June 16, 1953 V. McLEAN 2,642,164

SWINGING DOOR

Filed Jan. 20, 1950

FIG. 3

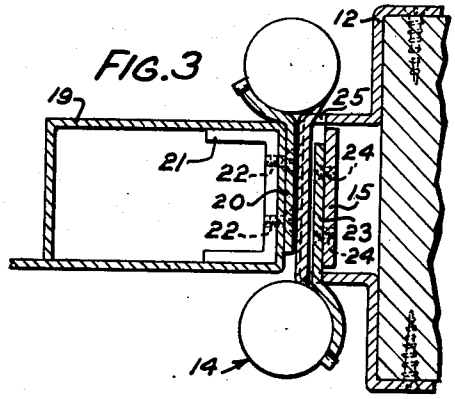


FIG. 1

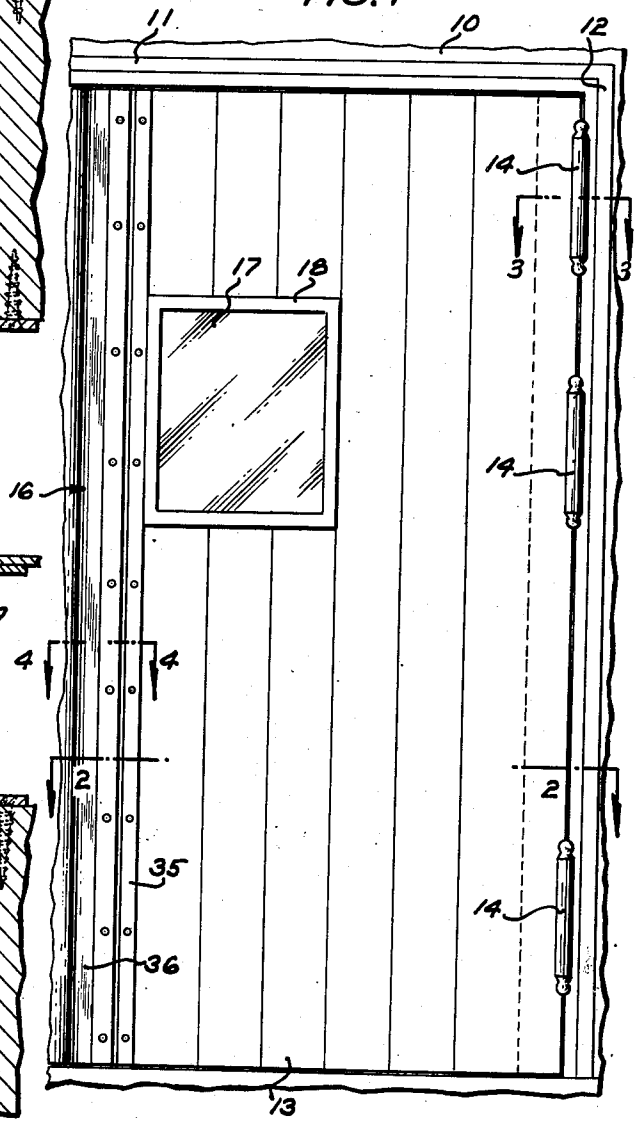


FIG. 4

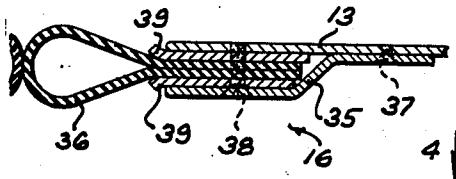


FIG. 5

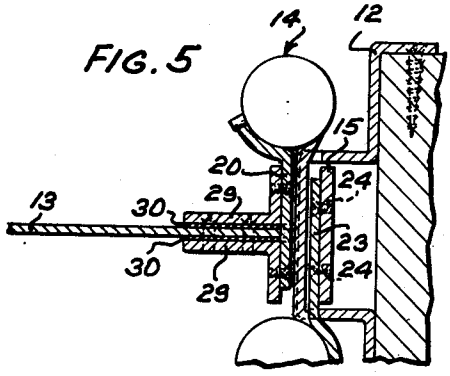


FIG. 6

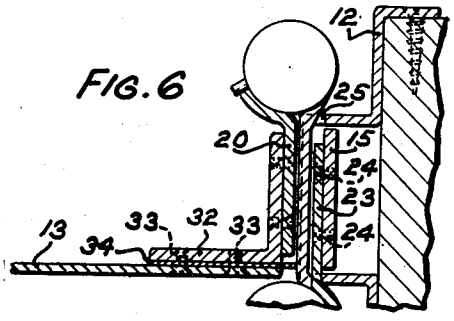
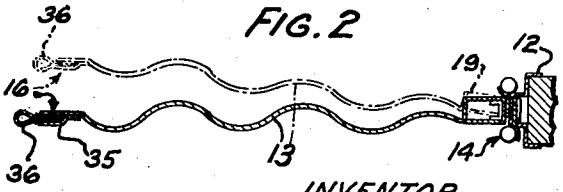


FIG. 2



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SWINGING DOOR

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2 Claims. (Cl. 189—46)

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This invention relates to passage closure devices and more particularly to impact-actuated swinging doors.

It is frequently necessary or desirable to use single or double swinging doors between certain portions of buildings or leading outdoors from buildings, and this is particularly true in factories and warehouses where various articles are transported within the factory or warehouse or to outdoor loading platforms. The transportation of such articles is, in many cases, accomplished by use of motor driven trucks, and for this reason it is desirable that any doors through which it becomes necessary to move such trucks be freely movable to open position by causing the truck to strike the doors, frequently at full speed of the truck. Doors heretofore used for this purpose have usually been constructed of wood or steel or some other relatively heavy and bulky material, and it has been found that such doors exhibit many disadvantages. Among these disadvantages is the fact that if such doors are made of light construction, they will not withstand the impacts to which they are subjected and, if they are made heavy enough to withstand the impacts of the trucks, their inertia is so great that they will be torn from their supports.

It is an object of this invention to provide a light, relatively resilient metallic swinging door.

One type of door illustrating certain features of the invention may comprise a sheet of aluminum alloy, preferably in the form of one of the commercially available alloys thereof. The metallic sheet should be of a thickness commensurate with the overall area of the door to thereby preserve its light weight and resilience, while at the same time the thickness should also be such as to withstand the impacts to which it is subjected and yet not be permanently deformed. The single metallic sheet is suitably reinforced or strengthened on the hinged side, as well as on the free side, and is preferably vertically corrugated or crimped in order to provide for greater rigidity in one direction.

A better understanding of the invention may be had by referring to the following detailed description when read in conjunction with the accompanying drawings, wherein

Fig. 1 is a front view of a door embodying one form of the invention;

Fig. 2 is a sectional view of the door taken along the line 2—2 of Fig. 1 showing it in full lines in its closed position and showing it flexed, as when struck by a truck, shown in dotted lines;

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Fig. 3 is an enlarged sectional view of the hinged side of the door taken along line 3—3 of Fig. 1;

Fig. 4 is an enlarged sectional view of a preferred construction of the outer edge of the door; and

Figs. 5 and 6 are enlarged cross sectional views of alternate methods of securing the door to the hinges.

Referring to Fig. 1, a wall 10, having an opening therein, has the opening suitably encased in a metallic framework 11, whereby the vertical portion of the framework 11 acts as a jamb, which is separately indicated at 12. The opening is closed by double doors, each comprising a single sheet 13 of a vertically corrugated or crimped aluminum or other relatively light metal or metal alloy. An aluminum alloy manufactured by the Aluminum Company of America under the name of "Alclad" No. 24ST has been found suitable for this purpose. This alloy has a tensile strength of 65,000 to 70,000 pounds per square inch and a yield strength of 53,000 to 66,000 pounds per square inch. This material has the requisite properties of lightness, strength, and resilience, but other materials having the required properties may be used. The sheet 13, which forms a door, is suitably hinged by a plurality of hinges 14, which are secured to a vertical metallic hanging strip 15 (Fig. 3), mounted within the jamb 12. The single sheet of light metal 13 preferably is about .125 inch in thickness and has a number of vertically placed corrugations therein to prevent the door from bending or flexing transversely or along a horizontal line when struck by a truck. However, the door will flex as shown by the dotted line position in Fig. 2 when struck by a truck, thereby absorbing a large part of the shock which would be transmitted to the door and its supports if the door were substantially rigid and/or heavy. The sheet 13 is also preferably provided at its outer edge with a reinforcing portion 16, to be more fully described hereinafter. A window 17 of flexible transparent plastic, such as "Plexiglas," encased in a suitable frame 18, may also be provided in the door.

Referring in detail to Fig. 3, a method of securing the sheet 13 to the hinges 14 may comprise forming the sheet 13 in such a manner that it defines a tubular box-like rigid portion 19 of substantially rectangular cross section. The tubular portion 19 is adapted to be secured to

one strap 20 of the hinge 14, which is here shown as a conventional double-acting hinge, by means of a reinforcing piece 21, which is nested within the tubular portion 19 opposite each hinge 14. Each reinforcing piece 21 is suitably tapped to receive a plurality of screws 22, which function to secure the sheet 13 to the strap 20 on the hinge 14. A second strap 23 on the hinge 14 is secured to the metallic hanging plate 15 by means of screws 24. The jamb 12 has openings 25 cut therein to accommodate a part of the hinge structure and to allow the strap 23 to be secured to the hanging strip 15. Thus it will be observed that the box-like portion 19 and reinforcing pieces 21 serve as a rigid supporting means for hinging the sheet 13 to the jamb 12.

Figs. 5 and 6 illustrate other methods which may be employed to secure the sheet 13 to the hinge 14. Referring in particular to Fig. 5, it will be seen that sheet 13 is suitably secured between a pair of angle brackets 29, preferably by screws, and the brackets, in turn, are suitably secured to the strap 20 on the hinge 14, preferably by means of screws. Thin sheets of gum rubber weatherstrip 30 may be included between the brackets 29 and the sheet 13 and the weatherstrip 30 may extend back to the jamb 12 between the hinges to thereby effect more complete closure of the opening.

Referring to Fig. 6, a method of securing the sheet 13 to the hinge 14 is illustrated wherein a single angle bracket 32 is employed. The bracket 32 is secured to the sheet 13 by means of screws 33 and is suitably secured to strap 20 of the hinge 14, preferably by screws. A single strip of gum rubber weatherstripping 34 may be included between the bracket 32 and the sheet 13 and the weatherstripping 34 may extend back to the face of jamb 12 to thereby effect more complete closure of the opening.

In all of the embodiments of the invention shown and described, it is to be observed that a space will be left open between the jamb and the hinged edge of the sheet except at the hinges. This space may be filled by a suitable filler strip or it may be closed by the weatherstrip extensions between the hinges and between the bottom and top of the door and the bottom and top hinges, respectively, as described in conjunction with Figs. 5 and 6. A space of approximately the same thickness as the strap 23 will also be present between the inner surface of the jamb and the hanging strip 15, except at the hinges, which space may also be filled with a suitable filler piece.

Referring to Fig. 4, a reinforcing portion for strengthening the outer edge of the sheet 13 may comprise a metallic clamping member 35, which serves to secure a loop 36 of gum rubber or the like to the sheet 13 by means of clamping screws 37 and 38. The screws 37 serve to secure the clamping member 35 directly to the sheet 13 and the screws 38 pass through the loop 36 of gum rubber or the like to cause the loop to be clamped between the clamping member 35 and the sheet 13. Strips of gum rubber cushioning 39 may also be provided between the loop 36 and the sheet 13 and clamping member 35, respectively. It is obvious that one function of the loop 36 of rubber or the like is also to effect more complete closure of the opening. Although the reinforcing portion at the outer edge of the sheet 13 has been shown and described as comprising the clamping member 35 and loop of gum rubber 36, other methods of reinforcing the outer edge may be employed. For example, the sheet 13 may be bent upon itself at the outer edge to form a loop or other tubular structure which may serve to impart rigidity to the outer edge of the sheet 13.

The door shown and described herein comprises a single sheet of a light metal and, although one specific alloy has been described hereinbefore as being particularly suited for the purpose, the material used for the sheet 13 may be any one of a number of commercially available light metals or metallic alloys. For example, the sheet may consist of an alloy of aluminum having very slight amounts of copper, manganese and magnesium alloyed therewith, in which case the sheet has a very high tensile strength and a very high yield strength. Other aluminum alloys containing very small amounts of copper, silicon, magnesium and chromium may be employed which give even higher tensile strength and yield strength. It is further desirable, in the case of an aluminum alloy sheet, to use an alloy which has been completely covered with commercially pure aluminum, in which case the door becomes less susceptible to corrosive action or other damage due to atmospheric conditions. Any other of the relatively light and flexible metals or metal alloys which exhibit satisfactory mechanical properties may be employed. For example, commercially available magnesium sheet may be used in place of any of the metals described above. Although the exact thickness of the sheet of metal depends upon its size and use, it has been found that a sheet of a thickness of approximately .125 inch is highly satisfactory under most conditions.

Since the hinges illustrated herein form no part of the invention, their action has not been described in detail, particularly since the hinges shown are conventional double acting hinges. It is to be noted that it is entirely possible to use single acting hinges where only one way traffic is to be accommodated and it is further obvious that any number or type of hinges may be employed depending upon the situation encountered.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. In an impact actuated swinging door, a sheet of vertically corrugated resilient metal having reinforcements only on the hinge edge and on the free edge parallel thereto to permit vertical flexing throughout its length to absorb most of the shock when struck while preventing destructive transverse flexing along a horizontal line, said reinforcement on the hinge edge being provided by forming that portion of the sheet into a tubular rigid portion to which hinges are secured, and the reinforcing member secured along the said free edge clamping a projecting loop of resilient material which extends the length of the door.

2. In an impact actuated swinging door, a single sheet of vertically corrugated resilient aluminum alloy having reinforcements only on the hinge edge and on the free edge parallel thereto, said reinforcement on the hinge edge being provided by forming the sheet into a tubular rigid portion, a reinforcing member positioned within the said tubular portion to which a hinge

is secured, a reinforcing element secured along the said free edge, a loop of resilient material positioned between the reinforcing element and the said free edge, and means for clamping the loop of resilient material between the reinforcing element and the said free edge.

VINCENT McLEAN.

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