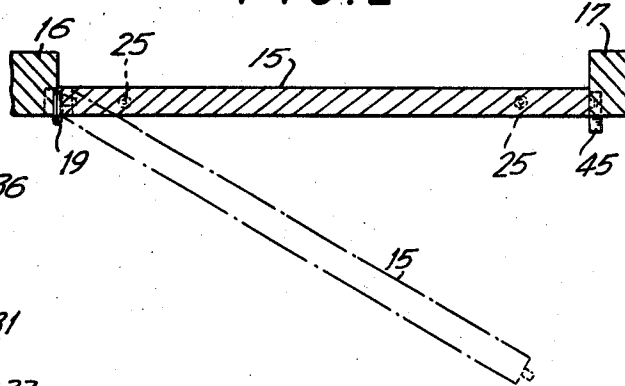


FIG. 2



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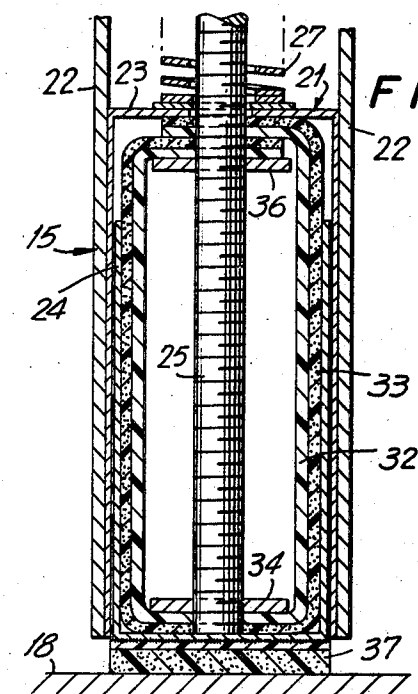


FIG. 4

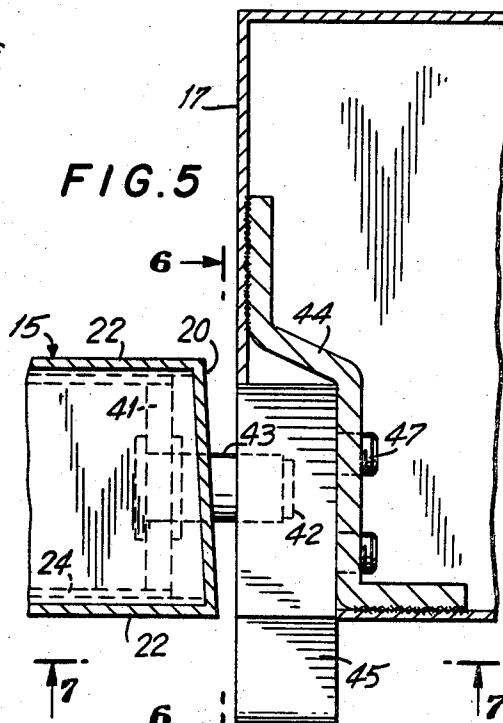


FIG. 5

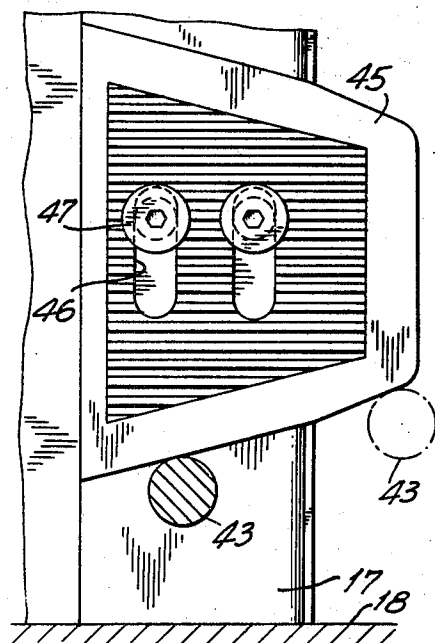


FIG. 6

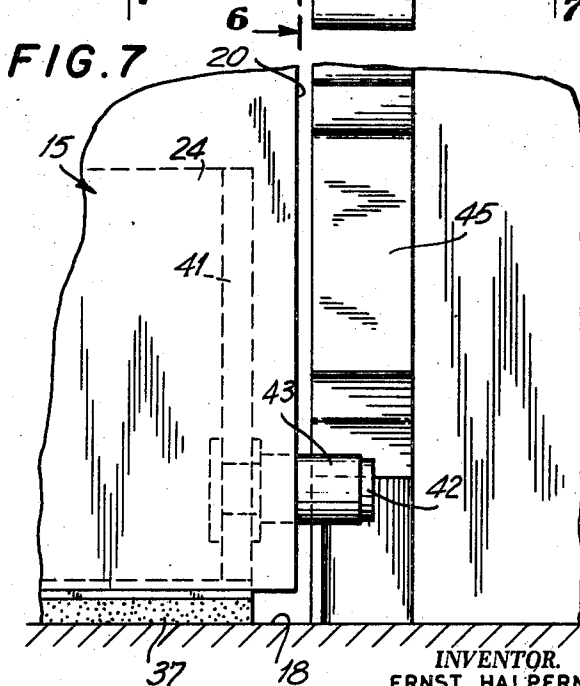


FIG. 7

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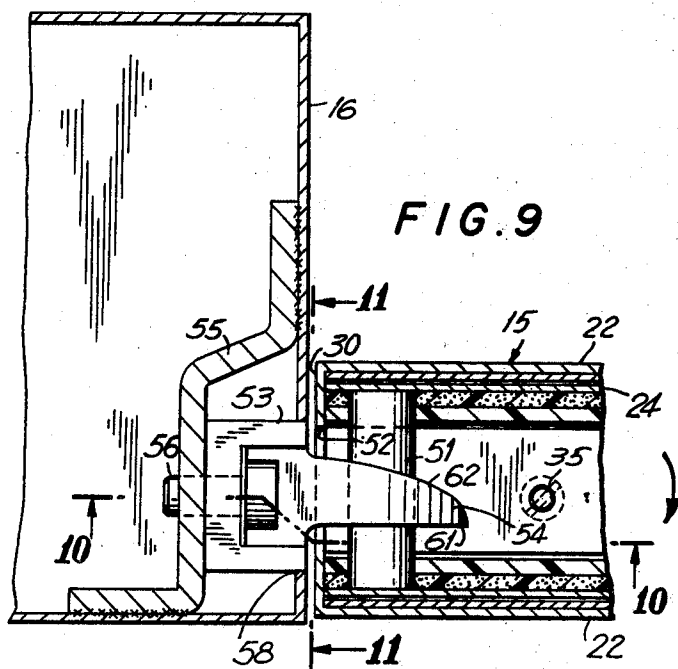


FIG. 8

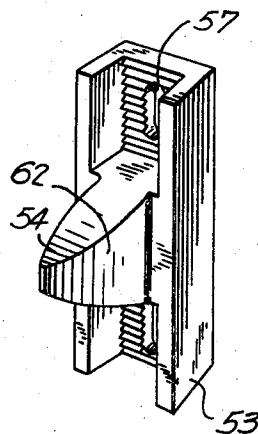
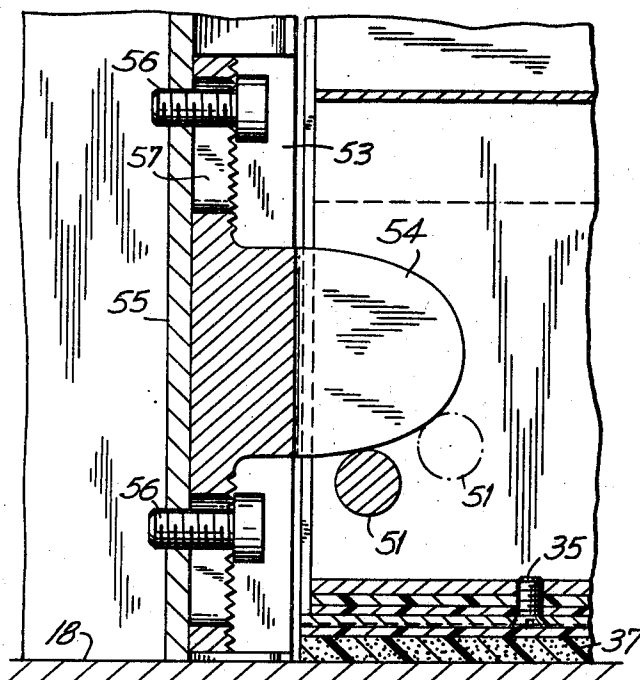
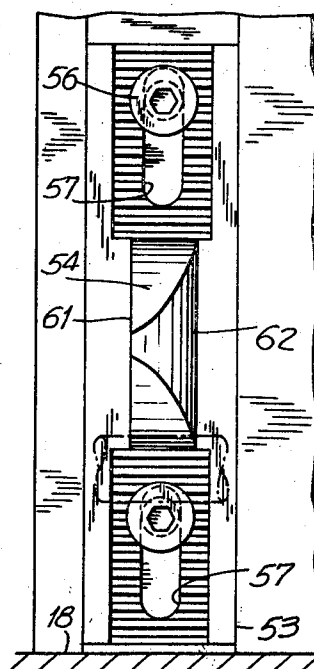


FIG. 11



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3,496,676

DOOR SEAL CONSTRUCTION

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Int. Cl. E06b 7/20

U.S. Cl. 49—307

10 Claims

ABSTRACT OF THE DISCLOSURE

A door seal carried within a door and extendible on closing of the door into engagement with portions defining the door opening, and particularly the floor, to effect a substantially soundproof seal. A principal feature is the provision of a tube joining fixed and movable parts and extendible in accordion-like fashion for blocking the sound that would otherwise travel through the sealing unit.

Background of the invention

This invention relates generally to a door seal and to the construction thereof. Door seals are well known in the art and are used for both insulating and soundproofing purposes. It is also known in the art to provide a movable seal actuated when the door is closed into abutment with a fixed surface, usually the floor.

However, in soundproofing a door, one of the weakest links has been the seal between the door and the floor. Especially where the floor at the door is flush or without a sill, the seal must be capable of movement away from the floor when the door is opened in order that the door may swing freely and must be capable of advancement into engagement with the floor when the door is closed. Providing a seal capable of functioning in such manner has generally forced a compromise in the soundproofing quality of the seal and thus, while the door itself and the seal at the jambs can be made to minimize sound transmission, a substantial loss in soundproofing has generally taken place at the seal with the floor.

Summary of the invention

Generally speaking, in accordance with the invention, a unit is provided within the door proximate to the floor which is advanced into engagement with the floor when the door is closed to thereby effect a tight seal with the floor to minimize sound transmission. In order to minimize sound transmission between the movable units and the door to which it is mounted, the movable unit and door have a flexible sheet or tube connected therebetween which acts as a sound barrier and which can expand and contract in accordion-like fashion.

Accordingly, it is an object of this invention to provide a door seal of improved construction.

Another object of this invention is to provide an improved door seal which is substantially soundproof.

A further object of the invention is to provide a door seal movably mounted on a door with means cooperating between the movable seal and the door to prevent sound transmission therethrough.

Still another object of the invention is to provide improved means for actuating a door seal upon closure of the door.

Still other objects and advantages of the invention will in part be obvious and will in part be apparent from the specification.

The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

Brief description of the drawings

For a fuller understanding of the invention, reference is had to the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a partial elevational view of the lower portion of a door incorporating a seal constructed in accordance with a preferred embodiment of the instant invention.

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a sectional view, at an enlarged scale, taken along line 3—3 of FIG. 1;

FIG. 4 is a partial view similar to FIG. 3 but showing the seal advanced into engagement with the floor;

FIG. 5 is a sectional view, at an enlarged scale, taken along line 5—5 of FIG. 1;

FIG. 6 is a sectional view taken along line 6—6 of FIG. 5;

FIG. 7 is a partial sectional view taken along line 7—7 of FIG. 5;

FIG. 8 is a perspective view of a cam element for operating the seal of the preferred embodiment;

FIG. 9 is a partial sectional view, at an enlarged scale, taken along line 9—9 of FIG. 1;

FIG. 10 is a partial sectional view taken along line 10—10 of FIG. 9; and

FIG. 11 is a partial sectional view taken along line 11—11 of FIG. 9.

Description of the preferred embodiment

Referring now to FIGS. 1 and 2, a door 15 is mounted in an opening defined by a hinge jamb 16, a strike jamb 17 and floor 18. One of the hinges securing the door to the hinge jamb is indicated as 19 and the door swings between the closed position shown in solid lines in FIG. 2 and an open position represented by phantom lines in FIG. 2. Carried within door 15 is a sealing mechanism indicated generally at 21 which has a lower portion for closely engaging floor 18 when the door is in the closed position.

Sealing mechanism 21 is more particularly shown in FIGS. 3 and 4. The sealing mechanism of the instant invention is especially suitable for mounting in the commercial type of hollow metal door having skins 22 which form the faces of the doors and internal spacers and reinforcements (not shown), all as well known in the art. A downwardly opening channel member 23 is secured to skins 22 by any suitable means, such as by welding, and channel member 23 serves to mount the sealing mechanism within the door and also acts as a spacer and reinforcement for skins 22 proximate to the lower edge of the door.

An upwardly opening channel member 24 is closely received within channel member 23 for relative telescoping action therebetween. Channel members 23 and 24 extend substantially the full width of the door to provide a seal along the entire width of the door. At least two studs 25 are secured to the bottom of channel member 24 and project upwardly through a clearance aperture 26 through the base of channel member 23. A spring 27 surrounds each stud 25 and acts between channel member 23 and a washer 28 on stud 25 limited by nuts 29. Spring 27 thereby applies a biasing force from fixed channel member 23 to movable channel member 24 through studs 25 to bias the movable channel member to a withdrawn position within the fixed channel member. The withdrawn position is shown in FIG. 3.

In hollow metal doors of the type disclosed herein, the soundproofing qualities can be enhanced by filling the door with an insulating or sound absorbing medium. To provide the same beneficial effect, a sound arresting

curtain barrier is provided within channels 23 and 24. The sound arresting barrier is indicated at 31 and consists of a sheet of flexible material which is secured to the base of both channel members. The material shown which has proven to be extremely satisfactory is a double layer sheet of leaded vinyl 32 with a foam backing 33. An intermediate portion of sheet 31 is secured to the base of channel member 24 and held thereagainst by means of a plate 34. Plate 34 is secured to the channel member by any suitable means such as screws 35 shown in FIG. 10. In order that sheet 31 forms a complete, closed tube, the ends thereof overlies one another in engagement with the inner surface of channel member 23 and the ends of the sheet are secured in contact with the channel member by a plate 31 through suitable screws (not shown) or other means. As shown in FIG. 3, the developed size of the sound arresting barrier or tube 31 is greater than required in order to extend between the bases of channel members 23 and 24 when channel member 24 is in the withdrawn position. This imparts an accordion effect to tube 31. In operation of the door seal, channel member 24 is caused to move outwardly to an extended position shown in FIG. 4 and the accordion effect of tube 31 permits the outward movement of channel member 24. It has been found desirable to adhere to the outer surface of the base portion of channel member 24 a sheet 37 of the leaded vinyl material with foam backing with the foam backing facing outwardly so as to engage floor 18 and compensate for irregularities when channel member 24 is advanced toward the door. It will, of course, be understood that the advanced position of channel member 24 as shown in FIG. 4 occurs when the door is closed and the withdrawn position shown in FIG. 3 occurs when the door is not closed. Withdrawal of channel member 24 into the door is as a result of the construction heretofore described under the biasing action of springs 27. The means for advancing channel member 24 towards the floor will now be described.

Means are provided at the opposite ends of sealing mechanism 21 for advancing both ends of the sealing mechanism toward the floor as the door is closed. The means at the strike jamb side is best shown in FIGS. 5 through 7. As best seen in FIG. 5, a plate 41 is secured, such as by welding, across the legs of channel member 24 at the jamb side of door 15. Secured to plate 41 is a pin 42 having a roller 43 mounted thereon. A suitable vertical slot is provided in the side edge 20 of door 15 through which pin 42 and roller 43 projects for vertical movement. A suitable bracket 44 is secured to strike jamb 17 and has mounted thereon a cam plate 45, the configuration of which is best seen in FIG. 6. Cam plate 45 is provided with a pair of slots 46 through which extend screws 47 which adjustably secure the cam plate to the strike jamb. Roller 43 acts as a cam follower which guides along the lower surface of cam 45. When the door is open, the sealing mechanism will be withdrawn within the door and roller 43 will be in a raised position. As the door is closed, roller 43 approaches cam 45 and initially makes contact therewith at the phantom line position of roller 43 shown in FIG. 6. As the door is advanced to the fully closed position, roller 43 will be driven downwardly toward the full line position shown in FIG. 6 carrying with it channel member 24 to advance one side of the sealing mechanism toward the floor. In the fully closed position, roller 43 will have driven sheet 37 into engagement with floor 18 as seen in FIG. 7. The position of cam 45 is adjustable through screws 47 to properly adjust the advanced position of the sealing mechanism. It will be readily understood that, as the door is opened, the sealing mechanism will be biased upwardly by springs 27 to the retracted position when roller 43 is no longer under the control of cam plate 45.

The advancing mechanism on the hinge jamb side is best seen in FIGS. 8 through 11. A pin 51 is secured be-

tween the legs of channel member 24 proximate to side edge 30 of the door. A slot 52 is provided in the side edge 30 for access to pin 51 by the actuating mechanism. The actuating mechanism is best seen in FIG. 8 and consists of a support 53 from which projects a cam 54. Hinge jamb 16 has secured thereto a bracket 55 to which support 53 is mounted by suitable screws 56 projecting through slots 57 in support 53. The slots provide means for adjusting the position of cam 54 on bracket 55. An opening 58 is provided in hinge jamb 16 for receiving support 53 whereby the support is recessed in the hinge jamb with cam 54 projecting therefrom.

The closed position of door 15 is depicted in FIGS. 9 and 10. Cam 54 extends inwardly of the door in engagement with pin 51 by which the sealing mechanism, at the hinge side, is advanced into engagement with floor 18. Adjustment of cam 54 to the proper position for causing the sealing mechanism to engage the floor is controlled through screws 56 and slots 57. As the door is opened by swinging same in the direction of the arrow indicated in FIG. 9, side edge 30 is caused to move away from hinge jamb 16 thereby effecting withdrawal of cam 54 from its position within the door through slots 52. As the door is opened, pin 51 guides along cam 54 as shown in phantom lines in FIG. 10 with the upward bias on the sealing mechanism being provided by springs 27.

Of course, it will be understood that the advancement and the retraction of the sealing mechanism via cams 45 and 54 occurs simultaneously as the door is closed and opened.

In a preferred arrangement, cam 54 is provided with a relatively flat face 61 for the hinged side of the door and a curve face 62 on the opposite side to aid entry of cam 54 into the door through slot 52 as the door moves in an arc on a relatively small radius toward the closed position.

With a door seal constructed in accordance with the above disclosed preferred embodiment, tests have established that substantially no sound transmission occurs through the seal located at the bottom of the door. Controlled tests were conducted to determine the amount of sound transmission through a door which had been caulked for complete sealing and through the same door which utilized at the bottom thereof a seal constructed in accordance with the instant invention. The difference in sounded transmission was immeasurable and thus a seal constructed in accordance with the instant invention is capable of providing an absolute sound barrier between the door and the floor.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above construction without departing from the spirit and scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A sealing mechanism for a door carried by a door frame comprising a fixed member mounted to the door, a movable member movable with respect to said fixed member between an advanced and a retracted position, first means acting between said fixed and movable members for moving said movable member to said retracted position, second means carried by said door frame and said movable member for moving said movable member to said advanced position, and a sound arresting barrier extending between said fixed and movable members for reducing sound transmission through said sealing mechanism without interfering with the movement of said movable member between said advanced and retracted positions.

2. A sealing mechanism as claimed in claim 1 wherein said sound arresting barrier comprises a length of flexible material having a first portion thereof connected to said fixed member and a second portion thereof connected to

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said movable member, the distance along said flexible material between said portions thereof connected to said fixed and movable members being sufficiently great to permit full advancement of said movable member, said length of material being capable of being flexed to permit movement of said movable member to said retracted position.

3. A sealing mechanism as claimed in claim 2 wherein said length of flexible material is in the form of a tube having opposite portions thereof connected to said fixed and movable members.

4. A sealing mechanism as claimed in claim 2 wherein said length of flexible material is comprised of leaded vinyl with a foam backing.

5. A sealing mechanism as claimed in claim 2 wherein said length of flexible material has end edges, said end edges being overlapped and forming one portion of said length of flexible material connected to one of said fixed and movable members, the other portion of said length of flexible material connected to the other of said fixed and movable members being substantially intermediate said end edges.

6. A sealing mechanism as claimed in claim 1 wherein said fixed member comprises an outwardly opening channel member slidably received in said outwardly opening movable member comprising an inwardly opening channel member slidably received in said outwardly opening channel member, said first means comprising spring biased means acting between said two channel members for biasing said inwardly opening channel member to a withdrawn position within said outwardly channel member, said second means comprising actuating means carried by said door frame and cooperating means carried by said inwardly opening channel for actuation by said actuating means as said door is closed to advance said inwardly opening channel member outwardly of said door against the biasing of said spring means.

7. A sealing mechanism as claimed in claim 6 wherein said sound arresting barrier comprises a length of flexible material and further including means for securing one portion of said flexible material to said outwardly opening channel member and separate means for securing

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another portion of said flexible material to said inwardly opening channel member.

8. A sealing mechanism as claimed in claim 6 wherein said cooperating means includes a pin secured to one end of said inwardly opening channel member and having its longitudinal axis parallel to the longitudinal axis of said inwardly opening channel member, said pin extending beyond the side edge of said door, and said actuating means includes a cam element secured to said door frame and adapted for cooperation with said pin as said door is closed.

9. A sealing mechanism as claimed in claim 6 wherein said cooperating means includes a pin secured to said inwardly opening channel member proximate to one end thereof, the longitudinal axis of said pin extending substantially perpendicular to the longitudinal axis of said inwardly opening channel member, said actuating means including a cam member secured to said door frame from one side thereof and extending generally toward the other side of said door frame, said cam member adapted for cooperation with said pin as said door is closed, the side edge of said door having an opening therein for permitting entry of said cam member to a position within said door as said door is closed.

10. A sealing mechanism as claimed in claim 9 wherein said cam has a face which is substantially vertically oriented and which faces away from the side toward which said door opens, said face being generally curved in the same direction as an arc described by the door as it opens and closes.

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