SUSPENSION OF GLASS DOORS

George F. Erath, Queens Village, N. Y., assignor to Pittsburgh Corning Corporation, Allegheny County, Pa., a corporation of Pennsylvania

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The present invention relates to closures and it has particular relation to closures of the swinging type and of relatively large dimensions suitable for use as doors in passageways of buildings.

The main object of the invention is to provide a large, swinging closure suitable for use as a door in a building and comprising a single panel of glass, which panel is self-sustaining upon its hinges.

A further object of the invention is to provide a novel method of securing the hinges to a door of the foregoing type.

These and other objects of the invention will be apparent from consideration of the following specification and the appended claims.

Doors for dwellings have heretofore been constructed of wood, sheet steel or similar material. In some cases panels of glass were inserted in the doors to provide for the transmission of light through the door or to obtain ornamental effects. In such doors, the glass merely closed an opening in the swinging member and was supported and reinforced by the latter, and little or no localized stress from the hinges was placed upon it.

Apparently, unitary doors comprising an unsupported panel of glass which acted as the movable barrier element and which also transmitted its own weight as well as other stresses to the hinges was not contemplated. Probably such doors constructed of the same quality of glass as the glass insert panels would have been too fragile to be practicable.

The present invention contemplates the provision of a door comprising a single panel of relatively strong, resilient tempered glass to which the hinge elements are directly attached. As an additional feature, the invention contemplates the provision of a satisfactory method of securing the hinges to the panel.

Tempered glass suitable for forming the doors constituting the subject matter of the present invention is obtained by heating ordinary sheet glass at a temperature of 1100 or 1200 degrees F. and then suddenly cooling it by plunging it into oil or by the direct application of a blast of cold air. Glass so treated assumes a mechanical strength almost equal to cast iron and is quite springy, or resilient. It is also quite capable of withstanding severe impacts or blows and severe mechanical stresses. If for any reason the door is broken, the glass instantly shatters into small rounded fragments which are quite harmless if they should strike a person adjacent to, or passing through, the doorway.

For a better understanding of the invention, reference may now be had to the accompanying drawings in which

Fig. 1 is a fragmentary elevational view of a building wall in which are disposed a pair of doors which are constructed in accordance with the provisions of the present invention.

Fig. 2 is a fragmentary cross-sectional view through the hinges of a door embodying the present invention.

Fig. 3 is a fragmentary elevational view in a plane at right angles of the door, one of the hinge mountings.

In the form of the invention illustrated in the drawings, a building wall 11, composed of masonry or any other suitable building material is provided with an opening in which are disposed the doors 12. These doors preferably consist of single panels of glass, tempered to a strength approximately four times that of untempered glass. The panel may be of substantially any preferred thickness. However, a range of about 3/16 to 1 or 1 1/4 inches is preferred. A satisfactory thickness for most purposes is about 3/4 inch.

Various forms and types of hinges may be employed in mounting the doors, but in view of the peculiar characteristics of the tempered glass panel in most instances it is necessary to provide specialized forms of securing devices for connecting the hinge to the panel. The drawings illustrate a satisfactory form of hinge and the method of securing it to the panel. These hinges include pins projecting from the top and bottom edges of the door panel and rotating in suitable bearings in the floor and the lintel of the door. The top hinge structure 15, includes a pair of side plates 16, gripping opposite sides of the glass panel and a casting 17, of a thickness corresponding to the thickness of the glass panel and providing a spacing element between the plate 16. This casting is secured in a notch 18, formed at the upper corner of the glass panel and having a rounded corner 20. Plates 16 and casting 17 may be secured together by welding or by bolts and the mechanical pressure of the plates upon the sides of the glass panel may be relied upon to hold the parts together. However, the means for securing the panel illustrated in the drawings comprises a bolt 21, threaded through a sleeve 22, both of which have heads 23. The bolt and sleeve are secured in openings in plate 16 whereby upon tightening of the
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b bolt, the plates will be caused to grip the glass. The edge of the notch 19 is provided with a semi-
circular recess 24 extending from face to face of the panel to receive bolt 21 and sleeve 22, and
5 side plate 18 between the sleeve and recess is filled with a suitable resilient packing such as felt
or the like. Portions of the plate project above the bottom of the recess upon both sides there-
of, thus locking the bolt 21 against displacement.

10 In the direction of extension of the upper edge of the plate. The bolt thus provides a key
element for holding the assembly in place upon the panel.

It is important to note that the corner 20
15 of the recess 18 and notch 24 are rounded to a curvature having a radius at least equal to half
the thickness of the panel. Any holes in the glass must have radii at least equal to half
10 the thickness of the glass panel. It is found to
be impossible to provide a glass panel of tem-
20 pered glass possessing satisfactory stability, if
radii of lesser value are employed. Semi-circu-
lar recesses 24 may be replaced by holes formed
in the panels at some distance from the edge.

25 Casting 27 is hollowed as indicated at 28 to re-
20 ceive a plate 27 which may be secured in position
by welding, riveting or bolting to the side of
the casting or in any other convenient man-
ner and the plate at each end is provided with
30 a downwardly-extending boss 28 which extends
25 into a well 26 formed in the casting 27.

This boss is bored as indicated at 30 to re-
35 ceive a hinge pin 31 that extends upwardly
through a boss 32 upon a fixed plate 33 secured by bolts
34 to a lintel 35. The lintel is slotted as in-
dicated at 37, to receive a pair of lugs 38 through
which extend a pin 39, constituting a pivot for a
lever 40, the forward extremity of which ex-
tends through a slot 42 formed in the side of

40 boss 32 into a recess 43 in pin 31. The lever at
its opposite end is formed with a slot (not
shown) to receive a grooved portion 46 of a pin
47 which is threaded through the plate 33. At
its lower end, the pin is formed with a slot 48
45 within which the end of a screw driver may be
inserted for rotating the pin up or down to raise or lower the
pin 31.

At the corresponding lower corner the panel is
50 notched as indicated at 50 to receive a casting
55 51 substantially corresponding to the casting 17
already described. The lever or arm 52 is
mounted in hollow 53 in this casting and is se-
cured to the side walls of the hollow by weld-
50 ing or by other convenient methods. A square
recess formed in the lever adjacent to its rear
end receives the square stem 54 of a vertically
disposed hinge pin or shaft 55. At its lower
extremity it is connected to a suitable actuating
means for rotating the shaft to swing the door
50 back to closed position after it has been opened.

Such mechanism also includes suitable dashing
mechanism for checking the rate of swing.

These various mechanisms are contained in
the floor or sill 57 and since they do not con-
stitute a portion of the present invention it is
not deemed necessary to describe them in detail.

Casting 51 is clamped in position by means of
side plates 58 corresponding to plates 18 and
50 held in place by a plate of tempered glass
70 and mounting to that described in con-
nection with the upper hinge.

It will be apparent to those skilled in the art
that the design 70 and shaft 55 need not be
55 disposed directly in the plane of the door panel.

It 55 is, of course, possible to provide laterally or
rearwardly-extending arms upon the casting 17
and casting 51 to secure suitable hinge pins in
these openings. The method securing such
hinges, of course, would substantially correspond to that shown in the drawings. It would involve
the provision of notches at the corners of the
doors or at other suitable locations along the
rear edge of the doors adapted to receive a spac-
ing body corresponding to the casting 17 or cast-
ing 51 of sufficient rigidity to support the hinge
pin and being suitably attached to a suitable side plates corresponding to plates 18.

It is again emphasized that indentations or
notches formed in the door panel must be suit-
ably rounded at the corners along lines of curva-
ture having radii equal to at least half the thick-
ness of the door panel. However, it is possible
obviate the necessity of recesses with rounded
angles by clipping away a triangular portion
at the corner by a single straight cut. Notches
25 24 may then be formed in the oblique edge.

Holes or openings formed in the panel must have
a diameter at least equal to the thickness of
the door and must be spaced from the corners
of the panels a distance at least equal to 6 times

the thickness of the panels. If these rules are not
observed spontaneous shattering of the
panel is likely to occur.

Doors comprising single panels of tempered
glass are highly suitable for use in many modern
architectural designs. They are perfectly clear
and for that reason are quite desirable for use
in stores or in the lobbies of theaters or other
places where it is desirable to display the in-
terior or a portion of the interior of a building
from the street. They are also very strong and
will resist blows which would shatter an ordi-
nary glass door. Furthermore, they are per-
fectly safe and if breakage does occur, the small
pieces or fragments prevent the possibility of
injury to persons or damage to property. Like-
wise, they are resistant to fire and resistant to
corrosion and weathering.

Although only certain preferred embodiments
of the invention have been shown and described,
45 it will be apparent to those skilled in the art
that numerous modifications may be made there-
in without departure from the spirit of the in-
vention or the scope of the appended claims.

What I claim is:

1. A door structure comprising a monolithic
plate of glass having vertical and non-vertical
edges disposed in intersecting relation, the cor-
ner portion between said edges being cut away
and having an arcuate recess formed in and
55 constituting a notch in the edge where the por-
tion is cut away, the recess extending from face
to face of the plate, a hinge fitting for the door
comprising means providing a pintle connection
positioned in the space provided by the cut-away
portion, said means having plates engaging op-
opposite faces of the glass plate and a key element
between are concealed beneath a fitting into the arcuate
recess and preventing the retraction of the
fitting by exerted in the direction of extension
of said non-vertical edge, the various portions of
the fitting being joined together into a unit
gripping the edge of the door.

2. A door as defined in claim 1 in which the
plate of glass is tempered to such degree that
upon rupture of the surface thereof it will auto-
matically shatter into small rounded fragments.

3. A door structure comprising a plate of tem-
pered glass having two vertically aligned corners
cut away to provide non-vertical edges, arcuate

recesses formed in the edges, the recesses being of diameters at least equal to the thickness of the glass plates, clamping plates upon opposite sides of the glass plate and covering the portions of the glass which are cut away, metallic spacing elements disposed in said portions between the plate, and being formed to receive hinge pintles and bolts extending through the clamping plates and being disposed in the semicircular recesses.

4. A door structure as defined in claim 1 in which the plate of glass is tempered, and the recesses are of a diameter at least equal to the thickness of said plate.

5. A door construction embodying a monolithic panel of tempered glass having an arcuate indentation so formed in an edge thereof that portions of the panel project above the indentation upon both sides thereof, said indentation extending from face to face of the panel, plates covering the indentation and gripping the panel, and means secured between the plates and projecting into the indentation to lock the plates against displacement in the direction in which the edge extends.

6. A door structure comprising a monolithic plate of glass having vertical and non-vertical edges disposed in intersecting relation, but having the corner portion between said edges cut away and having an arcuate recess formed in 5 and constituting a notch in the edge where the portion is cut away, the recess extending from face to face of the plate, a hardware fitting for the door comprising means providing a connection for a pin constituting a connection between 10 the door and a marginal portion of a doorway of a building, disposed in the space formed by the cut-away portion, holding plates secured upon opposite faces of the plate of glass and maintaining said means in the space, a key element be- 15 tween the plates and being disposed in the arcu- ate recess to prevent the retraction of the fitting by force exerted in the direction of extension of said non-vertical edge, the various portions of the fitting being joined together into a unit em- 20 bracing and holding the edge of the door.

GEORGE F. ERATH.