April 23, 1963 R. LAPOF 3,086,261

FLOOR SEAL

Filed June 13, 1961 2 Sheets-Sheet 1

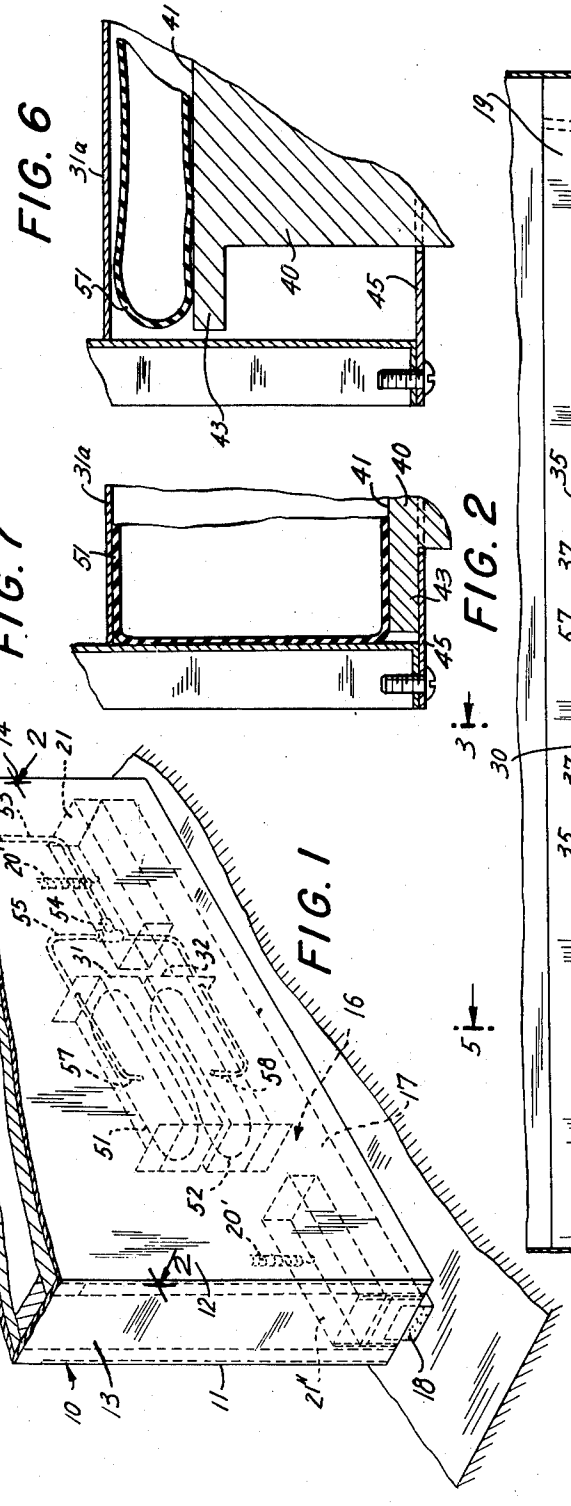

FIG. 1

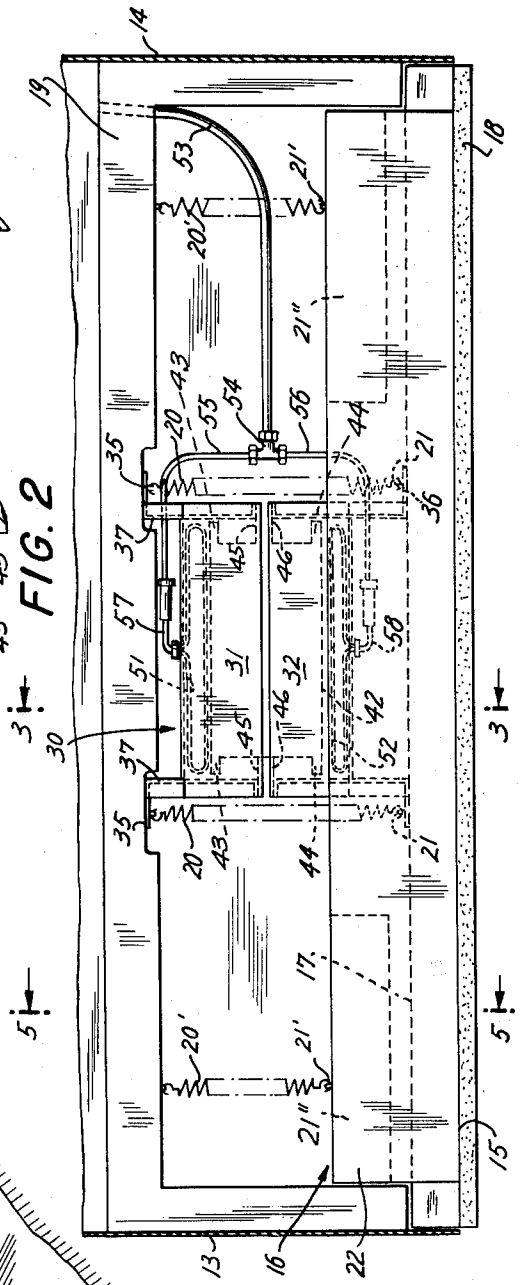

FIG. 2

FIG. 6

FIG. 7

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FIG. 3

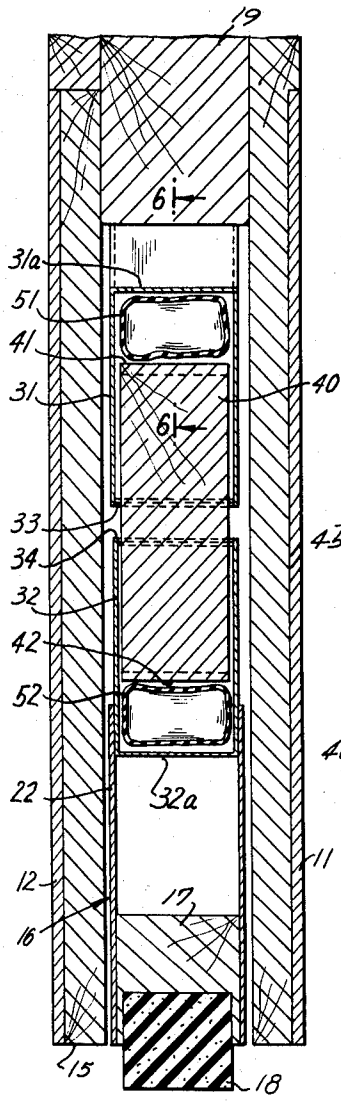


FIG. 4

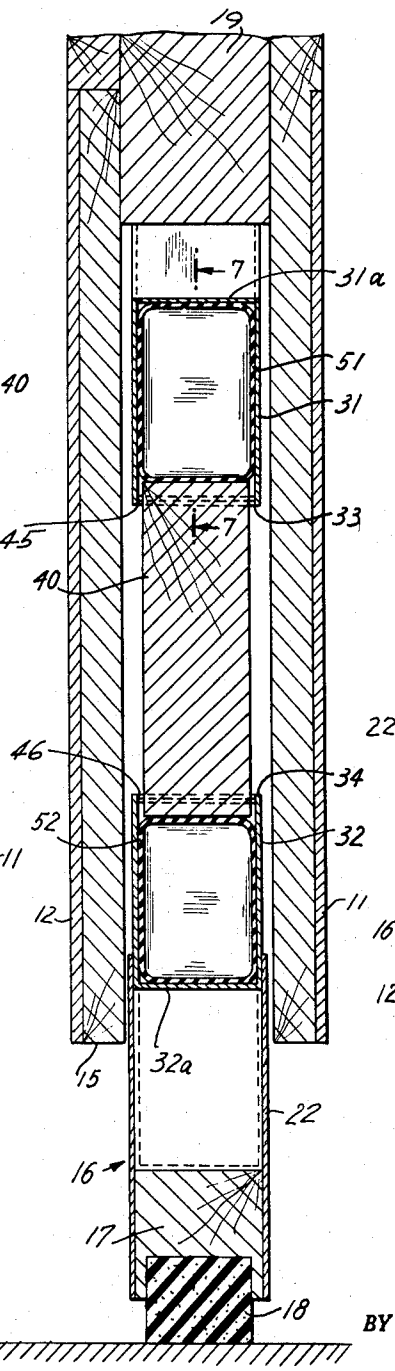
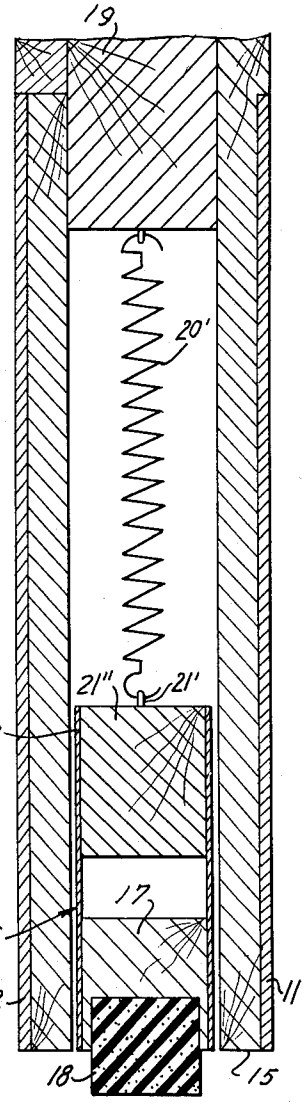


FIG. 5



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3,086,261

FLOOR SEAL

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Filed June 13, 1961, Ser. No. 116,735
6 Claims. (Cl. 20—68)

This invention relates to folding partitions or doors, and more particularly to seals for such doors or folding partitions, to span the space between the lower door edge and the floor. More particularly, this invention relates to pneumatically depressed floor seals and particularly for floor seals required to be projected a considerable distance beneath the lower edge of the door and to floor engaging contact.

This invention is a continuation-in-part of my application Serial No. 6,933, filed February 5, 1960, and entitled Folding Partition and Seal Therefor.

While my invention is described in connection with a single door or panel, it will be readily recognized that the same is adapted for use with a panel which is one of a series of panels such as disclosed in my aforesaid application and used for subdividing gymnasiums, auditoriums, banquet halls, and the like. In such installations, it is desirable to soundproof the divided space, so that a minimum of the sounds generated on one side of the partition are transmitted through the partition to the other separated space. Where the partition is suspended, so that the lower edge thereof is a considerable distance from the floor, for instance, a distance from two to three inches, it will be obvious that to secure a sealing effect, a floor seal must travel a distance approximately at least equal to the separation of the door edge and floor. In my co-pending application, I have illustrated and described a pneumatically actuated apparatus capable of projecting a seal into floor engagement of irregular or warped outline. While the seal structure therein illustrated constitutes a considerable advance over seal actuating mechanisms heretofore known, I have discovered, and it is an object of this invention to provide, an improved floor seal and actuating mechanism therefor. Particularly, this invention is adapted for use in instances where relatively thin panel members are employed and where the floor seals must be projected relatively greater distances than contemplated by my prior application.

As described in my prior application, floor seal articulation may be achieved by means of a pneumatically inflatable element confined within an expansion chamber having a shiftable wall element which is urged linearly out of the chamber upon expansion of the element. The linear movement aforesaid is, in turn, communicated to a downwardly shiftable floor seal. I have found for optimum efficiency and optimum life of the pneumatically inflatable element, that the vertical expansive distance to be secured through inflation of such element should be limited to the widthwise dimension provided between the sides of the panel structure. Thus, for instance, where the interior spacing of the lateral walls of an expansion chamber is 2", it is desirable to limit the vertical expansion of the pneumatically inflated element to a distance of 2". Failure to observe the relationship above noted, results in undue wear of the sides of the inflatable member against the walls of the expansion chamber and ultimately will result in a leak or destruction of the inflatable member. The use of inflatable members of accordion shape is undesirable from a cost standpoint and otherwise, since such structure will occupy considerable space in the retracted position of the floor seal and will be subject to wear and deteriorating influences from the factors previously described. It will be

readily recognized, therefore, that in a panel or partition structure, wherein a large seal deflection is desired, and where the panel width is relatively small, that a serious problem may arise in coping with stresses, displacement, and friction resistance in operating the seal members. Thus, for instance, if a 3" seal deflection is desired in a structure utilizing panels having only 1½" clearance between the inner panel walls, the use of a single inflatable member is not desirable.

Attempts by me to provide relatively large seal throw by stacking pneumatically inflatable elements, one on top of the other, have not provided a satisfactory solution. This is true because two pneumatically inflated elements often tend to inflate at different rates, and thus the entire deflection of the seal where two elements are employed, might be effected by expansion of but one of the elements, the other element retaining its uninflated condition. Obviously, the above described condition may result in bursting of the over-inflated element, or at best in undue wear on such element. Similarly, after repeated inflations, the elasticity of one or the other of the inflatable members may be reduced and a condition as above described may be obtained in which the entire downward deflection is caused by inflation of the element having reduced elasticity.

Accordingly, it is an object of this invention to provide a floor seal assembly, for use in combination with one or more doors or panels. A further object of this invention is to provide a floor seal actuator assembly particularly adapted to provide a long throw or deflection of the floor seal. Still a further object of this invention is to provide a floor seal assembly of the class described having the property of permitting a relatively great throw of the floor seal member, notwithstanding the confinement of the seal actuator assembly within a relatively narrow panel. Still a further object of this invention is to provide a floor seal actuating assembly utilizing a plurality of pneumatically expansible elements, wherein during each seal actuation, the elements are retarded from expanding beyond a predetermined desirable limit, which limit corresponds substantially to the widthwise expansion of the element thereby reducing unwarranted stresses on localized areas and assuring long life and uniform operation.

Still further objects of this invention will appear herein or be hereinafter pointed out in connection with the description of the accompanying drawings in which:

FIGURE 1 is a fragmentary perspective view of the lower portion of a door or panel, showing in phantom principal elements of the seal actuating device;

FIGURE 2 is a magnified section taken from line 2—2 of FIGURE 1;

FIGURE 3 is a magnified section taken from line 3—3 of FIGURE 2;

FIGURE 4 is a section similar to FIGURE 3, showing the position of the parts in the lowered condition of the seal;

FIGURE 5 is a section taken from the line 5—5 of FIGURE 2;

FIGURE 6 is a further magnified section taken from the line 6—6 of FIGURE 3;

FIGURE 7 is a section taken from the line 7—7 of FIGURE 4.

In accordance with my invention, a panel **10** which may be a single door unit, or may be one of a series of folding panels together forming a movable partition, comprises a generally hollow structure defined by side walls **11**, **12** and edge walls **13** and **14**. Beneath the lower edge **15** of the panel **10**, there is reciprocally supported a seal member **16**, the latter including a rigid supporting body **17** having at its lowermost portion a deformable strip

18 preferably comprising sponge rubber, or the like. A support strut 19 is spaced upwardly from and carried parallel to the lower edge 15 of the panel. The seal assembly 16 is springingly urged upwardly or out of the floor engaging position by tensioned coil springs 20, the upper ends of which springs are secured through the medium of appropriate anchoring hooks or eyes to the strut 19. The lower ends of springs 20 are secured through eyes formed in brackets 21 which are fastened to the body portion 17 of the seal 16. In addition, the tension springs 20' are secured at their upper ends to strut 19, the lower ends of said springs 20' being secured through eyes 21' carried by blocks 21'' between the opposed walls of skirt 22 which extends upwardly beyond the body portion 17 of the seal and closely adjacent the inner faces of the side walls 11 and 12 of the panel.

There is interposed between strut 19 and the seal assembly 16 a pneumatic expansion assembly now to be described in detail. The assembly 30 comprises upper and lower casings or expansion chambers 31, 32, respectively, which casings or chambers include composite open-mouthed portions 33, 34, respectively. In the illustrated embodiment, the chambers or casings are shown as generally rectangular in cross-section, but it will be readily understood that other cross-section configurations may be employed without departing from the spirit of my invention.

The upper casing 31 is optionally, but preferably, secured to strut 19 by screws or similar means which pass through casing support brackets 35. The brackets 35 and legs 37 depending therefrom, preferably maintain the casing 33 spaced apart from the strut 19 for purposes which will appear hereafter. The lower casing 32 is secured by depending brackets 36 to the rigid portion 17 of the seal member 16. It will thus be seen that the upper chamber 31 and lower chamber 32 are fixed respectively to strut 19 and seal 16 and that the substantially congruent mouth portions 33, 34 of the chambers 31, 32, respectively, are in diametrically opposed or mouth-to-mouth relationship.

A floating block member 40 of a height which somewhat exceeds the maximum desired seal throw or deflection is positioned so that its upper and lower faces 41 and 42, respectively, lie in the raised condition of the seal in spaced relation to the uppermost wall 31*a* of the upper bladder chamber and the lowermost wall 32*a* of the lower bladder chamber. As best seen in FIGURE 6, the block 40 is provided adjacent the extremities of its upper and lower edges 41 and 42, respectively, with extending ledge portions 43, 43, 44, 44, respectively. The upper and lower chambers 31, 32, respectively, are provided with paired inwardly extending abutments 45, 45, 46, 46, respectively, which are bolted or otherwise secured adjacent the mouth portions 33, 34, respectively. It will be readily recognized that paired abutments 45 will coact with ledge portions 43, 43 to prevent block 40 from being displaced from chamber 31. Similarly, paired abutments or clips 46, 46, will prevent the lower ledge portion 44, 44 of block 40 from passing outwardly through the mouth 34 of the lower chamber 32. By providing removably secured clips 45, 46, it is possible first to insert the block 40 in the upper and the lower chambers, and then to lock the same against displacement from said chambers. Also, in case of rupture of a bladder, the removability of clips 45, 46 provides access for replacement of the bladder.

There is interposed between the upper wall 31*a* of chamber 31 and the upper face 41 of block 40, a pneumatically expansible member 51, a similar pneumatically expansible member 52 being disposed between the lower face 42 of block 40 and the lower wall portion 32*a* of the lower chamber 32. Pneumatic members 51, 52 may comprise any number of known air impervious materials, neoprene rubber being a desirable example, and are preferably of a configuration to lie substantially flat when evacuated.

Members 51, 52 are connected to a supply hose 53 to a suitable source of air, not shown. The hose 53 leads to a T connection 54. Branches 55, 56 from said connection are being led respectively to input nipples 57, 58 of the members 51, 52, respectively.

In my aforesaid co-pending application, mechanism is described whereby, when it is desired to lower the floor seals, pressure in an input line is applied to the seal input connections. Likewise, for so long as the floor seals are desired to be retained in a down or a protracted position, pressure is maintained in the input line. When it is desired to have the seal raised to retracted position, then the panel pressure is relieved and the seal is urged upwardly under spring tension. The mechanism for introducing pressure into, or alternatively, relieving pressure from the input line, is fully described in the aforesaid application and a description thereof will not be repeated herein.

When the door is in the stored or opened position, or is moving from one to another position, the line 53 is at atmospheric pressure. When the door is shifted to the partitioning or closed position, air introduced into the line 53 gradually causes expansion members 51 and 52 to become inflated, such inflation being accompanied by a shifting of the door seal parts from the position shown in FIGURE 3 to that of FIGURE 4. It will be readily recognized that in the course of such movement, the block 40 will have been shifted downwardly within the chamber 31 by the expanding action of the member 51. Similarly, the expansion of the member 52 will shift the entire chamber 32 downwardly with respect to the block 40 and the seal 16 will thus have been depressed a distance which is the same as the vertical expansion component of the members 51 and 52. It should therefrom be noted that the vertical component of expansion applied by the members 51 or 52 is limited by the cooperative action of the clips or abutments 45, 45, 46, 46, against the ledges 43, 43, 44, 44 of the block 40'. The expansion limiting function of the abutments and ledges is important in that the downward component of movement provided by the members 51 and 52 is equalized to a degree and neither element 51 nor element 52 is permitted to expand beyond a desired degree. Thus, for instance, should element 51 present less resistance to inflation than element 52, then element 51 might, upon application of the pressure to the line 53, cause ledges 43, 43 of block 40 to be urged against abutments 45, 45, prior to any movement of the block 40 in the lower chamber 32. However, when ledges 43, 43 abut clips 45, 45, further expansion of element 51 is inhibited and the element 52 will thereupon be forced to expand, completing the lowering of the seal. From the aforesaid description, when the line 53 is open to the atmosphere, springs 20 and 20' will draw the seal 16 to the stored or upward position gradually as the air is evacuated from the members 51, 52.

It will be readily recognized that the extent of downward deflection of the seal with its tandemly propelling pneumatic components is in no wise limited in the invention heretofore described by the lateral spacing of the side panel walls. Also, no single pneumatically expansible member has been caused to stretch or extend throughout a locus sufficiently great to cause undue abrasion, expansive friction or wear, or unduly expand in localized areas. While my invention has been described and illustrated in conjunction with a floor seal depressed by two tandem independently expansible members, it will be obvious to those skilled in the art, in the light of the foregoing discussions, that more than two members may be utilized in order to achieve an even greater downward deflection where necessary.

Accordingly, what I claim is new and seek to secure by Letters Patent, is:

1. A sealing device for a door or the like having a recessed portion opening onto the lower marginal edge thereof comprising a seal member reciprocably mounted in said recess and shiftable outwardly therefrom, spring

means urging said seal member to retracted position within said recess and a composite pneumatic expansion assembly interposed between the upper edge of said recess and said seal member, said assembly including a first casing engaging said upper edge of said recess and having a downwardly directed open mouth portion, a second casing engaging said seal member and having an upwardly directed open mouth portion, a boundary block slidably supported in spanning relation of said casings, and a pair of pneumatically expansible members disposed in said first and second casings, respectively, between the upper face of said block and said upper edge of said recess, and the lower face of said block and said seal member, said expansible members having a common inflation source.

2. A sealing device for a door or the like having a recessed portion opening onto the lower marginal edge thereof comprising a seal member reciprocably mounted in said recess and shiftable outwardly therefrom, spring means urging said seal member to retracted position within said recess and a composite pneumatic expansion assembly interposed between the upper edge of said recess and said seal member, said assembly including a pair of expansion casings, each having parallel side walls, an end wall, and an open mouth portion opposite said end wall, said casings being positioned in mouth to mouth relation, a boundary block slidably supported in spanning relation of said casings, said block having opposed parallel wall portions each positioned adjacent an end wall of one of said casings, and normally flat, pneumatically expansible members interposed between said adjacent end walls of said casing and said wall portions of said block.

3. A device in accordance with claim 2 wherein said block and casings include cooperative abutment means positioned to limit movement of said wall portions of said block outwardly beyond said mouth portions of said casings.

4. A pneumatic seal device for sealing the space between the lower edge of a door and a floor comprising a seal member mounted for vertical shifting movement from protracted floor engaging to retracted floor released positions, spring means urging said seal member to said retracted position, and composite expansion means interposed between a fixed horizontal portion of said door and said seal member comprising a pair of open mouthed expansion chambers disposed in mouth to mouth relation, with their mouths in a horizontal plane, a flat pneumatically expansible member disposed in each said chamber, and a floating spacer block interposed between said chambers with opposed portions of said block forming a sliding mouth sealing wall for each of said chambers.

5. A device in accordance with claim 4 wherein said block and said chambers include cooperative means for restraining outward sliding movement of said block beyond the mouth portion of said chambers.

6. A device in accordance with claim 5 wherein said cooperative means includes extending portions on said block and abutment means extending in partial blocking relation of said mouth portion and in the path of movement of said extending portions of said block.

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