

RAPID HINGES

DESCRIPTION

5 1. Background of invention

1.1 Field of the Invention

10 This invention relates to door hinges and refers particularly, though not exclusively, to such hinges having aesthetic qualities and capable of being installed effortlessly and quickly.

1.2 Brief Description of Prior Art

15 Traditionally doors are installed on site using either Butt Hinges or Pivot Hinges. (See FIG. 1)

20 These hinges need to be chiseled and mortised into timber door or recessed into metal doors with reinforcement plates. If this is fabricated in a factory, as they usually are, the hinges face the problems of alignment, trimming, cutting doors, relative hinge positions changed, etc, due to differences in floor to ceiling heights depending on location and premises.

25 The alternative is to customize the hinges on site but due to current hinge designs, much carpentry and metalworking is required to install the hinges into the door. This is one of the main reasons for the excessive amount of time and effort currently required to install door hinges.

30 Finally, the knuckles of hinges are glaringly exposed when the door is closed, and the hinge plates when the door is open.

Thus, known pivot hinges allow a door to be pivoted from a frame by attaching the hinges to a side edge of the door ("the hinge side") and frame, such that the door swings
5 on the hinges.

With the aforementioned problems of known devices in mind, it is an object of the present invention to provide a pivot hinge that improves concealment of the hinge when attached to the door and frame whilst at the same time allowing the door to remain clear of the frame when navigating its swing path.

10

SUMMARY OF THE INVENTION

With the aforementioned in view, in one aspect the present invention provides a concealed pivot hinge arrangement comprising;

a) a door having a front and a rear face, the door having a thickness of between 35mm and
15 60mm, and a respective door frame including a rebate for flush mounting of the door, the door and frame having a minimum 3mm gap between the frame rebate and a rear face of the door and between the frame and side edge of the door;

b) the door including a strap built into a corner of a top end or bottom end of the door during fabrication of the door and glued, screwed, nailed or sandwiched between stiles
20 and rails of the door;

c) a pin/shaft mounted on metal flanges for fixing to either the floor/doorframe or to the corner of the respective top or bottom end of the door; and

d) a receiver mounted on flanges for fixing the receiver to the respective corner of the door end or the floor/door frame such that the pin/shaft is arranged to be received into the
25 receiver, the pin/shaft providing a pivot extending within the material of the door;

wherein, when the hinge is mounted to the door and door frame/floor, the pin/shaft and receiver arrangement provides a pivot point at the corner of the respective top or bottom

end of the door adjacent the front face of the door such that the door is permitted to open and close without contacting the frame and frame rebate.

Thus, advantageously, by selecting the pivot axis of the hinge offset towards the
5 front face corner of the top or bottom end of the door, the present invention permits the hinge to be more discretely concealed at the top or bottom of the door when compared to side mounted hinges, and allows the door to navigate its swing path without contacting a side of the frame adjacent the door edge or the rear door face contacting the frame rebate, or requiring an edge of the door/frame adjacent the frame during opening/closing to be
10 specially shaped.

Preferably the pivot shaft or shaft receiver is adjustable to vary a position of said pivot axis within the thickness of the door. Thus, the position of the pivot axis may be adjustable to select the most suitable pivot axis for a given door and frame arrangement.

15

Preferably the receiver may have a cylindrical body for mounting into a recess in a top or bottom edge of the door or mounting to said door frame or floor, said cylindrical body may include an aperture extending into said cylinder from an end thereof for receiving the pivot shaft. Thus, a hole for the cylindrical receiver body may be readily cut
20 in situ into the door or frame using readily available tools, such as a holesaw, router or the like.

Preferably the aperture in the receiver may be positioned offset from a centreline of said cylindrical body, and the cylindrical body may be rotatable to permit adjustment of said pivot axis relative to said door. Thus, practical selection and/or adjustment of the
25 pivot axis in situ can be realised.

Preferably the pivot shaft or shaft receiver is mounted to a reinforcing support attached to said door, which thereby may provide additional strengthening of the door such that the weight of the door may be more efficiently supported by the hinge. More
30 preferably the reinforcing support may be a discrete metal strap integrated into said door during construction thereof or mounted to an external periphery of said door, which strap may have perforations, corrugations, wire netting or a combination thereof to aid bonding

or gluing of said strap into or to said door. The strap may locate the receiver into position relative to the door and distributes loads from said receiver through said door.

Preferably the pivot shaft may include a ball bearing proximate a distal end thereof, which said ball bearing may contact a portion of the receiver to help reduce friction during opening or closing of said door.

Preferably the pivot shaft may be adjustable in effective length to provide adjustable hinge height. More preferably the pivot shaft may be mounted to a flange, and adjustment of the effective length of the shaft is effected by a screw/nut adjuster or shims. Preferably the flange may be mounted to an end of the door or to the door frame or floor.

Preferably the door is a hollow core door.

A further aspect of the present invention provides a method of installing a door using pivot hinges according to one or more of the aforementioned forms embodying an aspect the present invention, said door having a thickness, said method including the steps of;

- a) attaching a lower hinge pivot shaft or shaft receiver to a floor;
- b) attaching an upper hinge pivot shaft or shaft receiver to an upper portion of a door frame;;
- c) attaching a corresponding lower hinge pivot receiver or shaft proximate a bottom edge of the door such that a pivot axis of the respective lower shaft extends towards/from a bottom edge of the door offset from a centreline passing through the plane of said door, said hinge pivot receivers each having an aperture for a respective pivot shaft;
- d) mounting said door onto the lower shaft/receiver by positioning the lower shaft into the aperture;
- e) positioning an upper hinge pivot shaft, offset from a centreline passing through the plane of the door, into a corresponding aperture of the upper hinge pivot receiver; and
- f) whilst the door is in an open orientation, fixing said corresponding upper shaft/receiver to an upper portion of said frame;

whereby, said door is hingedly pivoted top and bottom with respect to said frame through the pivot axis of the top and bottom hinges offset from the centreline of the plane of the door.

5 Preferably the door may include an integral reinforcing strap proximate the top and/or bottom periphery of the door, and said whereby said upper receiver and/or lower hinge pivot shaft is/are attached to said door via a respective strap.

Preferably the method may include a further step of adjusting the offset of the top and/or bottom pivot axis within the thickness of the door though remaining offset from the centreline.

10 Preferably the method may include a step of removing a portion of material from the top and/or bottom edge of the door, and mounting the upper receiver or flange holding said lower shaft into a respective aperture formed after removal of said material.

Preferably the method may further include a step of attaching the upper receiver and/or lower shaft to a support trap integral with or attached to said door.

15 Preferably the method may include a step utilising an algorithm to determine the position of the offset hinge pivot axis.

BRIEF DESCRIPTION OF THE DRAWINGS

20 Figure 1 shows a prior art butt hinge and its attachment to an edge of a door and frame.

Figure 2A shows a prior art arrangement of an off-set pivot hinge and its attachment to a door.

25 Figure 2B shows a prior art arrangement of a centre pivot hinge and its attachment to a door.

Figure 2C(i) to (vii) show various areas in an end of a door in which the pivot may be arranged in various embodiments of the present invention.

30 Figure 2D shows a comparison of choice of pivot points affecting door opening clearance for a pivot hinge according to one or more embodiments of the present invention.

Figure 3 shows a strap providing a reinforcing member for a pivot hinge according to an embodiment of the present invention.

Figure 4 shows various forms of reinforcing member for application to a door for a pivot hinge according to various embodiments of the present invention.

Figure 4A shows a reinforcing strap applied to a panel door for a pivot hinge according to an embodiment of the present invention.

5 Figure 4B shows various arrangements of reinforcing strap for a pivot hinge according to embodiments of the present invention.

Figure 5 shows various arrangements of pivot shaft for mounting to a door or frame for a pivot hinge according to embodiments of the present invention.

10 Figure 6 shows various arrangements of a pivot hinge according to embodiments of the present invention including an adjustable pivot shaft receiver.

DESCRIPTION OF PREFERRED EMBODIMENT

There are generally two types of known pivot hinges – off-set pivot hinges (see
15 Fig 2A) and centre pivot hinges (see Fig 2B)

An off-set pivot hinge of known construction is used in single doors (single action doors) where it is attached in the usual manner as shown in Fig 2A. As such they are visible when the door is closed as the pivot point is outside the door.

20 A centre pivot hinge of known construction is used in dual direction doors (double action doors) where it is attached in the usual known manner as shown in Fig 2B. The hinge is concealed within the door, but requires both edges of the door to be rounded/chamfered so that the edges can clear the frame when navigating its swing path. The pivot point is situated along the centre of the door thickness.

25 The present invention allows for a new pivot point which is neither centred nor off-set as the aforementioned known hinges. Instead, it is at a point where the corners of the door can clear the frame without coming into contact with the frame, whilst keeping the pivot point located within the line of the material of the door, thereby helping to conceal the pivot point. The position of a pivot point may be determined by computer aided design where the two corners A and B of the door edge and the frame, for example,
30 a 20mm rebate having a 3mm gap (tolerance) may be used.

The shaded area as shown in Fig 2C(i) to (vii) provides examples of the area in which the pivot may be located in order to achieve a preferred pivot point for the present invention. Any point selected

within this area will allow the edge of the door to navigate the swing path without coming into contact with the frame. This is subject to:

- 1) Door is of a thickness between 35mm and 60mm.
- 5 2) There is a minimum 3mm gap/tolerance between door and frame for both face and edge.
- 3) The rebate is 20mm deep.

10 The choice of location of the pivot point within the shaded area is affected by several factors:-

- 1) If the pivot point is moved away from the door edge (A-B, hinge side), this will correspondingly reduce the clear opening space the authorities require for escape. (see FIG. 2D).
- 15 2) If the pivot point is moved nearer the door face, this will require the door to be of sturdier material that can carry a 50-60kg door with thinner pin/shafts since one has to take into account a 5mm radius shaft for the pin. This means that the thickness from the door surface to the shaft is only 5mm.
- 20 3) If the pivot point is moved nearer to corner 'A' of the door, stronger straps and reinforcements will be needed to support the weight of the door and to off-set from the turning moment force.

25 Most pivot hinges comprises a strap with holes to chisel/ fit into the top and bottom of the door. (see FIG 3). The strap's function is to:

- (i) act as a reinforcement for the pivot point,
- (ii) act as a 'key' to locate the point;
- 30 (iii) distribute the forces along the strap.

As such, straps for heavy duty, doors are of thickness of 3-15mm – this is a large amount for site chiseling.

5 In order to avoid site chiseling; all removal of timber/ material will be done with a drill only. – i.e. only round holes.

This invention is a complete change from the traditional way, where the doors are worked on site to be mounted onto the frame.

10 The rapid hinges comprises 3 parts:-

1) Strap

15 Unlike conventional straps which are thick (3-15mm) and require chiseling, the present design uses straps which are 1.5mm-8mm thick, but are broader. The straps are to built into the door during the fabrication along the top and bottom corner of the door and glued, screwed, nailed or sandwiched between the stiles and rails.

20 The strap is broader so as to be easily located as well as to distribute the weight of the door over a wider area and thus reducing the forces acting on the hinges and the door.

25 For hollow core, additional blocking can be used to reinforce the strap. (see FIG. 4)

30 Furthermore the strap can come with perforations, corrugations, wire netting to aid bonding/gluing to the timber/composite door. For certain panelized designs, the strap can be bent into an 'L' or profiled into a 'U' shape. (see FIG. 4A)

As parts are designed to be either drilled or surface mounted, the strap plays an important part in –

- 1) Locating the receiver position
- 5 2) Maintain the exact height
- 3) Distribute the point load/support along the door panel.

The strap is a reinforcement plate of metal 1-3mm in thickness and embedded in the door panel during the production of the door. Each strap is located between the door core (if it is fire door) and internal edge banding. (see FIG. 4); with one strap on the top and one on the bottom. For hollow doors, slots in the banding can be made or additional wood used to hold the straps in place.

15 2) Pin/shaft

This is the item which the door pivots on and is preferably made of non-corroding material like stainless steel. The preferred diameter is 5-14mm depending on the frequency of use, width and weight of the door. The shaft is preferably hardened and a ball bearing used on the bottom to reduce friction. For light duty door (30-50kg) the whole weight can be carried on the pin.

The pin has to be mounted on metal flanges to allow the pin to be fixed to the floor and frame. Various types/configurations can be used. (see FIG. 5) It is preferable to have the pin fixed to the flange and the height varied by shims. The alternative is to have a pin that can be raised/lowered with respect to the flange by screw/nut or other means.

30 3) Receiver – flat/flanges or drum/disc types

The pin will be housed in a sleeve called a receiver. The receiver is to be mounted opposite to the pin/shaft, e.g. if the pins/shaft are frame mounted, then the receiver will be door mounted, and vice versa.

5 The receiver is mounted on flanges to allow the receiver to be fixed to the door or floor/ frame. It is preferable that the flanges are of stainless steel as they are exposed to view and the elements and 2-9mm thick. The flanges can be of unequal thickness, e.g. a thinner top but a thicker bottom. This is because more weight is carried at the bottom than the top, and also the top serves more as a guide for the door to pivot around. The door-to-floor gap can be 10mm and the door-to-frame at the top 3-5mm. These flanges should be surface mounted to avoid chiseling. For heavier doors, the sleeve will be expanded to a disc as shown in (FIG. 6).

15 This disc/drum will be able to rotate so as to allow for adjustment of the pivot point and have holes to secure the disc to the strap (remembering that the strap has been pre-installed in the door). In this configuration, the pin is made shorter so as to act as a guide only to pivot about, and the door weight is carried by the disc which has a larger area. The disc/ drum can be raised or lowered. Depending on the weight of the door, the size and shape of the strap, pin, and receiver can vary. Some variations of these parts are shown in FIG. 4. The pin can be frame mounted or door mounted with the receiver in the opposite location.

25 As with all pivots, the pin and receiver may be door mounted and frame/floor mounted respectively or vice versa.

30 The door edge banding is of a fixed thickness, usually the size of the receiver. The flange/ flat receivers can be made with welded guides. At this location, guides can have friction-reducing sleeves and bearings or sintered bearings. The disc/drum can also have sleeves lining the holes with bearings.

The installations method is as follows:-

- 1) Pin is screwed/ bolted to floor/ frame.
- 5 2) Receiver placed in door (top and bottom).
- 3) Door panel carried to pin on floor and placed in position.
- 4) Pin for top is put in receiver for door while the door top is accessible by tilting it out of the frame.
- 10 5) The top pin is then screwed into place by opening the door till the flanges with holes for screws are exposed.

For doors of up to 50-60kg, the pin can be used to carry the door weight as the diameter of the pin can be 6-14mm without affecting the door face since the pivot point is so close to the door face and a thicker pin will reduce the space left.

15

For heavier doors, the drum/disc is used and the weight will then be distributed along the width of the drum. The pin then serves as a guide only. The drum/disc can be rotated within its center to make any necessary adjustments during installation. This will let the position of the hole of the receiver move to allow for adjustment in the left/right or front/back positions.

20

For adjustments in height, the floor pin can have shims, or washers to raise the drum/disc. The disc/drum can also be made to protrude more by adding shims between the strap and drum/disc to take up the tolerance left between door and frame.

25

As this is a pivot hinge system, security pins can be used, if needed, like in other standard practices.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A concealed pivot hinge arrangement comprising;

a) a door having a front and a rear face, the door having a thickness of between 35mm and 60mm, and a respective door frame including a rebate for flush mounting of the door, the door and frame having a minimum 3mm gap between the frame rebate and a rear face of the door and between the frame and side edge of the door;

b) the door including a strap built into a corner of a top end or bottom end of the door during fabrication of the door and glued, screwed, nailed or sandwiched between stiles and rails of the door;

c) a pin/shaft mounted on metal flanges for fixing to either the floor/doorframe or to the corner of the respective top or bottom end of the door; and

d) a receiver mounted on flanges for fixing the receiver to the respective corner of the door end or the floor/door frame such that the pin/shaft is arranged to be received into the receiver, the pin/shaft and receiver providing a pivot extending within the material of the door

wherein, when the hinge is mounted to the door and door frame/floor, the pin/shaft and receiver arrangement provides a pivot point at the corner of the respective top or bottom end of the door adjacent the front face of the door such that the door is permitted to open and close without contacting the frame and frame rebate.

2. The pivot hinge according to claim 1, wherein the pin/shaft or receiver of the hinge is pre-installed in the door to remove the need for on site chiselling.

3. The pivot hinge according to claim 1 or 2, wherein the hinge is reinforced by the pin/shaft and receiver being secured to the strap to allow the hinge to bear the weight of the door.

4. A pivot hinge as claimed in any one of the preceding claims wherein the pivot pin/shaft or receiver is adjustable to vary a position of said pivot point at said top or bottom end corner adjacent said front face of the door.
5. A pivot hinge as claimed in any one of the preceding claims, wherein said receiver has a cylindrical body for mounting into a recess provided in the top or bottom end of the door or respective mounting to said door frame or floor, said cylindrical body including an aperture extending into said cylinder from an end thereof for receiving the pivot pin/shaft.
6. A pivot hinge as claimed in claim 5, wherein the aperture is positioned offset from a centreline of said cylindrical body and the cylindrical body is rotatable to permit adjustment of said pivot point relative to said door.
7. A pivot hinge as claimed in any one of the preceding claims, wherein said strap includes perforations, corrugations, wire netting or a combination thereof to aid bonding or gluing of said strap to said door.
8. A pivot hinge as claimed in any one of the preceding claims, wherein said strap locates the receiver into position relative to the door and distributes loads from said receiver through said door.
9. A pivot hinge as claimed in any one of the preceding claims, wherein the pivot pin/shaft includes a ball bearing proximate a distal end thereof, said ball bearing contacting a portion of the receiver to reduce friction during opening or closing of said door.
10. A pivot hinge as claimed in any one of the preceding claims, wherein the pivot pin/shaft is adjustable in effective length to provide adjustable hinge height.
11. A pivot hinge as claimed in claim 10, wherein the pivot pin/shaft is mounted to a flange, and adjustment of the effective length of the shaft is effected by a screw/nut adjuster or shims.

12. A pivot hinge as claimed in any one of the preceding claims, wherein the door is a hollow core door.