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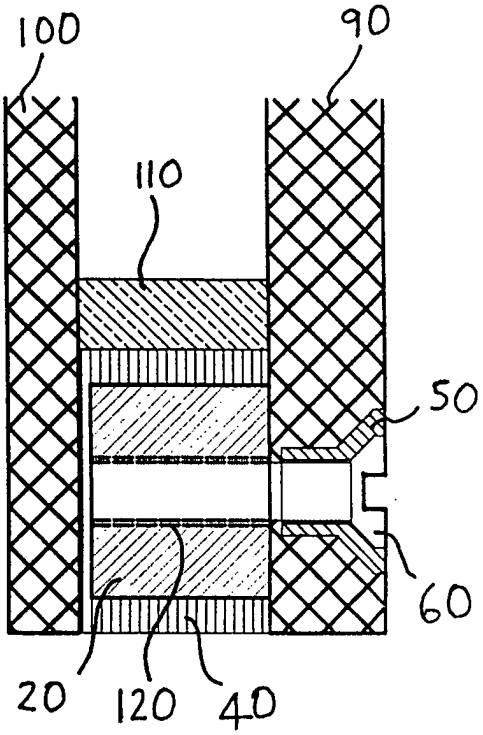
(54) Frameless glazed doors

(57) A glazed door 10 can be constructed without the use of a frame or hinges. The door 10 utilises a pivoting arrangement. The pivoting arrangement is facilitated by fittings 20, 30 that need only be secured to a single pane 90 of the glazed door 10. The door 10 can therefore have an elegant, minimalist-style construction without the need for a prominent frame. The door 10 is particularly suitable for blending in with surrounding glass or glazed regions, as are frequently utilised in modem architecture.

Fig 3



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Description

[0001] The present invention relates to glazed doors, particularly to frameless glazed doors.

[0002] Glazing is well known and is used to provide both sound insulation and thermal insulation. This is typically achieved by providing an insulating layer of air that is trapped between glass panes via a hermetic seal.

[0003] It is also possible to use inert gases such as argon or krypton, as an alternative to air. This provides improved insulation properties.

[0004] Various forms of glazed doors are known in the art, including double glazed doors, triple glazed doors, etc. Glazed doors typically comprise at least two glass panes, a spacer that separates the panes, a seal that is located between the spacer and the glass, a seal around the outside of the spacer and a supporting frame. Various fittings may be secured to the frame, including hinges, handles, etc. Indeed the frame is usually very prominent.

[0005] Nowadays many architects and designers seek minimalist designs. If it would be possible to dispense with the frame of a glazed door, then the aesthetic appearance of the door and of its surroundings could be greatly enhanced, particularly where the door is used in an environment in which there is a large amount of surrounding glass or glazing.

[0006] In such an environment the use of a prominent supporting frame for a door interferes with what might otherwise appear to be a very attractive, almost continuous glass / glazed area. This is because the supporting frame emphasises the outline of the door, whereas it is often desired for the door not to be emphasised, but to blend in to a high degree with surrounding areas of glass or glazing.

[0007] There is therefore a major need to provide a frameless double glazed door.

[0008] In recent years the need has become even greater. There is now a major trend for using large glazed areas in offices. This allows a great deal of light into an office (which has been shown to have major psychological benefits), whilst still allowing both thermal and noise insulation. It can also create an environment of accessibility and openness. However the presence of a frame on the door cuts down the transmission of light, as well as detracting from the desired minimalist appearance.

[0009] The trend to using large amounts of glazing in buildings is not restricted to offices.

[0010] Glazed doors have been used in the domestic environment for many years and there is now a trend to have additional areas of glazing, especially by providing conservatories or glazed partitions. Many modem conservatories and partitions used in the domestic environment have minimalist designs but the designs can be let down by glazed doors with prominent frames.

[0011] Large amounts of glazing are now also used in public buildings, sports centres, shopping centres, corporate headquarters, etc. Examples of buildings and constructs with prominent areas of glazing can be found on the website www.hansenglass.co.uk, for example.

The number of applications for glazing is almost limitless. However, where glazed doors are used to provide access to glazed areas, doors with frames are still used.

[0012] There is therefore a major need to provide a truly frameless glazed door that has an aesthetically pleasing design, but is still functional.

[0013] The present inventors have now met this need.

[0014] According to the present invention there is provided a frameless glazed door comprising at least two glass panes.

[0015] The door is desirably provided with a first fitting that engages a floor mounted pivot.

[0016] This fitting is secured to glass, rather than to a frame. The present inventors were surprised that the fitting secured to glass without a frame was still able to support the door and to allow pivoting without breakage/damage.

[0017] Indeed, in a preferred embodiment, the first fitting is secured to just one pane of glass of a multiple glazed door. It was particularly surprising that the fitting can be secured to only a single pane of glass and can still function effectively, given the weight of the glazed door and the stresses induced by pivoting.

[0018] The first fitting can be secured to the glass by any desired securing means.

[0019] For example one or more screws or bolts that extend through apertures in the glass can be used. Preferably, a plurality of screws or bolts (per fitting) are used as securing means. An intermediate material will normally be provided between the head of a screw or bolt and the glass. This prevents glass-to-metal contact. Any suitable material can be used. The material may for example be a synthetic rubber or plastics material, such as a nylon bush. It may be removable or may be fixed in place. The precise shape is not crucial as long as it performs its function in reducing the risk of damage to the glass.

[0020] As an alternative to screws, bolts or other mechanical fixings, other means of securing the first fitting to the glass may be provided but are less preferred.

[0021] It is preferred that the first fitting is integrated into a seal. This means that at least part of the fitting is in contact with sealant, without breaking the seal. Normally the fitting will be integrated into a seal so that sealant (e.g. structural silicone) is in contact with the top of the fitting and the sides of the fitting or at least part thereof. Sealant is also preferably in contact with part of the base of the fitting. However at least the part of the base that engages the floor-mounted pivot should be kept free of sealant in order to allow access for the pivot and to allow subsequent pivoting.

[0022] In a less preferred embodiment the whole of the base is free of contact with sealant. Here the base can be substantially aligned with a lower edge of the layer of sealant. The fitting can therefore still be regarded as being integrated into the sealant, because there will still be sealant on either side of it and above it and it will appear to be in the same region as the sealant.

[0023] Thus the fitting will have low visibility. Indeed, unless the door is inspected closely, a user of the door will normally be unaware of the presence of the fitting and will simply consider it to be part of the seal. The fitting may even be shaded or coloured to match the colour of the sealant.

[0024] The first fitting will normally be positioned at /close to the base of the door and engage a floor mounted pivoting mechanism, as discussed earlier. The pivot itself is small, inconspicuous and is fixed below the fitting. Thus it is not prominent to a user of the door, in contrast to prior art frames, hinges etc.

[0025] The floor-mounted pivoting mechanism may be arranged to prevent the door being opened beyond a given angle. It may also be biased so as to return the door to its closed position after it has been opened. For example, it may be spring-loaded, or another biasing means may be used (e.g. a resilient, elastomeric material may be used).

[0026] Spring-loaded, floor mounted pivots are well known for doors and can be obtained from a variety of suppliers. Typically they comprise a pivoting mechanism; a floor plate that is secured to the floor by screws or bolts and a spring loaded mechanism. They can for example be obtained from a wide variety of companies. For example they can be obtained Dorma U.K Ltd, which is based in Hitchin in Hertfordshire.

[0027] In some cases the pivot may be adjustable to limit the angle of pivot. It may comprise an integral stop that prevents pivoting beyond a given extent in one direction. If desired a further integral stop may be provided to prevent it pivoting beyond a given extent in the reverse direction. Of course such stops are optional. Indeed, in practice stops are often located separately from pivots. They may for example be mounted to a floor or a wall, as is well known. Typically a stop is screwed into a wall or door at a desired position and has a head formed of a soft, resiliently deformable material that contacts the door once it has been pivoted to a maximum desired level.

[0028] Preferably, the door is arranged so that it can pivot through an angle of at least 90 °. More preferably it can pivot through an angle of at least 180 °. For example it may be capable of pivoting through at least 210 °, at least 240 ° or at least 270 °. (As indicated above, stops and/or biasing means can be provided if desired to limit the angle and/or speed of pivoting. This can be useful in preventing accidental damage to adjacent partitions or walls.)

[0029] Normally a second fitting will be present that is positioned at/close to the top of the door for engaging a second pivot that is mounted above the door. The second pivot may be second mounted in a horizontal support (transom) located at the top of the door. Such supports are often present as part of a structure for additional glazing or partition panels.

[0030] As with the first fitting it is desired that the second fitting is integrated into a layer of sealant (typically of structural silicone).

[0031] Normally the second fitting will be integrated into a seal so that sealant (e.g. structural silicone) is in contact with the base of the fitting and the sides of the fitting or at least part thereof. Sealant is also preferably in contact with part of the top of the fitting. However at least the part of the top that engages the upper pivot should be kept free of sealant in order to allow access for the pivot and to allow subsequent pivoting.

[0032] In a less preferred embodiment the whole of the top of the second fitting is free of contact with sealant. Here the top can be substantially aligned with an upper edge of the layer of sealant. The second fitting can therefore still be regarded as being integrated into the sealant, because there will still be sealant on either side of it and below it. It will therefore appear to be in the same region as the sealant.

[0033] Thus the arrangement for integrating the second fitting into the sealant will normally mirror that of the first fitting. Again the fitting may be coloured to match the colour of the sealant, if desired.

[0034] Preferably, when the glazed door is fitted in position, the first and second pivots are aligned with each other along a common, substantially vertical axis. It is not however essential for the axis to be vertical. If it is desired for the door to open at a different angle then a different axis of pivoting may be used and the first and second pivots can be angled accordingly. In most circumstances however it is envisaged that the first and second pivots will be aligned along an axis that is vertical or only a few degrees from the vertical (e.g. less than 5 degrees)

[0035] As discussed earlier, the pivoting arrangement of the present invention avoids the need for hinges.

[0036] It is therefore a major departure from the approach set out in DE-A1-1010869, for example.

[0037] DE-A1-10108697 describes a door that does not have a frame extending fully around the door, but still has an elongate frame that is separate from the spacer and is used to support a hinge. It is therefore not truly a frameless door, as this term is understood in the art.

[0038] (The term "frame" is generally used by those skilled in the art of glazed doors to describe any structure that is not a spacer and is present along the length or width of a door/ a substantial portion thereof in order to support fittings and/or to support glass. The term is therefore not limited to a structure that extends completely around the periphery of the door. It includes structures that are sometimes known as "sub-frames".)

[0039] The hinge described in DE-A1-10108697 is of a generally "U-shaped" cross-section. It engages the elongate frame provided within the door. It also engages a similar elongate frame that is located in an adjacent panel of glazing.

[0040] This is achieved by providing each arm of the "U" shaped hinge with an enlarged, rounded end that fits into complementary shaped recesses present in the frame of the door or the panel fitting. The frame of the

door described in DE-A1-10108697 is positioned at an edge of the door between two glass panes and close to a spacer. The frame and the associated hinge are therefore highly visible.

[0041] This contrasts with the present invention, where relatively small fittings are required that are much less prominent than the hinge and frame described in DE-A1-10108697.

[0042] Indeed in the preferred embodiment of the present invention the fittings are integrated into sealant (as described earlier), whereas this is simply not possible in respect of the invention disclosed in DE-A1-10108697. This is because the sealant is in a different location from the frame that is used to support the hinge.

[0043] It is also notable that the glazed door described in DE-A1-10108697 has significant practical limitations, relative to the present invention. For example, the hinge and associated frame limit the angle of pivoting of the door. Additionally, it is necessary to allow sufficient clearance between the edge of the door and an adjacent side panel to accommodate the hinge structure and to allow it to flex. This gap can be large and can itself disrupt the appearance of a glazed area. It can also result in a significant reduction in thermal and noise insulation inside a room where the door is fitted.

[0044] It will therefore be appreciated that the glazed frameless door of the present invention represents a significant advance over prior art systems such as that described in DE-Al-10108697.

[0045] In addition to the door itself, the invention further includes a pane of glass suitable for use in the construction of the door.

[0046] The pane comprises a lower and upper indent and lower and upper apertures wherein:

a) the lower indent is shaped for receiving a first fitting as described earlier and the lower apertures are positioned for receiving securing means (e.g. bolts or screws) to secure the first fitting to the pane of glass; and

b) the upper indent is shaped for receiving a second fitting as described earlier and the upper apertures are positioned for receiving securing means (e.g. bolts or screws) to secure the second fitting to the pane of glass.

[0047] The glass is toughened glass and the apertures can be formed using a sharp drill, as is known in the art.

[0048] The indents can be formed by cutting with a glass cutter. They are desirably in the form of generally rectangular or square indents. They allow the first and second fittings for pivots to be accommodated, as described later on in connection with the drawings.

[0049] The pane of glass with the indents and apertures (now referred to as the "first pane") is preferably thicker than a second pane of glass to which it will be attached in the completed door. This is because the first pane will bear a higher load and higher stresses, including the load of the second pane of glass. It is therefore desirable that the second pane of glass is thinner that the first pane of glass.

[0050] It may, for example, be at least 10%, at least 20%, at least 30% or at least 40% thinner than the first pane.

[0051] The second pane of glass will however generally the same outer shape as the first pane, apart from the fact that it is not necessary to provided indents or apertures.

[0052] In addition to the panes of glass the present invention also includes fittings.

[0053] Thus a further aspect of the invention is a fitting for a glass door of the present invention; wherein the fitting is shaped for receiving a pivot and for being attached to the door without the use of a frame.

[0054] A fitting is also within the scope of the present invention.

[0055] As discussed later the first and second fittings have unusual shapes. They are preferably generally elongate but have a region that extends/bulges away from a longitudinal axis so as to accommodate a pivot. Normally at least two apertures for receiving securing means (e.g. screws or bolts) will be present. These can be symmetrically arranged about the pivot point.

[0056] The fitting may be provided as a spare part or as part of a kit for making a glass door.

[0057] If provided as part of a kit, the kit may also include securing means for securing the first and/or second fittings in position.

[0058] Many other components may optionally be included in the kit.

[0059] These include, for example, one or more of the following (or any combination thereof):

- the first glass pane
- the second glass pane
- silicone or another curable material that can be used to cure *in situ* so as to join the first and second panes together and thereby to support the second frame in position during use
- a spacer
- a glass cutter
- a pivot for engaging the upper fitting
- a pivot for engaging the lower fitting
- a lubricant to aid smooth pivoting.

[0060] The kit may also include instructions for use in assembling a door of the present invention.

[0061] Components of the kit may be packaged within a large container. For example a box may be used and padding may be provided to prevent damage to fragile components such as glass panes (if present in the kit).

[0062] As will be appreciated from the foregoing description a wide variety of kits are possible.

[0063] All are within the scope of the present invention, provided that they are useful in the assembly of a frame-

less door of the present invention. Unlike prior art kits there is no need to provide a frame for the door in the kit.

[0064] The present invention also includes within its scope a method of making a frameless door of the present invention

[0065] The method includes

a) providing first and second panes as aforesaid;
b) securing the upper and lower fittings to the first pane;
c) attaching the second frame to the first frame with a spacer located intermediate the two frames.

[0066] Preferably attachment is achieved using structural silicone or another curable material that can bear the weight of the second pane once the material is cured. This is desirably applied around the edges of the spacer and allowed to cure to form a continuous seal.

[0067] The spacer is desirably already attached to one of the panes before they are adhered together by the curable material.

[0068] More desirably it is attached to the first pane.

[0069] This can be achieved by locating the spacer onto the first pane of glass.

[0070] The method may include the step of adding a handle to the door. This can be achieved via conventional means. For example, bonding the handle to the glass can be achieved using a suitable silicone sealant. Less preferably a handle may be mechanically secured in place, e.g. by using bolts or screws

[0071] Alternatively, the door need not have a handle. It may, for example simply be pushed open and then may close by an automated action. For example closure may be achieved via a controlled, spring-mounted pivoting arrangement.

[0072] Once the door has been assembled and the curable material has cured, the door is ready to be mounted. Normally it will be mounted upon a lower pivot that has already been secured in place (e.g. via a floor mounted plate). An upper pivot may then be positioned and secured above the door, whilst the door is temporarily supported to prevent it falling.

[0073] In practice the door may be supported manually whilst it is being mounted onto the upper and lower pivots.

[0074] Alternatively, a temporary physical support may be used. For example suitable fixing blocks may be used, as is well known in the art.

[0075] The door of the present invention can be used in a wide variety of different situations. It may be used externally and may be part of a glazed part of the outside of a building. Alternatively, it may be used internally. For example it may be part of a glazed partition.

[0076] In addition to be being used in office buildings, homes, public buildings, etc., the door can be used in conservatories or glasshouses.

[0077] Indeed the number of applications is almost limitless. The door can be used in any situation where it is desired to provide a glazed door to provide access. It is particularly advantageous where it is desired to create a minimalist appearance, whilst still having the advantages of glazing.

[0078] The door can be shaped to fit any desired opening and can then be quickly erected on site.

[0079] It is important to appreciate that, although in the preferred embodiment of the invention the door comprises fittings that engage upper and lower pivots various alternatives are possible.

[0080] One alternative is for the fittings to themselves include upper and lower pivots. These can be received by pivot-engagers located above and below the door respectively.

[0081] A further alternative is for just one of the upper or lower members to comprise a pivot and the other to comprise a pivot engager.

[0082] All of these alternatives are within the scope of the present invention.

[0083] The present invention will now be described by way of example only with reference to the accompanying figures; wherein:

Figure 1 shows a front view of double glazed door of the present invention having upper and lower fittings for connecting with upper and lower pivot points respectively. For ease of reference just the door is shown, without the upper and lower pivots and without surrounding panels or partitions.

Figure 2 shows a partial horizontal cross-section through the part of the door comprising the lower fitting. This is taken along the direction of arrow X shown in Figure 1.

Figure 3 shows a partial vertical cross section through the part of the door comprising the lower fitting. It is taken along the line indicated by the letter Y in Figure 2. It therefore goes through the lower left hand bolt shown in Figure 1.

Figure 4 is a perspective view of the lower fitting of the door that is shown within the door in Figures 1 to 3. For ease of reference, however, the lower fitting is shown alone in Figure 4

Figure 5 is a perspective view of the upper fitting of the door that is shown located within the door in Figure1. For ease of reference, however, the upper fitting is shown alone in Figure 5.

Example

Double glazed frameless door

[0084] As can be seen from Figure 1, a double glazed frameless door of the present invention 10 has a lower fitting 20 and an upper fitting 30 that are each integrated into a layer of structural silicone 40 and do not require a

supporting frame. The fittings 20, 30 engage upper and lower pivots (not shown), which allow the door 10 to pivot about a vertical axis indicated by the letter X.

[0085] The fittings 20, 30 are at the same level as the silicone 40. They are relatively small. They are located at positions that are not at normal eyeline level. All of these factors, coupled with the absence of a supporting frame, mean that the fittings are inconspicuous and therefore a user of the door 10 will normally not notice them. Thus in practice they simply blend in with the layer of silicone 40 that would be present anyway.

[0086] The overall impression that a user is left with is that of a door 10 that has an elegant, minimalist design and does not require hinges. Indeed, because of the absence of hinges or of a frame, the side of the door 80 that is proximal to the axis of pivoting can be positioned very close to an adjacent panel of glass or glazing. This allows gap size to be reduced, it improves insulation and it also allows the door 10 to blend in more easily with its surroundings, thereby greatly improving overall aesthetic appearance. This is particularly desirable if it is desired to create an impression of an almost continuous region of glass, as is the case with many modem architects and internal designers.

[0087] Each fitting 20, 30 is held in place by a pair of bolts 60, 70, which pass through a front pane of toughened glass 90. This can best be seen from Figures 2 and 3. These figures show the lower fitting 20 secured in place. The upper fitting 30 is secured in place in generally the same manner, apart from being positioned to receive an upper pivot rather than a lower pivot.

[0088] The front pane of toughened glass 90 has been pre-drilled to receive bolts 60, 70. It has also been countersunk. In order that the bolts 60, 70 do not contact the glass 90 directly, the countersunk region is provided with a protective nylon bush 50 that lies between the bolt heads and the glass 90.

[0089] When the bolts 60, 70 are screwed in position, the bolt heads lie flush with (or even slightly below) the exposed surface of this pane of glass. This allows the bolts 60, 70 to be relatively unobtrusive. The bolts or bolt heads may even be coloured / shaded to match the fittings 20, 30 and/or the surrounding silicone 40.

[0090] The heads of the bolts 60, 70 are indented to receive a complementarily shaped Allen key (not shown). This allows the bolts 60, 70 to be easily inserted or removed. The shafts of the bolts 60, 70 are screw threaded and engage complementarily shaped receiving threads 120 located on inner bores of the fittings 20, 30. (For simplicity just the heads of the bolts 60, 70 are shown, although in practice threaded shanks would of course also be present.)

[0091] As can be seen from Figures 2 and 3, the glazed door 10 comprises a rear pane of toughened glass 100 that is thinner than the front pane of toughened glass 90. (Although it is not essential that the rear pane 100 be thinner than the front pane 90, this is advantageous in that it reduces load.)

[0092] Unlike the front pane 90, the rear pane 100 is not bolted in place in the embodiment shown in the example (although it would be possible to have a bolt extending through both panes 90, 100 and this would still be within the scope of the invention). The rear pane 100 is simply held in place by the adhesive properties of the structural silicone 40.

[0093] An aluminium spacer 110 is provided that serves to keep the front 90 and rear panes 100 a desired distance apart, as is well known in the art. This is best seen in Figure 3. The spacer 110 is generally rectangular, consisting of two horizontal aluminium bars that are connected by two vertical aluminium bars. (The spacer is not viewable in Figure 1 because it is obscured by the dark layer of structural silicone 40.)

[0094] The lower fitting 20 includes a central aperture 130 that is defined by an inner wall 180. This is shaped for receiving a standard, spring-loaded, floor mounted pivot (not shown). Such floor mounted pivots can be obtained, for example, from Dorma UK Ltd., as discussed earlier.

[0095] In use, the floor mounted pivot extends upwardly from the floor mounting into the aperture 130.

[0096] The rotation of the pivot assembly allows door movement, with the top pivot providing support.

[0097] For ease of reference, the lower fitting 20 is shown separate from the door in Figure 4.

[0098] The upper fitting 30 is also shown separate from the door in Figure 5.

[0099] In the embodiment described in this example, the movement of the door 10 is essentially controlled by the lower, floor mounted pivot. This is used to control the speed of opening / closing and the angle of pivot.

[0100] The upper pivot is not therefore required to control these factors and acts therefore as a simple pivot point, without spring loading or other biasing means and without stops.

[0101] Thus the shape of the upper fitting 30 can be different from that of the lower fitting 20, as can be seen by comparing Figures 4 and Figure 5.

[0102] More specifically, the upper fitting 30 has an aperture 190 that is defined by a simple cylindrical inner wall 200. This aperture 190 receives an upper pivot with a complementarily shaped outer cylindrical wall. The upper pivot is free to pivot within the upper fitting 30, although in practice pivoting is controlled by the speed of opening / closing of the lower pivot and the angle of pivoting of the lower pivot.

[0103] The inner wall 180 of the lower fitting 30 has a more complex structure than that of the inner wall 200 of the upper fitting. This is because this inner wall 180 of the lower fitting 30 is shaped for receiving the spring-loaded, floor mounted pivot (not shown) and must control the pivoting action. It is more elongate in shape, although it does still have a rounded central region.

[0104] Both the lower 20 and upper 30 fittings have two apertures 210, 220 for receiving two bolts 60, 70. These apertures 210, 220 are positioned equidistantly

from the axis of pivoting (X).

[0105] The fittings 20, 30 have an axis of symmetry that passes through the mid point between these apertures 210, 220 and also passes through the axis of pivoting (X).

Manufacture of the door

[0106] A door as described in the preceding pages can be manufactured by the process set out below.

[0107] A 10 mm thickness piece of float glass is cut to a desired shape for a given door size. This is to serve as the front pane 90 of the door 10. The glass has been toughened in accordance with standard BS EN 12150. The shape is generally rectangular, apart from a lower indent 140 that is cut out to accommodate the shape of an outwardly protruding part of the lower fitting 150 (see Figures 1 and 2) and a corresponding upper indent 160 that is cut out to accommodate the shape of an outwardly protruding part of the upper fitting 170.

[0108] Two apertures are drilled towards the base of the front pane of glass 90 and two apertures are drilled towards the top of the front pane of glass 90 for receiving bolts 60, 70. As discussed earlier, the apertures are symmetrically located at the sides of the indents 140, 150. They are countersunk to allow heads of the bolts 60, 70 as well as protective nylon bushings 50 to be accommodated.

[0109] A 6 mm thickness piece of toughened BS EN 12150 float glass is cut to the same shape as the 10mm piece of toughened glass, apart from the fact that no indents for the first and second fittings are cut out, because none are required. Similarly, no apertures are drilled, because none are required. (This piece of glass is to serve as the rear pane 100 of the door 10 and will be held in place by structural silicone 40.)

[0110] Standard spacer bar inserts 110 are prepared for a 22 mm sight line along the vertical edges and 30 mm along the horizontal edges. The inserts are attached to the 10 mm glass using screws and gasket (not shown for ease of reference) to ensure no glass to metal contact.

[0111] A silicone smear is applied to any exposed parts.

[0112] The first and second fittings 30, 40 are then fitted by using bolts 60, 70 that pass through the drilled apertures. Prior to fitting the bolts 60, 70 protective nylon bushings 50 are inserted. An Allen key is then used to insert and tighten the bolts 60, 70, taking care not to overtighten them.

[0113] The rear pane 100 is then placed on top of the front pane 90 (or *vice versa*) and structural silicone (e.g. Sika IG 25 obtainable from Sika of Switzerland) is applied to seal the unit.

[0114] This binds the 6 and 10 mm panes together. The curing process for the structural silicone 40 typically takes about 48 hours. The panes of glass 90, 100 are left undisturbed on a substantially horizontal surface over this period.

[0115] Once the structural silicone 40 has cured sufficiently to support the first 90 and second 100 panes together during use, the door 10 can be fitted in place, as described later.

[0116] The door 10 described above is not fitted with a handle and, when it is fitted in place, may simply be pushed to open it. The spring-loaded floor pivot provides a smooth automated closure.

[0117] However, if a handle is desired, it may be secured in place by structural silicone, as discussed earlier.

[0118] Alternatively, but less preferably, bolts or screws may be used for securing the handle. If this is done then the apertures should be positioned towards the edge of the door 10 in locations that do not to break the hermetic seal that provides the insulating properties of the door 10.

Fitting of the door

[0119] The upper and lower inserts 20, 30 are designed to accept standard "off the shelf" pivot assemblies, such as those supplied by Dorma U.K. Ltd.

[0120] When a door 10 is ordered the preferred locations of the lower pivot (the floor spring pivot) and of the upper pivot (the transom pivot) are determined in order that a door 10 of appropriate size and shape can be made with appropriately positioned upper and lower fittings 20, 30 for receiving the upper and lower pivots respectively.

[0121] The intended locations of the pivot points are checked again prior to fitting. If necessary (e.g. if a purchaser changes his/her mind, or if initial measurements were not correct), adjustments in the initially calculated locations can be made. For example, a floor plate comprising the floor mounted pivot can be moved to a new position and then screwed into the floor to secure it at the new position.

[0122] This will then affect the desired location of the upper pivot point, which will to be provided along a common, substantially vertical axis with the lower pivot. The location of the upper pivot point can then be recalculated accordingly. It can also be checked using a spirit level/ laser level.

[0123] Once the location of the floor mounted pivot has been finalised and it is secured in position, the base of the door 10 is lifted onto the pivot, taking care not to damage the glass. Typically at least two people are used for this operation. Rubber wedges can be used to support the door 10 during this operation, if desired.

[0124] Whilst supporting the door in position on the pivot (either manually or with a supporting frame / clamps), a transom with an associated pivot point can be fitted above the door 10.

[0125] The upper pivot can be adjustable so that it can be positioned at various locations along the transom. For example the transom may comprise a track and the upper pivot may be slid along the track until it is at a desired position and then screwed into position to secure it.

[0126] Any adjustments to the upper pivot point are

made to ensure that the pivot engages correctly with the upper fitting.

[0127] If desired, surrounding glass, or other partitioning material can then be installed (e.g. above the transom) and the operation of the door 10 can then be tested.

[0128] The lower pivot will normally be adjustable (e.g. by turning a screw) to allow fine manual adjustment of the position of the door 10 whilst the door is *in situ.* This is well known in the art. Thus if the door 10 catches at its base or at its top, the pivot can be adjusted as appropriate. This is useful to account for different floor surfaces, such as carpets with different heights of pile, etc. Typically adjustments of at least several mm in any direction can be achieved using standard floor spring pivots, such as those sold by Dorma UK Ltd.

[0129] Given that the pivots engage the upper and lower fittings 20, 30, the positioning within the door 10 of the parts of the fittings 180, 200 that receive the pivots is important and is predetermined when the door is manufactured. These parts 180, 200 should normally be positioned so that the pivots are engaged at a mid-point between the two outer surfaces of the glass of the door 10. Given that the panes of glass 90, 100 have different thicknesses, this mid-point is not also the mid-point between the two inner surfaces of the glass, but is slightly offset from this. In order to accommodate a pivot receiving part at such an offset position the first and second fittings have walls 150, 170 that bulge/extend outwardly in this region. This explains the unusual shapes of the first and second fittings 20, 30. It also explains why the glass 90 is cut with upper and lower indents (to allow for the "bulge" present in the fittings).

[0130] This ingenious design allows a glazed door 10 to be manufactured without needing to use two thick panes of glass. Only one relatively thick pane 90 and one relatively thin pane 100 need be used.

[0131] This is important because the weight of the door 10 can be kept down, thereby allowing easier fitting and use than would otherwise be the case.

[0132] (In an alternative, but less preferred embodiment, two equally thick panes of glass could be used. The fittings would not then need to have "bulges" and corresponding indents would also not be needed in glass. However the weight of the door 10 would then be relatively high. Furthermore this would put additional strain on the supporting silicone 40.)

[0133] The fact that the weight of the door 10 can be kept down is also advantageous if it is desired to remove it (e.g. if it becomes damaged and it is desired to replace it). This can easily be done by the reverse operation to that of mounting the door 10.

Maintenance of the door

[0134] Once the door 10 is fitted and in place it is easy to maintain.

[0135] Normally it is only necessary to apply a light oil periodically to the upper and lower pivots and to ensure that there is regular cleaning to ensure that the upper and lower pivot points are kept free of dirt and debris.

[0136] If the door 10 slips or it catches, then an adjustable floor spring pivot can be raised or lowered by at least a few mm, allowing fine adjustment of the pivot without needing to remove the door.

[0137] (However, in practice it is usually desirable to leave sufficient clearance at the top and bottom of the door 10 when it is fitted to minimise the risk of such situations arising.)

[0138] It is notable that the door 10 has no hinges and there is therefore no need to grease hinges. Furthermore slippage of hinges is not a problem.

[0139] Thus in normal situations the door should be very low maintenance.

[0140] The elegant design of the door 10 is therefore not only aesthetically pleasing but also provides numerous practical advantages. It therefore represents a major advance in the field of glazing.

Claims

1. A frameless glazed door comprising at least two glass panes.

2. A door according to claim 1 that does not have side hinges.

3. A door according to claim 1 or claim 2, wherein the door comprises a first fitting that either:

   a) is a pivot engager that is capable of engaging a pivot mounted below the door; or
   b) has a pivot that can engage a pivot-engager mounted below the door.

4. A door according to claim 3; wherein the door comprises a second fitting that either:

   a) is a pivot engager that is capable of engaging a pivot mounted above the door; or
   b) has a pivot that can engage a pivot-engager mounted above the door.

5. A door according to claim 3 or 4, wherein the first and/or second fitting are secured to glass, rather than to a frame or other door-mounted support.

6. A door according to any of claims 3 to 5, wherein the first and/or the second fitting are secured to a single pane of glass.

7. A door according to any of claims 3 to 6, wherein the first fitting and/or the second fitting are integrated into a seal of the glazed door.

8. A pane of glass for a frameless glazed door, wherein

the pane comprises a lower and upper indent and lower and upper apertures, and wherein:

a) the lower indent is shaped for receiving a first fitting as described in claim 3 and the upper apertures are positioned for receiving securing means to secure the first fitting to said pane of glass; and
b) the upper indent is shaped for receiving a first fitting as described in claim 4 and wherein the second and at least one indent; the apertures and indent being arranged to allowing a fitting be secured to the door via the securing means and to be located between first and second panes of glass.

9. A fitting for a frameless glazed door; wherein the fitting

a) is a pivot engager that is capable of engaging a pivot mounted above the door; or
b) has a pivot that can engage a pivot-engager mounted above the door;

and wherein the pivot is shaped to be attached to a pane of glass as described in claim 8.

10. A kit comprising at least one fitting as described in claim 8 and securing means suitable for securing the at least one fitting to a pane of glass as described in claim 9.

Fig 1

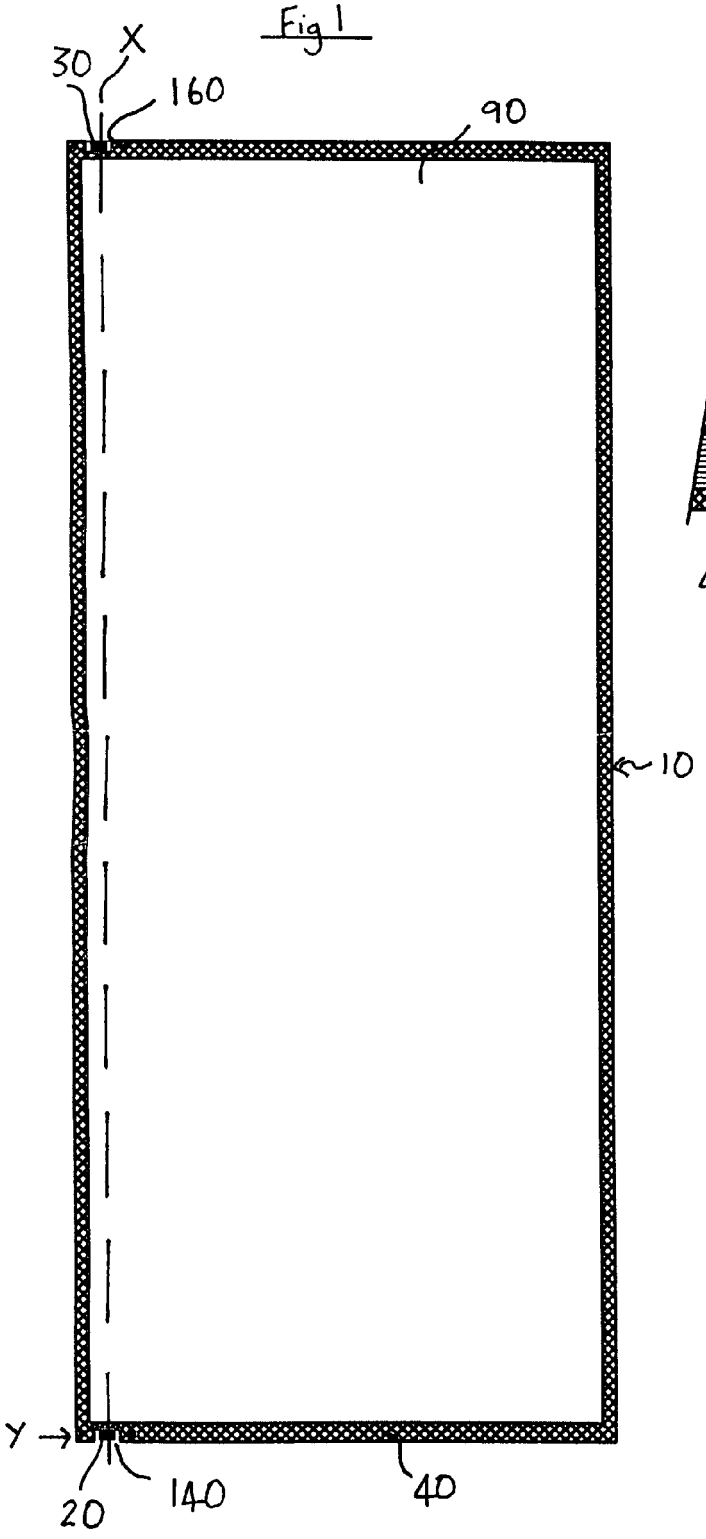


Fig 2

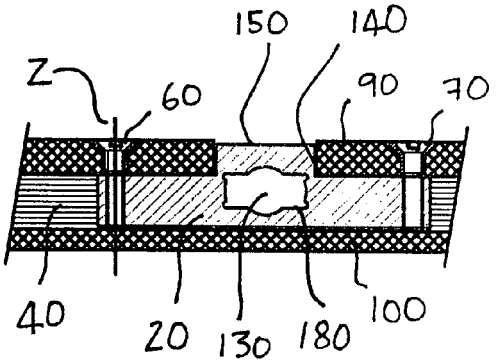


Fig 3

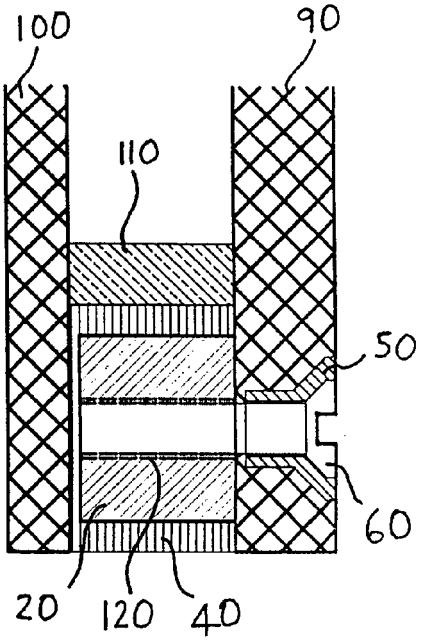


Fig4

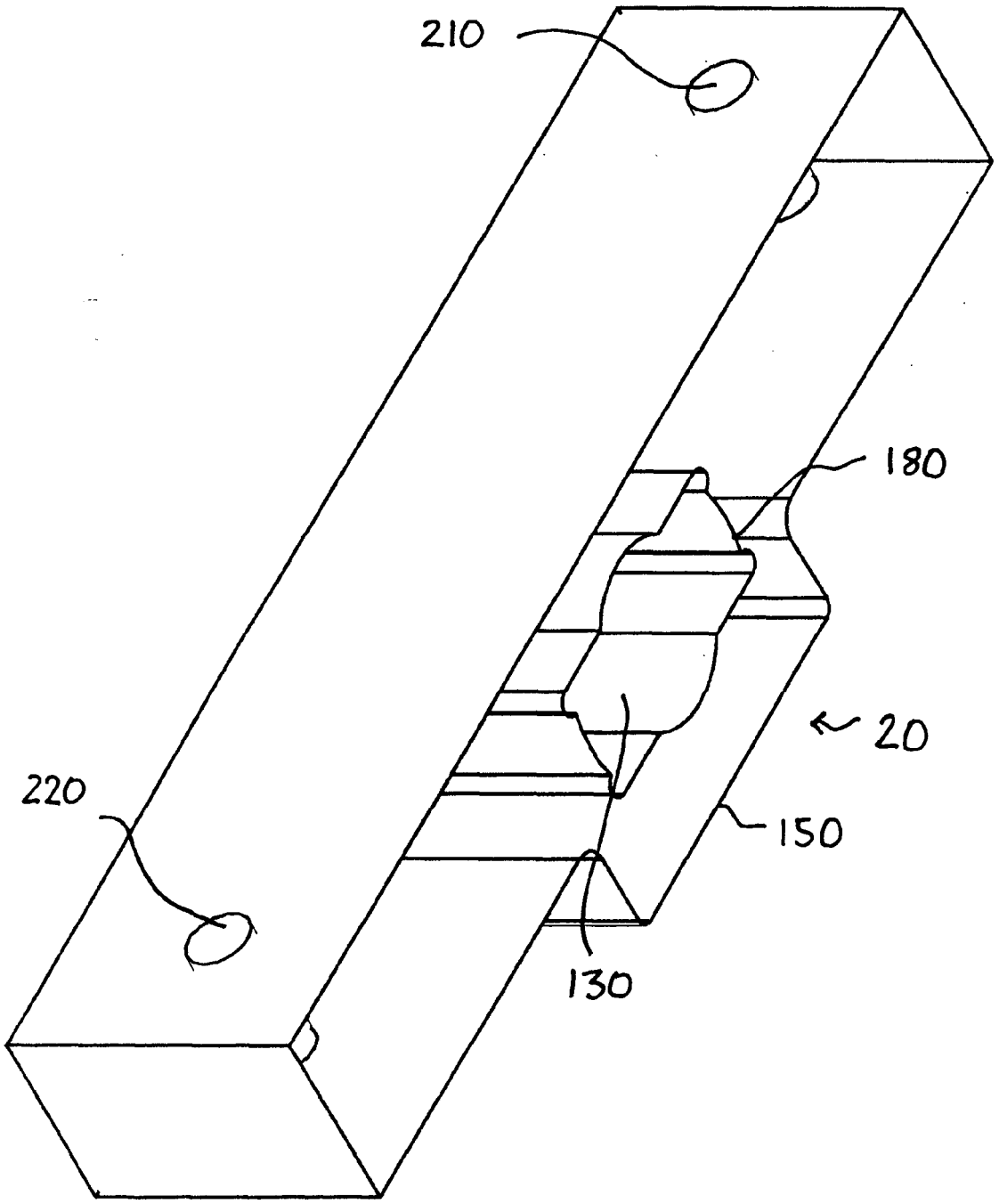
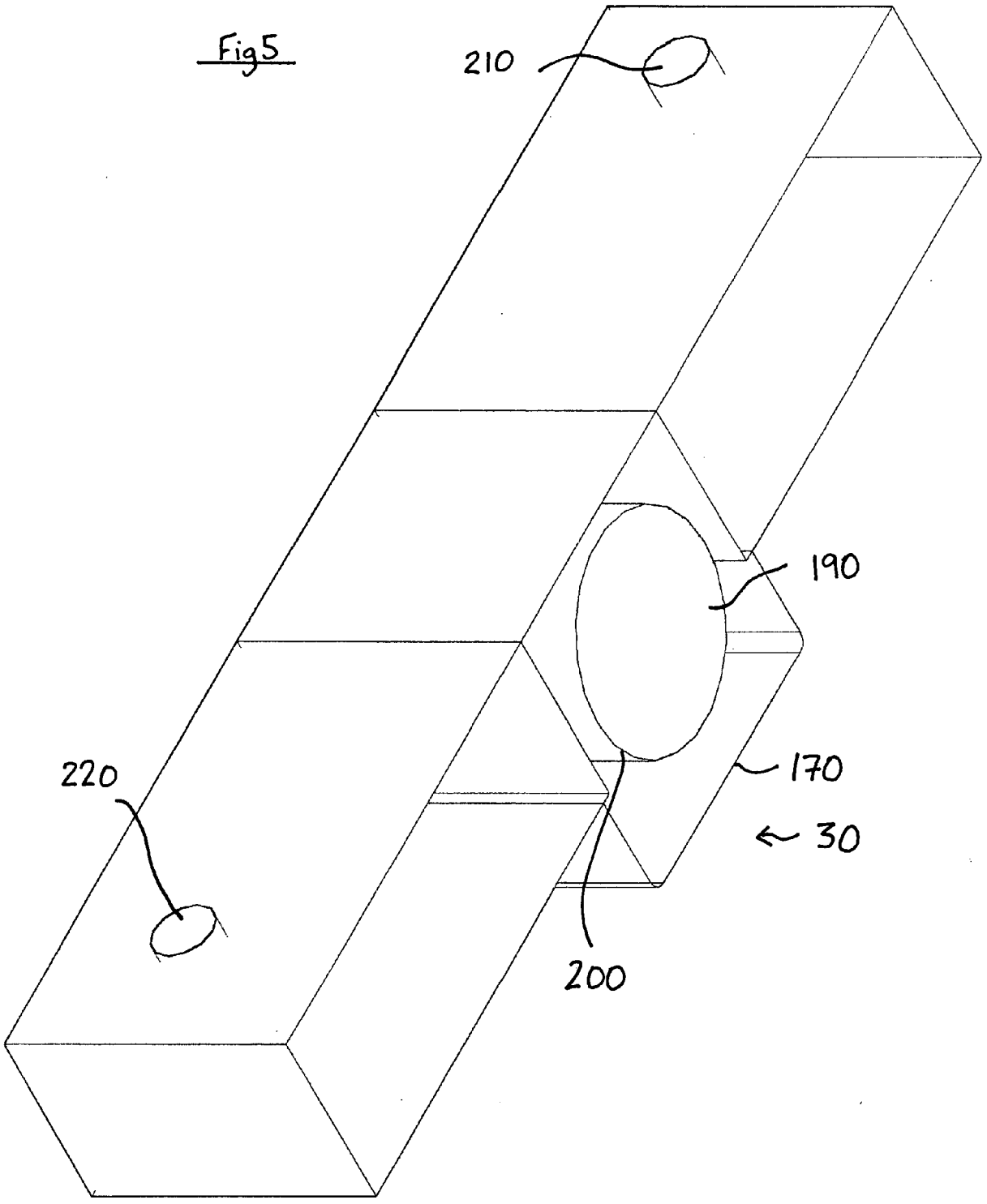


Fig5



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EUROPEAN SEARCH REPORT

Application Number
EP 07 00 8605

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	24 October 2007	Merz, Wolfgang

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