April 30, 1957 P. S. FALCONER 2,790,210

DOORS, PARTICULARLY FOR GARAGES

Filed March 15, 1954 2 Sheets-Sheet 1

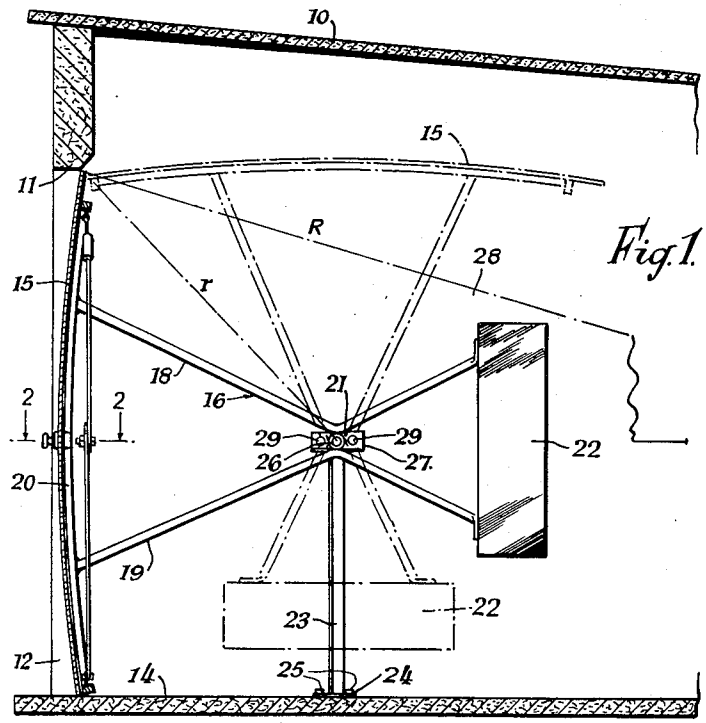


Fig. 1.

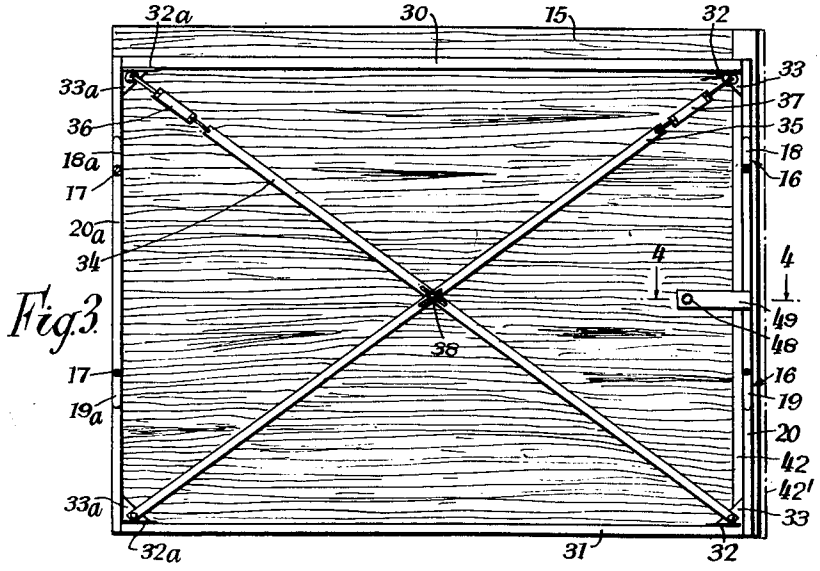


Fig. 3.

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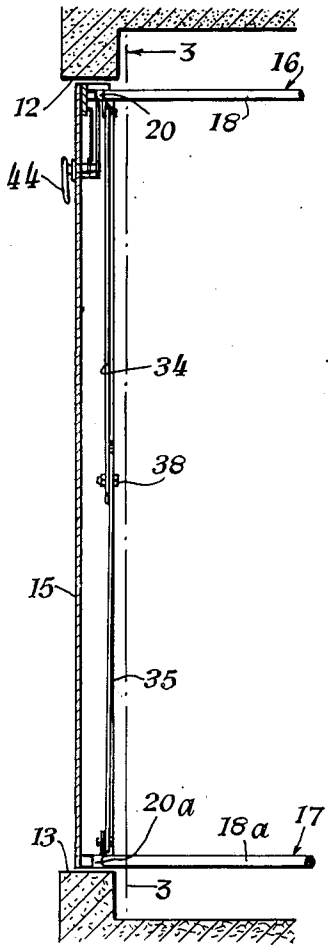


Fig. 2.

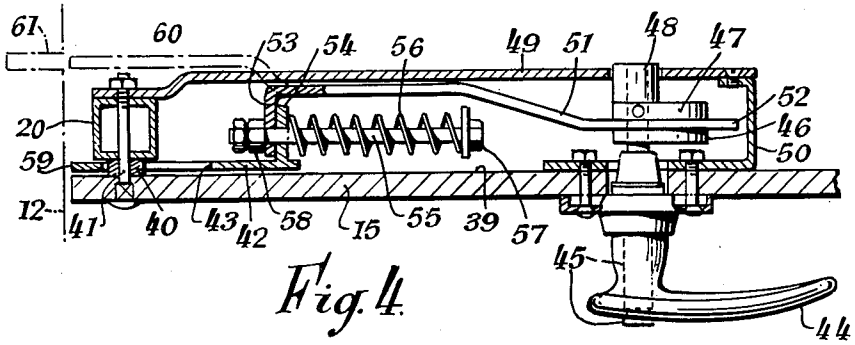


Fig. 4.

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United States Patent Office 2,790,210 Patented Apr. 30, 1957

2,790,210

DOORS, PARTICULARLY FOR GARAGES

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Application March 15, 1954, Serial No. 416,070

8 Claims. (Cl. 20—16)

This invention relates to doors, particularly for garages.

It is the object of the invention to provide an improved construction of door assembly of the kind (hereinafter mentioned as the kind referred to) in which the door is provided adjacent each of its two vertical edges with a mounting bracket having a fulcrum, the common pivotal axis of said fulcra being horizontal and being displaced a substantial distance behind the door, and at about half the height of the latter, so that by lifting said door it is caused to swing upwards and backwards through approximately a right angle to a substantially horizontal position in the ceiling space. The improved construction is simple to manufacture and install, and is moreover very light in operation.

According to the invention, in a door assembly of the kind referred to, each mounting bracket includes a batten member having a curved front surface attached to a sheet of material forming the door, which material is held by the batten members in a curved state. The door itself may thus be composed of simple flat sheet of material such as plywood, which is bent to a "cylindrical" curvature and is held curved by the batten members to which it is firmly secured; thus the sheet material composing the door is curved in vertical section but is substantially straight in horizontal section. Alternatively of course the sheet material may be moulded or fabricated so that it naturally has a curved shape to suit the batten members.

Preferably a pair of diagonal tie members extend between opposite corners of the sheet forming the door. Conveniently the tie members are secured to the batten members and are provided with adjusting means for varying the effective length.

If desired the door assembly may incorporate holding means comprising a movable latch member which extends down one side of the door for substantially the whole height thereof, and actuating mechanism for displacing said latch member sideways, thereby causing the door assembly to increase in total width, and thus to become jammed in the door opening. The latch member can comprise a curved strip which is mounted slidably behind the sheet forming the door and is guided by pin and slot means so as to be slidable bodily sideways.

Each mounting bracket may have a fulcrum comprising a bearing pedestal, the foot of said pedestal being substantially level with the bottom of the door, when closed. Preferably each mounting bracket is extended beyond the fulcrum and is provided upon the extension with a counterweight.

According to another aspect of the invention there is provided for building a door assembly of the kind referred to, a mounting bracket comprising an upright batten member having a front face which is convexly curved as seen in side elevation, a plurality of arms extending from said batten member to a fulcrum having its axis horizontal, the arms being continued beyond the fulcrum to form a rear extension, and a counterweight secured to the said extension of the arms.

The invention is illustrated by way of example in the accompanying diagrammatic drawings, in which:

Figure 1 is a sectional side elevation of a garage door assembly;

Figure 2 is a fragmentary sectional plan, taken on the line 2—2 of Figure 1;

Figure 3 is a sectional elevation showing the rear of the door, the section being taken on the line 3—3 of Figure 2; and

Figure 4 is a sectional plan view of the locking means, the section being taken on the line 4—4 of Figure 3 and being drawn to an enlarged scale.

The illustrated example is a door of a domestic or other small garage or like building, which latter is indicated at **10**; it has a door opening, say about 8 feet square, formed by a lintel **11**, a pair of door posts **12, 13** and the usual garage floor **14**. The door proper is composed of a single sheet of plywood **15**, said ⅜ inch thick, which is naturally flat but is held in a cylindrically curved form due to the fact that it is firmly secured to a pair of suitably shaped pivotal bracket members, these being indicated generally at **16** and **17** in Figures 2 and 3. Each bracket member is in the form of a rigid framework fabricated from steel tubes welded together and comprises an upper arm **18**, a lower arm **19**, an arcuately curved batten member **20** in the form of a square-section tube secured to the front ends of the arms **18, 19**, a fulcrum bush **21** welded between the arms **18, 19** and a hollow rectangular container **22** secured to the rear ends of the arms **18, 19** to hold heavy material, such as sand, so as to act as a counterweight. The arms **18, 19** are widely spaced at their front ends and converge towards the fulcrum bush **21**, their rear ends then diverging towards the counterweight container **22**.

A similar mounting bracket is provided at each side of the door and each is pivotally supported by a pedestal of the form shown in Figure 1. It comprises an upright **23** made of angle steel and having a bottom plate or foot **24** which is secured to the floor **14** by screws **25**. At its upper end the pedestal rigidly supports an overhanging rod **26** upon which the fulcrum bush **21** turns freely, endwise displacement being prevented by a washer (not shown) secured to the end of the rod to form a retaining flange. A piece of angle steel **27** welded to the top of the upright **23**, is adapted to be fastened to the corresponding garage side wall **28** by screws **29** to steady the upright and locate the fulcrum; it will be apparent however that the vertical loading on the fulcrum, due mainly to the counterbalance weight **22**, is borne directly by the upright **23** and foot **24**. The two brackets **16, 17** are of substantially the same construction, and although only the bracket **16** has been described, those parts of the bracket **17** which appear in the drawings are indicated by the same references but with the suffix *a*.

The upright batten members **20, 20***a* are arcuately curved to a much greater radius than the actual operating radius about the coaxial fulcrum rods **26, 26***a*. Preferably the actual radius of curvature, indicated at R is approximately five times the maximum operating radius *r* (which is usually the distance from the top edge or the bottom edge of the door to the fulcrum); the operating radius *r* can advantageously be between three and eight times the maximum operating radius *r*.

The curving of the sheet material **15** forming the door considerably enhances its rigidity, but it is found to be desirable to incorporate stiffeners **30, 31** along the upper and lower margins of the door **15**. These are screwed or bolted to the sheet material and their ends are also attached to horizontal flanges **32, 32***a* formed upon gusset plates **33, 33***a* which are welded to the upper and lower

end parts of the batten members **20, 20a**. Furthermore a pair of diagonal tie members **34, 35** are provided, these being in the form of metal strips bolted at their lower ends to the lower gusset plates **32, 32a**, while their upper ends are anchored to the upper gusset plates by turnbuckles **36** and **37** by which the tension in the respective tie members can be closely adjusted to suit requirements. Where the tie members cross, they are slotted longitudinally and, after adjustment, are clamped rigidly together by a bolt **38**. By this means a very rigid but light door structure is produced and, after the door assembly has been installed, the tie members can be easily adjusted so that the bottom of the door rests evenly upon the floor **14**.

For enabling the door to be held or "locked" in its closed position the following arrangement is provided. The batten member **20** is spaced from the rear surface **39** of the door sheet **15** by the provision of a thick washer **40** on each of the bolts **41** used for securing the door sheet **15** to the batten member **20**. A steel strip **42**, say 3½ inches wide and suitably curved, extends from the top to the bottom of the door and is slidably interposed between the batten member **20** and the door sheet **15**, a horizontal slot **43** being formed transversely of the strip to accommodate each of the washers **40** and permit the desired sideways sliding movement of the strip **42**. The strip **42** is shown in its retracted position in Figure 4, and it is adapted to slide out to the position **42'**, shown in Figure 3 so as to increase the effective width of the door **15** and thus cause it to become firmly jammed between the door posts **12, 13**. If desired the strip **42** can enter a recess (not shown) in the door post **12**, so as to produce a positive locking action instead of just an extremely powerful frictional engagement.

A convenient actuating mechanism for the strip **42** is shown in Figure 4 and comprises an external handle **44** incorporating a lock **45** (such handles are now commonly used for motor-car doors) and having a spindle **46** upon which an eccentric **47** is fixed; this eccentric is formed with a boss **48** which is snugly rotatable in a bearing plate **49** extending between the batten member **20** and a J-shaped bracket **50**. A connecting rod member **51** made of sheet metal has a sheave portion **52** fitting over the eccentric **47**, its other end being bent at right angles to form a lug **53** engaging outside a complementary lug **54** welded to the strip **42** about half way up. Both lugs are drilled to receive loosely a bolt **55**, a strong coiled compression spring **56** being mounted on said bolt between the head **57** thereof and the lug **54**. The bolt **55** has a locked nut **58** adapted to bear against the lug **53** so that the spring **56** acts normally to urge the lugs **53** and **54** into tight engagement. Therefore, when the handle **44** is turned in the locking direction, the eccentric **47** moves the connecting rod member **51** to the left, the strip **42** moving as one therewith, but when the outer edge **59** of the strip **42** meets the door post **12** (Figure 2) its movement is obstructed. Nevertheless the handle **44** and eccentric **47** can continue to turn until a complete half revolution has been made, for the bolt **55** slides relative to the lug **54**, the length of the spring **56** being reduced by an equal amount. Thus by the time that the eccentric **47** has reached its dead-centre position, the strip **42** is pressing against the door post **12** and the spring **56** is operatively interposed between the eccentric **47** and the strip **42** so that it has the effect of resiliently expanding the width of the door, with the result that the side opposite to the strip **42** (i. e. the left-hand side as seen in Figure 3) is also urged into tight engagement with the corresponding door post **13**. The lock **45** is adapted to hold the handle **44** and eccentric **47** in this dead-centre position so as to prevent the door being loosened until the appropriate key has been inserted.

It will be understood that the above details are given by way of example only and that various modifications may be made. For instance, additional curved batten members may be used between the two side brackets in order to stiffen the door, and/or more than two straight lateral stiffening members may be used for the same purpose. If desired a positive bolt may be provided to prevent the door being pushed open when it is locked and in one arrangement the connecting rod member **51** (Figure 4) is formed or provided with an offset bolt member as shown in broken lines at **60**, which protrudes through a slot in the bearing plate **49** and is adapted to engage within a hole **61** in the door post **12**. Any suitable means can be used for counterbalancing although it has been found satisfactory to insert the requisite quantity of sand or other heavy material in the container **22**, and then seal it, say by welding a cover of sheet metal into position. If desired the door sheet may be moulded, pressed or otherwise formed so that it is curved horizontally as well as vertically.

I claim:

1. A door comprising a rectangular sheet of normally flat sheet material, a pair of batten members each having an arcuately curved front face, said batten members having their curved faces fastened along opposite parallel edges of the sheet to bend and hold the sheet to a part-cylindrical curvature, a first tie member extending diagonally from the bottom extremity of one batten member to the top of the other batten member, a second tie member extending diagonally from the bottom extremity of said other batten member to the top of said one batten member, and a length-adjusting device in each of said tie members, the tie members extending chordwise behind the curved sheet.

2. A door comprising a rectangular sheet of normally flat sheet material, a pair of batten members each having an arcuately curved front face, said batten members having their curved faces fastened along opposite parallel edges of the sheet to bend and hold the sheet to a part-cylindrical curvature, a first tie member extending diagonally from the bottom extremity of one batten member to the top of the other batten member, a second tie member extending diagonally from the bottom extremity of said other batten member to the top of said one batten member, adjustable clamping means rigidly connecting together the tie members where they cross behind the centre of the curved sheet, and a length-adjusting device in each of said tie members, the tie members extending chordwise behind the curved sheet.

3. A door according to claim 2, in which the adjustable clamping means comprise a longitudinal slot formed in the middle of each tie member, and a bolt which passes through the two slots where they cross and is tightened to clamp the tie members together.

4. A door comprising a rectangular sheet of normally flat sheet material, a pair of upright batten members each having an arcuately curved front face, said batten members having their curved faces fastened along mutually parallel upright edges of the sheet to bend and hold the sheet to a part-cylindrical curvature about a horizontal axis, a first tie member extending diagonally from the bottom extremity of one batten member to the top of the other batten member, a second tie member extending diagonally from the bottom extremity of said other batten member to the top of said one batten member, and a length-adjusting device in each of said tie members, the tie members extending chordwise behind the curved sheet, so that variation of their length by the length-adjusting means causes them to warp the top and bottom edges of the door relatively in horizontal planes.

5. A door assembly comprising a rectangular sheet of normally flat sheet material, a pair of batten members each having an arcuately curved front face, said batten members having their curved faces fastened along opposite parallel edges of the sheet to bend and hold the sheet to a part-cylindrical curvature, a first tie member extending diagonally from the bottom extremity of one

batten member to the top of the other batten member, a second tie member extending diagonally from the bottom extremity of said other batten member to the top of said one batten member, a length-adjusting device in each of said tie members, the tie members extending chordwise behind the curved sheet, arms extending rearwards from the batten members, and fulcrum means upon which said arms are pivotally mounted for movement about a transverse horizontal axis.

6. In a door comprising a rectangular sheet of normally flat sheet material, a pair of batten members each having an arcuately curved front face, said batten members having their curved faces fastened along opposite parallel edges of the sheet to bend and hold the sheet to a part-cylindrical curvature, a first tie member extending diagonally from the bottom extremity of one batten member to the top of the other batten member, a second tie member extending diagonally from the bottom extremity of said other batten member to the top of said one batten member, and a length-adjusting device in each of said tie members, the tie members extending chordwise behind the curved sheet, the provision of holding means comprising a movable latch member which extends down one side of the door for substantially the whole height thereof, and actuating mechanism for displacing said

latch member sideways, thereby causing the door assembly to increase in total width, and thus to become jammed in the door opening.

7. A door assembly according to claim 6, in which the latch member comprises a curved strip which is mounted slidably behind the sheet forming the door, pin-and-slot means being provided to guide said strip as it slides bodily sideways.

8. A door assembly according to claim 7, in which the latch strip is slidably mounted between the rear face of the sheet forming the door and the front face of the corresponding batten member.

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