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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.

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2. Summary of the invention

A door is attached to the frame by hinges. The hinge is attached to a side of the door ("the hinge side"). The door swings on the hinges.

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This invention aims at concealing the entire hinge system within the door and frame but at the same allowing the door to keep clear of the frame when navigating its swing path. To achieve the latter objective, a special pivot point in the door must be found. The door will then rotate on this point when opening and closing by using a pivot hinge.

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There are generally 2 types of pivot hinges – off-set pivot hinge and centre pivot hinge. (See FIG. 2A and 2B).

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An off-set pivot hinge is used in single directional 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.

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A centre pivot hinge is used in dual directional doors (double action doors) where it is attached in the usual manner as shown in FIG. 2B. The hinge is concealed within the door, but requires both edges of the door to be rounded / champhered 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. This invention uses a new pivot point which is neither centre nor off-set. Instead it is at a point where the corners of the door can clear the frame without coming into contact with it while keeping the pivot point located within the door, thus concealing it. The concealed pivot point can be located by computer aided design where the 2 corners A and B of the door edge and the frame with 20mm rebate having 3mm gap (tolerance) is used.

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The area shaded as shown in FIG. 2C(i) to (vii) is the area in which the pivot may be located in order to achieve the effect described above. Any point selected

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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.

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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)

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

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

10 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

20 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 fiction. For light duty door (30-50kg) the whole weight can be carried on the pin.

25 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

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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
10 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
20 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.

 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
30 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.
- 5) The top pin is then screwed into place by opening the door till the flanges
10 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.

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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
20 adjustment in the left/right or front/back positions.

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
25 frame.

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

CLAIMS

- 1) A pivot hinge comprises the following:
 - 5 a. a strap built into the door during fabrication along the top and bottom corner of the door and glued, screwed, nailed or sandwiched between the stiles and rails;
 - 10 b. a pin/shaft mounted on metal flanges to allow it to be fixed to the floor at the bottom and frame at the top;
 - c. a receiver mounted on flanges to allow it to be fixed to the door or floor/ frame.
- 15 2) The strap, according to claim 1, can be pre-installed in the door to remove the need for on-site chiseling.
- 3) The pivot hinge, according to claim 1, is reinforced by the pin/shaft and receiver being secured to the strap to allow it to bear the weight of the door.