United States Patent

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[72] Inventor **Roger C. Follett**
Carson, Calif.

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[73] Assignee **Sprague Electric Company**
North Adams, Mass.

[54] **DOOR FOR A SHIELDED ENCLOSURE**
4 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** ..... **174/35 MS,** 49/477
[51] **Int. Cl.** **H05k 9/00**
[50] **Field of Search** 174/35.4, 35.2; 49/477

[56] **References Cited**
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Primary Examiner—Darrell L. Clay
Attorneys—Connolly and Hutz, Vincent H. Sweeney, James Paul O'Sullivan and David R. Thornton

ABSTRACT: A sliding door for a shielded enclosure is constructed with a pair of spaced panels and includes an expandable means, typically a bladder, which is disposed between the panels and is adapted to create a uniform sealing pressure of each panel against the door frame.

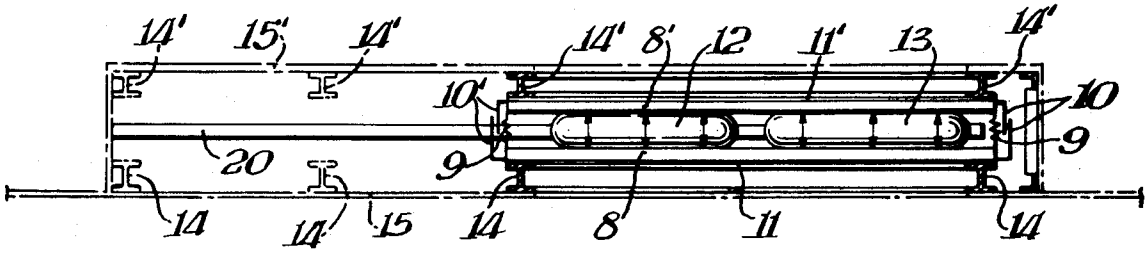


Fig. 1.

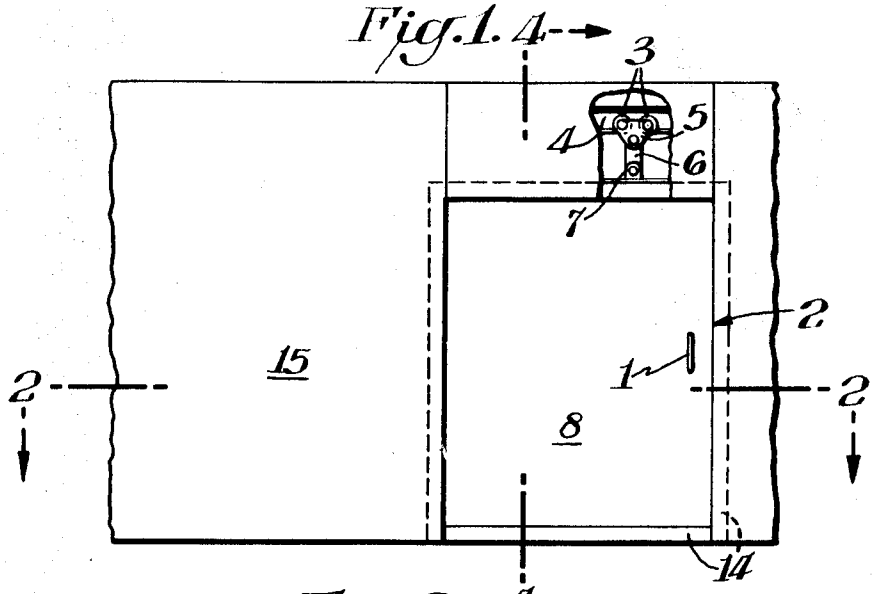


Fig. 2.

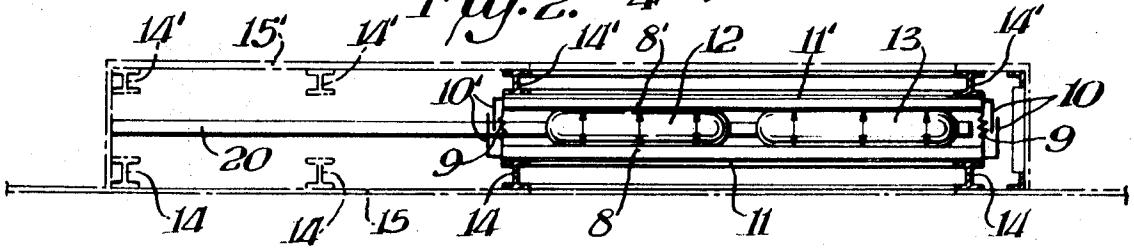


Fig. 4.

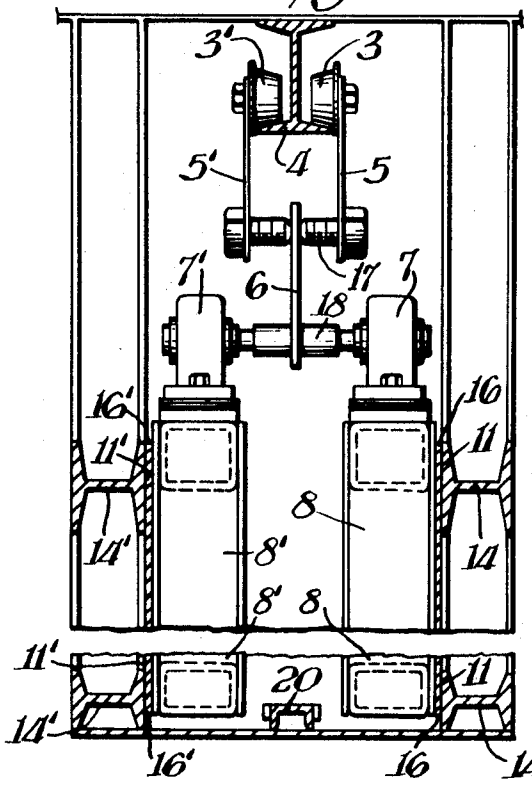
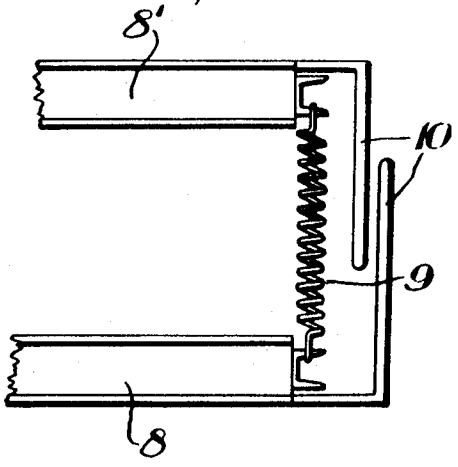


Fig. 3.



DOOR FOR A SHIELDED ENCLOSURE

BACKGROUND OF THE INVENTION

This invention relates to a shielded door closure for an opening in a shielded enclosure and, more particularly, to a sliding door assembly with expandable sealant means.

Shielded enclosures serve to protect an enclosed area from external electromagnetic energy or to contain and prevent emanation of electromagnetic energy from within the area. Openings to these enclosures are unavoidable and fitting a door for these openings presents the problem of maintaining electrical continuity between the door and the frame of the enclosure opening. Stating the problem another way, the resistance and reluctance path across the door frame should be as effective as the like path offered by the walls, ceiling and floor of the enclosure in preventing the entry or exit of electromagnetic energy.

Present door construction techniques generally utilize a shield panel, held in place by latches which press the door against the frame and exert pressure on a seal gasket or finger stock material placed around the periphery of the door seam. It is impossible, however, to maintain absolutely equal pressure along the door seam and, since the resistance and reluctance pressure at any given point along the seam will vary according to the pressure at that point, some magnetic and electrostatic leakage inevitably ensues, particularly the former. Since there is only one panel, such leakage constitutes an immediate contamination of the enclosure or dissipation of the energy source within the enclosure.

It is one object of the present invention to provide a door assembly utilizing an improved sealing means.

It is another object of the invention to provide a sliding door assembly having expandable panels for providing door-sealing means.

It is still another object of this invention to provide a dual panel sliding door which utilizes a bladder to laterally expand the panels into peripheral contact with spaced frame surfaces.

These and other objects of the invention will become apparent upon consideration of the specification and claims taken in conjunction with the drawing.

SUMMARY OF THE INVENTION

Broadly a shielded door closure in accordance with the invention comprises at least a pair of panels coupled together in a spaced relationship such that said panels are free to move in directions perpendicular to their surface; expandable means disposed between said panels for exerting a force on said panels to increase the distance therebetween; a pair of shielded guide walls in a substantially parallel relationship; means for supporting said panels between said guide walls and sliding them along said guide walls; and openings in said guide walls in which the immediate surrounding surface area of said opening overlaps said panel when said panel is slid in front of said openings.

In a more limited sense the door assembly consists of panels coupled together in a parallel relationship. A flexible bladder is arranged between the panels so that when air or other filler is fed into the bladder under pressure, the distance between the panels may be expanded thereby seating a uniform peripheral pressure at the mating surface of each panel and the abutting surface immediately surrounding said opening.

The advantage of using double panels is that each panel forms an electrical path across separate surfaces. Should there be leakage along the outside perimeter of one panel, the shielding along the second path across the other panel will effectively block this stray leakage. This is in contrast with a single panel closure wherein any leakage across the door clearance perimeter results in immediate contamination.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a frontal pictorial view of a sliding door assembly;

FIG. 2 is a cross-sectional view of FIG. 1 across line 2—2;

FIG. 3 is part of a cross-sectional view of FIG. 1 across line 2—2 showing the coupling in greater detail; and

FIG. 4 is a cross-sectional view of FIG. 1 across line 4—4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawings FIG. 1 shows the preferred embodiment of the shielded door 2 in a wall of a shielded enclosure. This particular enclosure is used to establish a low-impedance field. FIG. 2 is a cross-sectional view through line 2—2 of FIG. 1 showing panels 8 and 8' coupled together by a plurality of springs 9, 9' the details of which are shown in FIG. 3. Alternate means of coupling panels 8 and 8' could be slotted brackets connected by guide pins and having some degree of travel within the slots. Whether springs or brackets are used, the coupling must provide support between the two panels maintaining them in proper relationship. Brackets 10 and 10' prevent the panels from sliding apart in a lateral direction.

Panel 8 and 8' are steel plate and of approximately the same size. Panel 8 contacts surface 11 and panel 8' contacts surface 11' by means of gasket strips 16 and 16' respectively as shown in FIG. 4 which is a cross-sectional view of FIG. 1 across line 4—4. Each panel establishes an electrical connection with its opposing surface across the panel and along the entire perimetric extent of the panel. The quality of this connection is dependent upon the pressure applied at the edges of each panel. The gasket elements 16 and 16' are composed of ferromagnetic mesh strips, Sn/Cu/Fe, 1/4inch thick by 1 inch wide, which provide a seal of high conductivity and permeability.

Bladders 12 and 13 are contained in the space between the panels and, when inflated, provide an outward uniform pressure forcing each panel into intimate contact with their respective mesh elements. The bladders used in this particular embodiment are Goodyear dunnage bags inflated to a low air pressure of 10 p.s.i., however the bladder may be of any resilient material capable of holding a predetermined shape and pressure when expanded. The area of the door panel contacted by the bladder is many times greater than the area of the door in contact with the frame. Since it is well known that pressure is force distributed over an area, the large force produced by the bladder, when distributed over the smaller area at the frame, provides a higher pressure in pounds per square inch at the frame. Springs could be substituted for the bladders. Also pneumatic or hydraulic cylinders mounted between the panels and acting against the panels could be substituted for the bladders.

A structure for providing sliding longitudinal motion of the door is shown in the cutaway view of FIG. 1 and the cross-sectional view of FIG. 4. Wheels 3, 3' are free to roll on track 4 and support shaft 17 by means of connecting panels 5, 5'. Shaft 17 in turn supports connecting panel 6 which in turn supports rod 18 which is fastened to panels 8 and 8' by brackets 7 and 7' respectively. Brackets 7 and 7' support panels 8 and 8' in a vertical position while allowing movement of the panels in a direction perpendicular to their surface. The door 2 may be slid along track 4 in a longitudinal direction by applying a force to handle 1. Guide strips 14, 14' and 20 keep the door positioned in a vertical plane and are attached to guide walls 15, 15' and the floor respectively. The advantage of such a structure is that a double-panelled door may be slid while in a vertical position with the panels free to move in directions away from or closer to each other.

In an alternate embodiment of the invention the pair of guide walls 15 and 15' could constitute elements of two separate shielded enclosures, one entirely within the other and insulated from the other. In such case the coupling means between the panels would have to be of insulative material.

While the panels and guide walls in the preferred embodiments are steel, the panels and guide walls could be made of other ferrous materials; both could be copper or any good conductor or, alternatively, the panels could be a combination of former and latter materials. The gasket strips, instead of being fixed to the panel perimeters, might be placed on the

edges of the frame surface in the area wherein the panels are to be seated.

The advantage of the invention in using parallel double panels is that each panel forms an electrical path across separate surfaces. Should there be leakage along the outside perimeter of one panel, the shielding along the second path across the other panel will effectively block this stray leakage. This is in contrast with a single panel closure wherein any leakage across the door clearance perimeter results in immediate contamination.

Since it is obvious that many changes and modifications can be made in the above-described details without departing from the nature and spirit of the invention it is to be understood that the invention is not limited to said details except as set forth in the appended claims.

What is claimed is:

1. A shielded door assembly for a shielded enclosure comprising: a door with at least a pair of shielded panels coupled together in a substantially parallel-spaced relationship such that said panels are free to move in a direction substantially normal to their surface; a pair of shielded guide walls in fixed substantially parallel-spaced relationship to each other; means for supporting said panels between said guide walls and including sliding means for allowing movement of said panels in a direction substantially parallel to said guide walls; openings in said guide walls directly across from each other in which the surface of said guide wall immediately surrounding said opening overlaps the surface of said panel providing an overlapping margin when said panel is positioned directly opposite said opening; and at least one inflatable bladder positioned between said panels in engaging relation to portions of opposing major surfaces of said panels, said portions being of substantially greater area than said overlapping margins, wherein upon inflation of said bladder, said panels engage said walls at said overlapping margins transmitting a uniform peripheral pressure per square inch to the seating surface of said abutting wall, said peripheral pressure being substantially greater than the internal pressure per square inch of said bladder.

2. The structure of claim 1 wherein said overlapping margin has gasket elements which establish an electrical connection between the surface of said panel and the surface of said guide wall in the area immediately surrounding said opening.

3. The structure of claim 2 wherein said pair of shielded guide walls comprise elements of two separate shielded enclosures insulated from each other, one entirely within the other, and wherein said panels are coupled together by insulating means.

4. The structure of claim 2 wherein said sliding means comprises a rail in fixed position between said guide walls and extending along said guide walls, a plurality of roller-equipped hangers riding along said rail, and a plurality of rods supported by said roller-equipped hangers and which support said panels in a substantially vertical position while allowing free movement of said panels in directions substantially perpendicular to their surfaces.