Sept. 6, 1960 A. W. LUCAS ET AL 2,951,533

FOLDING GARAGE DOOR

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Fig. 1.

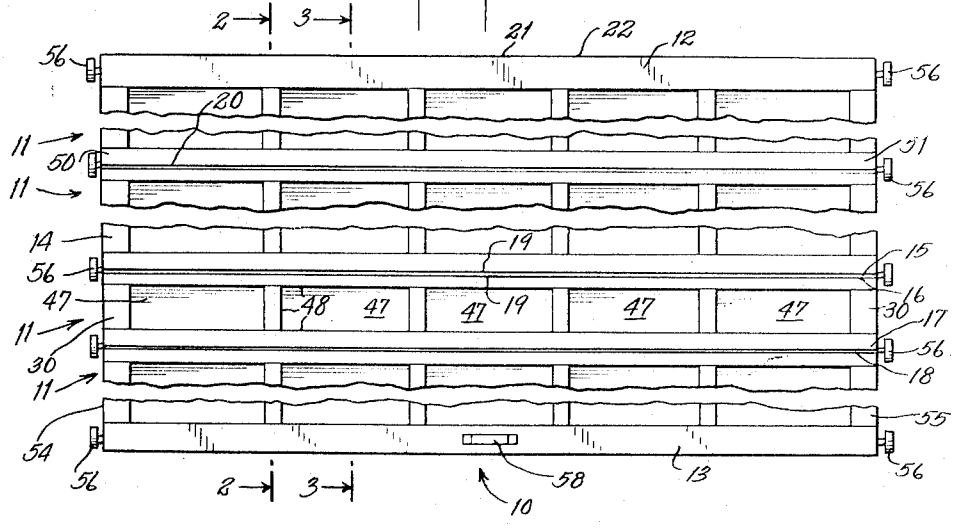


Fig. 6.

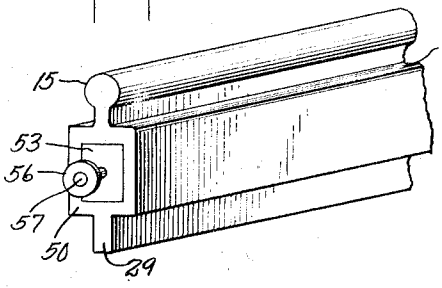


Fig. 7.

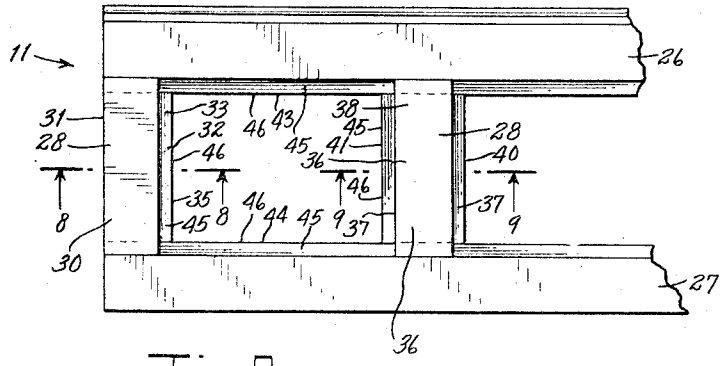


Fig. 8.

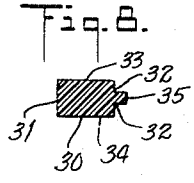
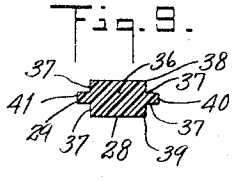


Fig. 9.



INVENTORS
ARTHUR W. LUCAS
CHESTER H. GOODWIN

BY Kenyon & Kenyon

ATTORNEYS

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Fig. 2. Fig. 3.

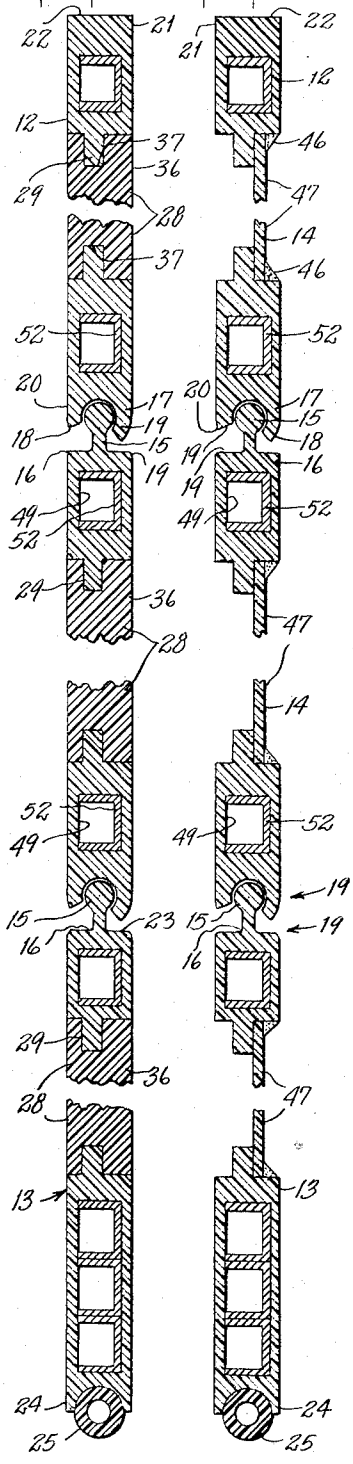


Fig. 4.

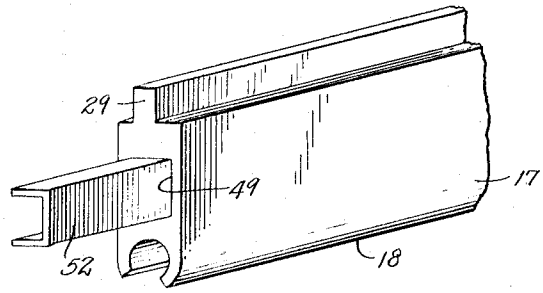
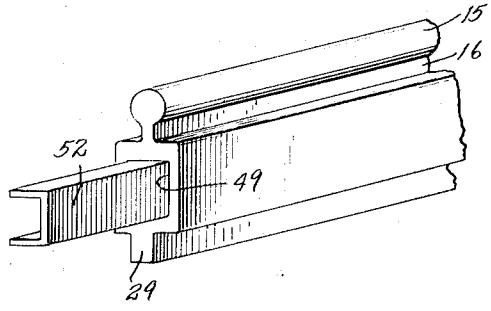


Fig. 5.



INVENTORS
ARTHUR W. LUCAS
CHESTER H. GOODWIN

BY Kenyon & Kenyon

ATTORNEYS

United States Patent Office

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FOLDING GARAGE DOOR

Arthur W. Lucas, 225 Parsonage Hill Road, Short Hills, N.J., and Chester H. Goodwin, 2008 Stratford Road, Decatur, Ala.

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4 Claims. (Cl. 160—40)

This invention relates to garage doors, partitions, and the like, and more particularly to overhead or folding garage doors or partitions comprised of interchangeable interlocking articulated sections.

Heretofore garage doors of the overhead or folding type have been generally constructed of wood or metal and shipped and installed fully assembled. Such doors have not only been cumbersome, but also have been relatively expensive, and their installation and repair have required the services of skilled artisans because of their involved structures, size, and the tools required. Furthermore, the heavy weight of the doors necessitated use of substantial counterbalance mechanisms which added to the initial cost as well as increased the complexity of the assemblies.

In addition, metal hinges and handles were normally used and maintenance by way of painting such exposed parts with rustproofing compounds, etc., was essential to keep them in useful condition. Moreover, alterations or repairs were expensive and required much hand labor. It was also necessary to paint the entire door periodically to keep up a good appearance and protect the wood or metal panels from the weather.

It is thus apparent that up until the present time, overhead garage doors have been not only expensive at the outset, but have required a continual periodic outlay of money by the owners throughout the entire useful lives of the doors in order to maintain them in proper functioning condition and decent appearance.

It is an object of this invention to provide a new and novel folding garage door or other similar partition which is assembled from standardized, interchangeable separable and articulated sections, which can be assembled quickly and easily by the unskilled home owner, without special tools, in a variety of combinations as desired, and for any one of a number of overall lengths.

Another object is to provide such a folding garage door which has a minimum of metal parts, none of which are exposed to the atmospheric elements, and has a door body made of weatherproof plastic of any desired color, thereby obviating the need for painting and other maintenance during the useful life of the door.

An additional object is to provide a garage door of lightweight construction such that counterbalance mechanisms can be greatly simplified or even entirely eliminated.

A further object is to provide a garage door construction having component parts which are especially adapted for mass production from relatively inexpensive raw materials, and thus can be sold to the ultimate consumer at unusually low rates.

Another object is to provide such a door which can be produced, shipped and delivered to the consumer in knocked down condition, if desired, whereby a package containing such a door would be a compact bundle of prefabricated sections and have overall dimensions of about one foot wide and eight feet long.

Briefly, the present invention is a folding lightweight garage door assembly comprising a plurality of prefabricated transverse articulated sections, each section constituted by a pair of longitudinal parallel frame members spaced apart from one another by a plurality of struts disposed at spaced intervals along the frame members and affixed to the latter members at the strut ends. The facing edges of the struts and the frame members have recessed portions which provide a plurality of continuous rectangular mounting grooves. Each of the said mounting grooves receives a rectangular panel which has its marginal edges fitting therein and affixed thereto, to enclose the entire section by such panels.

Each frame member has a hollow passage extending lengthwise through it from end to end, and within each such passage is a channel-shaped metal stiffener to provide increased structural strength and stability to the assembly. Inserts are placed within the opposite ends of each hollow passage, and wheel means are rotatably attached to the inserts and are disposed outwardly from such ends for engagement in an overhead garage door track.

There are respective complementary cylindrical-shaped male and female elements formed integrally with the frame members and disposed axially along the facing surfaces of adjoining sections. Such adjacent complementary elements are connected to one another in an interfitting relationship, whereby adjacent door sections are articulated for relative angular movement with respect to one another along said elements. The female element of each section is downwardly disposed on the lower surface thereof to avoid accumulation of rain water, snow, etc., therein. Such male and female elements may either be continuous along the entire length of the section, or discontinuous so as to provide a plurality of short interconnecting elements at spaced intervals. The upper edge of the topmost section has a plain surface, and the lower edge of the bottom section also has a plain surface, or can be provided with a resilient bumper means if so desired.

The above door assembly is adapted for delivery to the homeowner in a bundle of prefabricated sections of preselected number, color and size, and with the appropriate arrangement of translucent, transparent, or opaque panels on the sections as desired. The assembly of sections one with the other is simply accomplished by sliding each section over the neighboring one so that the male and female elements on neighboring sections are interfitted, and the door or partition is then ready for use.

Other objects and features of the invention will become apparent in the following description and appended claims, and in the drawings, in which:

Fig. 1 is a fragmentary elevation of one embodiment of the invention;

Fig. 2 is a fragmentary section taken along lines 2—2 of Fig. 1;

Fig. 3 is a fragmentary section taken along lines 3—3 of Fig. 1;

Fig. 4 is an enlarged fragmentary isometric view of one end of one type of frame member;

Fig. 5 is an enlarged fragmentary isometric view of one end of another type of frame member;

Fig. 6 is a view similar to Fig. 5, showing a closeup of the wheel means and its attachment;

Fig. 7 is an enlarged fragmentary elevation of a portion of the structure shown in Fig. 1;

Fig. 8 is a section taken along lines 8—8 of Fig. 7; and

Fig. 9 is a section taken along lines 9—9 of Fig. 7.

Referring now to the drawings, Fig. 1 shows a door assembly according to the present invention and generally designated by reference numeral 10. It is comprised of a plurality of transverse articulated sections 11, includ-

ing a top section **12**, a bottom section **13**, and an appropriate number of interchangeable intermediate sections **14**. Each intermediate section **14** has an axially disposed cylindrical-shaped male connector or element **15** integrally formed along its upper edge **16**, and a complementary female element **17** integrally formed along its lower edge **18**, the male and female elements **15**, **17** on the facing surfaces **19** of adjacent sections being connected to one another in a pivoted interfitting relation as shown in Figs. 2 and 3 such that adjacent sections are articulated for relative angular or bending or folding movement with respect to one another about a common axis passing through said interfitted elements **15**, **17**. The opening of the female element **17** is canted slightly to one side as shown in Figs. 2 and 3 to provide sufficient relative bending movement of the sections when in use.

The top section **12** has a female element **17** along its lower edge **20** but its upper edge **21**, not having an adjacent section above it, has a plain upper surface **22**. The bottom section **13** likewise has a male element **15** along its upper edge **23** and a bottom edge **24** which can be either plain or adapted to receive a resilient bumper means **25**. The female element **17** of the top section **12** receives the male element **15** of the next lower adjacent intermediate section **14**, and the male element **15** of the bottom section **13** is received by the female element **17** of the next upper adjacent intermediate section **14** to provide a completely articulated assembly.

Each section **11** has an upper frame member **26** and a lower frame member **27** spaced apart from one another as shown. Vertical brace members or struts **28** are disposed at spaced intervals along said frame members **26**, **27** and connected to the same by conventional rabbet joints **29** as shown in Fig. 2. The extreme end struts **30** have flat respective outer side surfaces **31** (see Fig. 7), and recessed portions **32** along the top **33** and bottom **34** of the inner side **35** (see, also, Fig. 8). The inboard or intermediate struts **36** also have recessed portions **37** along the top **38** and bottom **39** of both sides **40** and **41** (see Fig. 9). All of said recessed portions **32** and **37** of the struts **28** lie in the same plane with similar recessed portions **42** along the respective inboard edges **43**, **44** of frame members **26**, **27**, and thereby provide continuous rectangular mounting grooves **45** along the inboard or facing edges **46** of the struts **28** and the frame members **26** and **27**.

Rectangular panels **47**, which may be transparent (e.g. glass), or translucent or opaque, as desired, properly dimensioned so as to have marginal edges **48** which fit snugly within the aforementioned mounting grooves **45** and are affixed thereto by any conventional means, e.g. a formed molded gasket **46** or the like for glass panels, and solvent, glue, etc. (not shown) for the other panels, to enclose or fill in each section **11** (see, also, Fig. 3).

Each of the frame members **26** and **27** has a hollow rectangular passage **49** extending lengthwise through it from one end **50** to the other end **51**, and within such passages are channel-shaped stiffeners **52** of metal or other strong material. The channel-shape is not absolutely necessary, but provides good structural rigidity with a reduced weight of metal. The stiffeners **52** are dimensioned to fit snugly within the passages **49** so that they will remain in place and will not shake loose or move, and the opposite ends (not shown) of the stiffeners **52** terminate short of the ends **50**, **51** of the passages **49**. Rectangular insert members **53** are secured within the aforesaid ends **50**, **51** by solvent, glue or other means to shut the passages **49** and to help maintain the stiffeners **52** longitudinally in place (see Fig. 6).

Rotatably affixed to the door **10** along its respective sides **54**, **55** are a plurality of wheel means **56** disposed in a spaced relation to one another and outwardly oriented with respect to the sides **54**, **55** for engagement with a supporting guide or track (not shown) when installed for use. Such wheel means may be affixed to the door by a bolt **57** or the like as shown in Fig. 6.

The wheels **56** may be affixed to the inserts **53** as shown in Fig. 6, or may be affixed adjacent the male and female elements **15**, **17** in a similar fashion as desired. It has been found that simple sturdy wheel means can be provided by using nylon wheels and conventional bolts, without including any ball bearings or the like. The weight of the door being light, friction is not so great a problem as with other types of door structures.

Handle means **58** may be affixed to the door as shown in Fig. 1.

In the manufacture of the above sections, extruded or molded polyvinyl chloride plastic or the like is used for all parts with the exception of the stiffeners **52** and the bolts **57**. To secure the associated parts of each section together, any well-known plastic bonding glue or cement may be used, such as for example, a cement sold by the B. F. Goodrich Company, Akron, Ohio, under their designation of A–541–B and which is a solvent for such plastic and dries to form a good strong bond between the parts.

The sections are prefabricated by the manufacturer in the color desired, and with the appropriate glass or other panels as ordered by the customer. The requisite prefabricated sections are then shipped to the buyer in broken down condition, i.e. fully assembled individual sections **11**. All that need be done by the buyer is to unpack the sections and then first slip the wheel means **56** of the top section **12** into the respective door tracks (not shown). Next the appropriate intermediate section **14** is connected to the top section **12** by sliding its male element **15** laterally into the female element **17** along the lower edge **20** of the top section **12**.

After the above two sections are thus interconnected, the wheel means **56** of the intermediate sections **14** are inserted into the door track, and the two sections slide upwardly to make room for the next intermediate section to be connected. In such fashion, all of the door sections are appropriately interconnected with one another and slidably disposed within the door tracks of the garage. If necessary or desired, a suitable counter-balance mechanism can be affixed to the door **10** in the conventional manner.

The present invention affords great versatility for the manner of manufacture and sale. For example, the manufacturer can assemble the sections in a variety of colors and types of panels and then ship to the customer prefabricated sections having the color and selection of panels desired, so that all that need be done by the customer is to interconnect the sections as described above. On the other hand, the device can be sold to the customer as a "do-it-yourself" kit, and the customer himself would then assemble the component parts of each section prior to making the actual installation previously outlined.

While one embodiment of the invention has been shown and described, it is to be understood that certain changes can be made to the particular embodiment herein without departing from the scope and spirit of the invention. In addition, it is to be understood that the present invention is readily adaptable for other uses, such as folding walls and partitions, as well as screens and the like, and in any of its uses can be articulated for either horizontal or vertical folding movement, or at other angular relationships as desired.

We claim:

1. A folding lightweight partition comprising a plurality of transverse articulated sections each constituted by a pair of opposed longitudinal frame members spaced apart from one another and having respective hollow passages extending lengthwise through said frame members, a plurality of lateral struts disposed at spaced intervals along said frame members, recessed portions along

the facing edges of said struts and said frame members of each section to provide a plurality of mounting grooves therein, respective panels having marginal edges fitting within said mounting grooves and affixed to said grooves to enclose said section by said panels, stiffening means disposed within each of said passages, respective complementary male and female elements integrally formed with said frame members disposed along the facing surfaces of adjoining sections and connected to one another in interfitting relationship, said female element encircling a major circumferential portion of said male element, whereby adjacent sections are attached and articulated for relative angular movement with respect to one another by the retention of said male element within the grasp of said female element, a plurality of wheel means rotatably attached to said sections and outwardly disposed along the side edges thereof in a spaced relation to one another, and an elongated resilient bumper means attached along the bottom edge of said partition.

2. A folding lightweight polyvinyl chloride plastic garage door comprising a plurality of transverse articulated sections each constituted by a pair of opposed longitudinal parallel frame members spaced apart from one another and having respective hollow passages extending lengthwise through said frame members from end to end thereof, a plurality of lateral struts disposed at spaced intervals along said frame members and affixed thereto at the respective ends of said struts, recessed portions along the facing edges of said struts and said frame members of each section to provide a plurality of continuous rectangular mounting grooves therein, respective rectangular panels having marginal edges fitting within said mounting grooves and affixed to said grooves to enclose said section by said panels, a channel-shaped metal stiffener disposed within each of said passages, respective complementary cylindrical-shaped male and female elements integrally formed with said frame members and axially disposed along the facing surfaces of adjoining sections and connected to one another in interfitting relationship, said female element encircling a major circumferential portion of said male element, whereby adjacent sections are attached and articulated for relative angular movement with respect to one another by the retention of said male element within the grasp of said female element, disposed on the lower surfaces of said sections, inserts affixed within the ends of said passages, wheel means rotatably attached to said inserts and outwardly disposed from said ends, and a tubular polyethylene bumper means attached along the bottom edge of said partition.

3. A lightweight polyvinyl chloride plastic garage door section comprising a pair of opposed longitudinal parallel frame members spaced apart from one another and having respective hollow passages extending lengthwise through said frame members from end to end thereof, a plurality of lateral struts disposed at spaced intervals along said frame members and affixed thereto at the respective ends of said struts, recessed portions along the facing edges of said struts and said frame members to provide a plurality of continuous rectangular mounting grooves therein, respective rectangular panels having marginal edges fitting within said grooves to enclose said section by said panels, a channel-shaped metal stiffener disposed within each of said passages, complementary male

and female elements axially disposed along the respective upper and lower edges of said frame members, inserts affixed within the ends of said passages, wheel means rotatably attached to said inserts and outwardly disposed from said ends, said section being adapted for interfitting connection of said male and female elements with corresponding elements of similar sections by the encirclement of a major circumferential portion of said male element by said female element, whereby a folding garage door having a plurality of articulated transverse sections is provided.

4. A folding lightweight polyvinyl chloride plastic garage door comprising a plurality of transverse articulated sections each constituted by a pair of opposed longitudinal parallel frame members spaced apart from one another and having respective hollow passages extending lengthwise through said frame members from end to end thereof, a plurality of lateral struts disposed at spaced intervals along said frame members and affixed thereto at the respective ends of said struts, recessed portions along the facing edges of said struts and said frame members of each section to provide a plurality of continuous rectangular mounting grooves therein, respective rectangular panels having marginal edges fitting within said mounting grooves and affixed to said grooves to enclose said section by said panels, a channel-shaped metal stiffener disposed within each of said passages respective complementary cylindrical-shaped male and female elements integrally formed with said frame members and axially disposed along the facing surfaces of adjoining sections, said female elements disposed to connect in interfitting relationship with said male elements so as to present a pair of male element encircling female lips, one longer lip encircling appreciably more of its side of said male cylindrical element than the opposed said lip encircles on its side, said pair of lips cooperating to encircle a major circumferential portion of said male element, all said larger encircling lips being on the same respective face of said resulting garage door, whereby adjacent sections are attached and articulated for relative angular movement with respect to one another along said elements, and said door is disposed to primarily articulate around curves whose center of curvature lies on the side of said door opposite said larger encircling lips side, so as to allow maximum moisture exclusion from said larger lips side, said female elements being downwardly disposed on the lower surfaces of said sections, inserts affixed within the ends of said passages, wheel means rotatably attached to said inserts and outwardly disposed from said ends, and a tubular polyethylene bumper means attached along the bottom edge of said partitions.

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