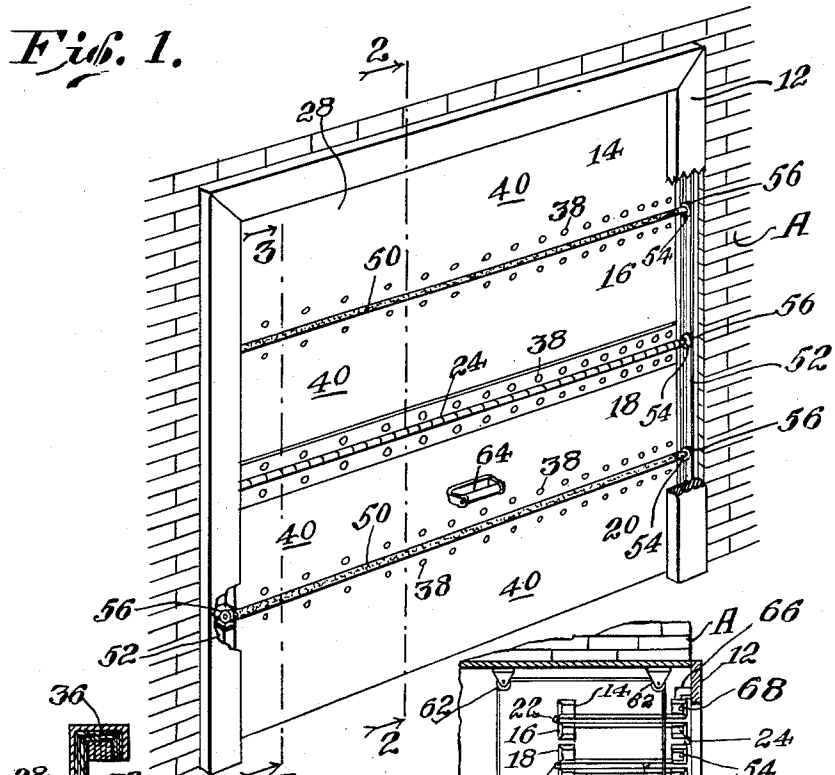
May 13, 1958 MacM. CLEMENTS 2,834,411

ACCORDION-TYPE DOOR

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Fig. 1.



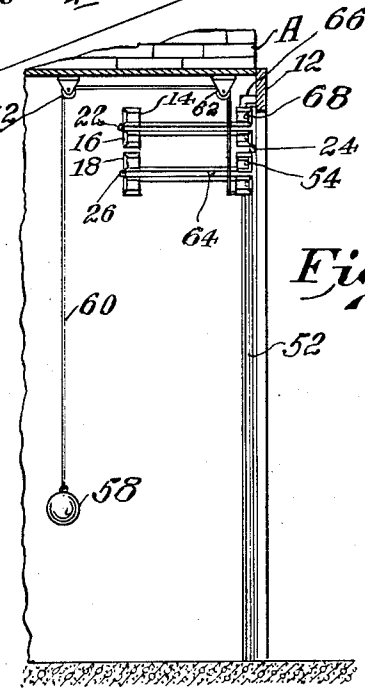


Fig. 2.

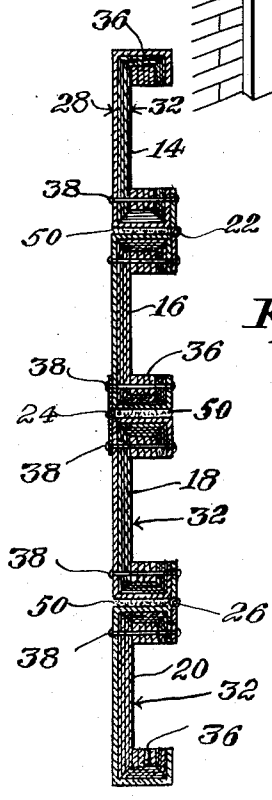


Fig. 3.

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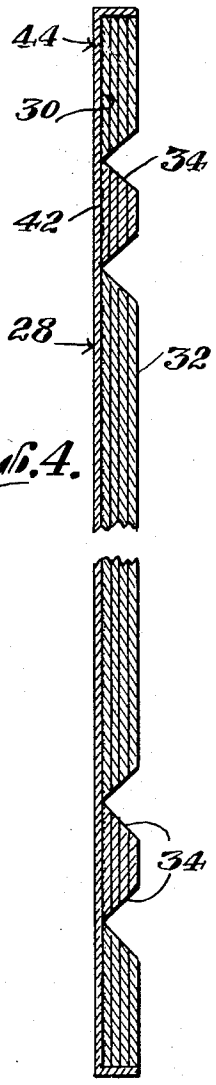


Fig. 4.

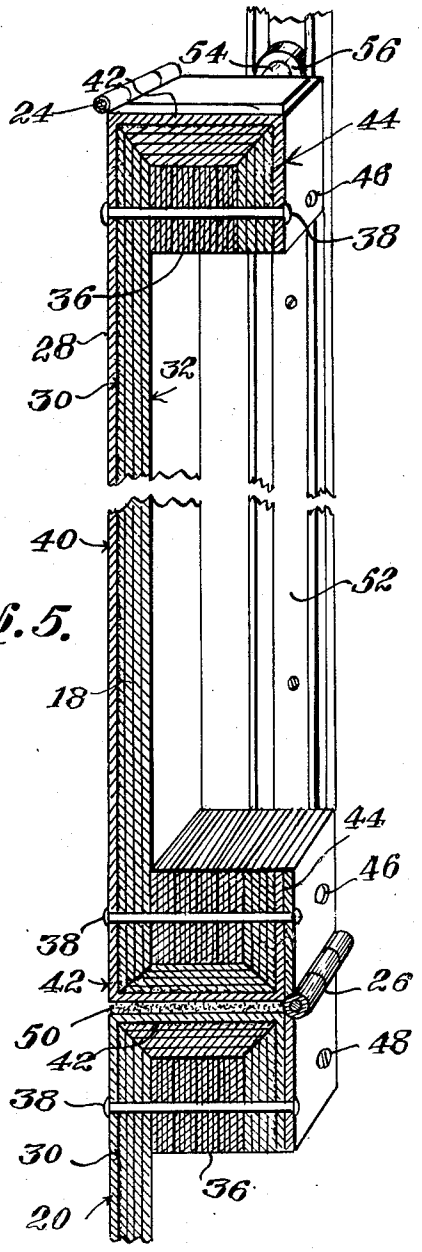


Fig. 5.

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ACCORDION-TYPE DOOR

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Application September 23, 1955, Serial No. 536,227

7 Claims. (Cl. 160—207)

The present invention relates to an accordion-type door.

An object of the invention is to provide a door of this type having light structural characteristics but which, nevertheless, is highly flexible, the individual components of which are rigid.

Another object is to provide a combined metallic and non-metallic door or closure which is readily foldable from an extended or closed position to an elevated or open position.

An additional object is to provide a door having a metal skin and a non-metallic bonded supporting means for said skin.

Other objects will appear hereinafter throughout the specification.

In the drawings:

Figure 1 is a perspective view of the door in closed position, partly broken away;

Figure 2 is a vertical sectional view of the door in open position with its panels in folded position.

Figure 3 is a vertical sectional view of the door, taken on the line 3—3 of Figure 1;

Figure 4 is a vertical sectional view of one of the door panels, partly broken away, before completion; and

Figure 5 is a perspective view, partly broken away and partly in vertical section, of a plurality of panels showing the mounting means therefor.

While the present invention performs the function of the typical overhead door, such as those which are in use as garage doors and the like, the device of this invention is strictly a vertically moving door as distinguished from an overhead type of door. Overhead doors that are in use today have a number of basic disadvantages. Such doors are rather heavy and cumbersome for their intended purpose, which is basically that of keeping out the elements, i. e., heat, cold, rain, snow, etc. Furthermore, the most commonly used overhead door construction is one of two kinds, one being a solidly constructed door which moves in special tracks so that when in open position it is generally parallel to the ceiling and floor level. The other type operates very much in the same manner, except that it is articulated into four or more parts or panels which are so hinged as to allow them to go into open position in an articulated form, thus presumably reducing the head room necessary to open the door from within. These door systems necessarily constitute relatively massive sections and relatively complex hardware for guiding and counterbalancing the several sections, and it will be noted that in both systems commonly in use, the inertia required to start the door from closed position requires heavy weights or balances which have to be so adjusted as to reduce their counterbalancing force as the door systems approach the open position.

As distinguished from all of such prior art structures, the device of this invention provides, first, for a much lighter system of construction; second, the reduction in the massiveness and costliness of the track and hardware commonly used with such systems; third, a simplification of counterbalancing and tensioning devices; and fourth,

a system which will provide for greater safety as well as economy of construction.

The present invention relates to a vertically movable closure, hereinafter referred to as a door, which consists of a plurality of light-weight panels which are hinged to each other, each panel combining the use of a thin skin of metal secured adhesively to plywood, or other non-metallic layer. The system of this invention will fold in what is commonly known as "accordion-fashion," and the basic assembly may consist of a number of such elements, such as four elements, ranging in the various widths needed to properly protect the opening. Each panel is connected to its adjacent panel by a continuous hinge, the hinge serving the dual purpose of connecting the sections to each other and providing a weather stop, thus obviating the necessity of providing overlapped adjacent section edges or flashing connections, the latter not only being hazardous but costly as well.

A typical construction embodying the present invention will include four sections or panels connected to each other by hinges, the sections being adapted to move upwardly to a folded or retracted position. In this construction, uniform counterbalancing may be used, inasmuch as the weight or lift-load is constant until the assembly reaches its retracted position, which may be at ceiling level. It is further noted that such an assembly can be properly and efficiently factory assembled with its components of hardware, inasmuch as it can be shipped in its folded position with the panels in their plaited or accordion shape. When the door is to be mounted, all that will be necessary will be to provide vertical tracks or guide means in place of the tracks which involve a 90° arc which latter usually calls for ceiling attachment problems which add to its unsightliness.

Referring to the drawings, Figures 1 and 2 show a wall A which is provided with a wall opening having a framework 12. The door may consists of four panels indicated at 14, 16, 18 and 20, which panels are preferably of the same size and shape. These panels are connected to each other by a plurality of hinges, three being shown at 22, 24 and 26. The central hinge 24, as shown in Figure 1, is mounted on the outside of the door, whereas the upper and lower hinges are mounted on the inside of the door to allow proper vertical movements of the sections when the door is moved from the position shown in Figure 1 to that shown in Figure 2.

Although I do not wish to be limited to a construction in which each panel is like that of each other panel, the drawings show, for illustrative purposes only, all panels as being identical. For instance, a panel will consist of an outer metal skin 28 that may be composed of any suitable high tensile strength material, such as, for example, thirty-two to twenty-eight guage sheet metal of stainless steel, aluminum, copper, magnesium, Monel metal, or other suitable metal. The skin is bonded at 30 to a relatively thick backing sheet 32 of low tensile strength material such as plywood or hardboard.

In making each panel, pairs of V-shaped notches 34 are cut into the non-metallic layer 32, as shown in Figure 4, so as to permit the upper and lower ends of the panel to be bent as shown in Figure 5. Filler blocks 36 are inserted in the U-bends located at the opposite ends of the panels, and securing means such as rivets 38 are used to secure the parts in final position. Each skin, therefore, is provided with a forwardly facing portion 40, horizontally extending portions 42, and inturned portions 44 as shown in Figure 5. The hinges 22, 24 and 26 are preferably piano hinges that extend the entire width of the door, each forming a weather barrier. The hinge leaves are provided with apertures 46, which apertures extend into the inturned portions 44 so that screws or other attaching means 48 may be used

to rigidly attach the skin to the metallic and non-metallic portions, including the filler blocks 36 of the panel. Strips of sealing material 50 may be adhesively attached to either of the facing horizontally extending portions 42 so as to add to the sealing qualities of the door.

The door opening or the framework is provided with vertically extending track guides 52 as shown in Figures 2 and 5. Each panel has a horizontal pintle 54 to which a roller 56 may be attached. The pintle and roller extend within the track, so as to guide the door sections or panels as they are moved from the open to the closed position of the door.

Suitable counterbalancing means shown in Figure 2 may be used. This may consist of a counterweight 58 connected to one end of the flexible rope or wire 60, the opposite end of which is connected to one of the sections of the door. The rope or wire is supported by suitable pulleys 62. One or more handles 64 may be provided, as shown in Figure 1.

It will be appreciated that the present construction greatly reduces the cost and the weight of the door, while increasing its thermal qualities and greatly improving the general appearance of the door.

The uppermost panel 14 is provided with pivots 68 at each end thereof which are mounted in hanger brackets 66, as seen in Figure 2, to allow free pivoting of panel 14. This panel, therefore, cannot slide as the other panels slide and pivot in the track guides 52.

The above description and drawings disclose a single embodiment of the invention, and specific language has been employed in describing the several figures. It will, nevertheless, be understood that no limitations of the scope of the invention are thereby contemplated, and that various alterations and modifications may be made such as would occur to one skilled in the art to which the invention relates.

I claim:

1. An accordion-type door comprising a plurality of articulated sections, means pivotally connecting the sections to each other, at least one of said door sections comprising a panel having a metallic skin and a non-metallic layer bonded to said skin, and guide means for guiding said sections from the open to the closed position of the door, said aforesaid door section which includes said metallic skin and non-metallic layer having a forwardly facing metallic and non-metallic portion, a pair of horizontally extending metallic and non-metallic portions, and a pair of inturned metallic and non-metallic portions, said portions forming U-bends in cross section at opposite ends of the panel and filler blocks in each U-bend.

2. An accordion-type door comprising a plurality of articulated sections, at least one of said door sections comprising a panel having a metallic skin and a non-metallic layer bonded to said skin, and guide means for guiding said sections from the open to the closed position of the door, said aforesaid door section which includes said metallic skin and non-metallic layer having a forwardly facing metallic and non-metallic portion, a pair of horizontally extending metallic and non-metallic portions, and a pair of inturned metallic and non-metallic portions, said portions forming U-bends in cross section at opposite ends of the panel and filler blocks in each U-bend, piano hinges pivotally connecting said sections at said U-bends.

3. An accordion-type door comprising a plurality of articulated sections, means sealing the facing edges of adjacent door sections, at least one of said door sections comprising a panel having a metallic skin and a non-metallic layer bonded to said skin, and guide means for guiding said sections from the open to the closed position of the door, said aforesaid door section which includes said metallic skin and non-metallic layer having a forwardly facing metallic and non-metallic portion, a pair of horizontally extending metallic and non-metallic portions, and a pair of inturned metallic and non-metallic portions, said portions forming U-bends in cross section at opposite ends of the panel and filler blocks in each U-bend, piano hinges pivotally connecting said sections at said U-bends.

4. An accordion-type door comprising a plurality of articulated sections, said door sections comprising a panel having a metallic skin and a non-metallic layer bonded to said skin, and guide means for guiding said sections from the open to the closed position of the door, said aforesaid door sections which includes said metallic skin and non-metallic layer having a forwardly facing metallic and non-metallic portion, a pair of horizontally extending metallic and non-metallic portions, and a pair of inturned metallic and non-metallic portions, said portions forming U-bends in cross section at opposite ends of the panel and filler blocks in each U-bend, said sections being pivotally connected at said U-bends by piano hinges, said hinges being alternately placed on the inside and outside of the door.

5. An accordion-type door comprising a plurality of articulated sections, means sealing the facing edges of adjacent door sections, said door sections comprising a panel having a metallic skin and a non-metallic layer bonded to said skin, and guide means for guiding said sections from the open to the closed position of the door, said aforesaid door sections which includes said metallic skin and non-metallic layer having a forwardly facing metallic and non-metallic portion, a pair of horizontally extending metallic and non-metallic portions, and a pair of inturned metallic and non-metallic portions, said portions forming U-bends in cross section at opposite ends of the panel and filler blocks in each U-bend, said sections being pivotally connected at said U-bends by piano hinges, said hinges being alternately placed on the inside and outside of the door.

6. An accordion-type door comprising a plurality of articulated sections, each of said sections comprising a panel having an outer metallic skin secured to an inner non-metallic layer, said skin and layer being inturned to form U-bends in cross section, each of said panels having a U-bend opposite a second U-bend, said sections being pivotally connected at said U-bends by piano hinges, said piano hinges being alternately placed on the inside and outside of the door, guide means for guiding said sections from the open to the closed position of the door, said guide means including a horizontally extending pintle means connected to said sections adjacent to said outer hinges of said door and track guides into which said pintle means extends.

7. An accordion-type door comprising a plurality of articulated sections, each of said sections comprising a panel having an outer metallic skin secured to an inner non-metallic layer, said skin and layer being inturned to form U-bends in cross section, each of said panels having a U-bend opposite a second U-bend, means sealing the facing edges of adjacent door sections, said sections being pivotally connected at said U-bends by piano hinges, said piano hinges being alternately placed on the inside and outside of the door, guide means for guiding said sections from the open to the closed position of the door, said guide means including a horizontally extending pintle means connected to said sections adjacent to said outer hinges of said door and track guides into which said pintle means extends.

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