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(72) Inventor: **Mao, Amanda**
Coventry, West Midlands CV7 9FW (GB)

(74) Representative: **Oxley, Robin John George et al**
Marks & Clerk LLP
Alpha Tower
Suffolk Street Queensway
Birmingham B1 1TT (GB)

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(71) Applicant: **Window Fabrication & Fixing Supplies Limited**
Exhall, Coventry CV7 9FW (GB)

(54) **Adjustable hinge**

(57) This invention presents an adjustable hinge (6) for mounting an openable member to a frame. The hinge (6) comprises a fixed plate (8), an adjustable plate (14), and a pivot member (12) pivotally connecting the fixed plate (8) and the adjustable plate (10). The adjustable plate (10) comprises a fixing plate (14) for fixed attachment to one of the openable member and the frame and a floating plate (16) movable relative to the fixing plate (14) in a first axis and in a second axis and configured for pivotal connection to the fixed plate (8). The floating plate (16) has a first (30) therein. A first adjustment means comprising a first eccentric cam (34) rotatable in the first slot (30) adjusts the position of the floating plate (16) in a first axis, and a second adjustment means (36) adjusts the position of the floating plate (16) in a second axis.

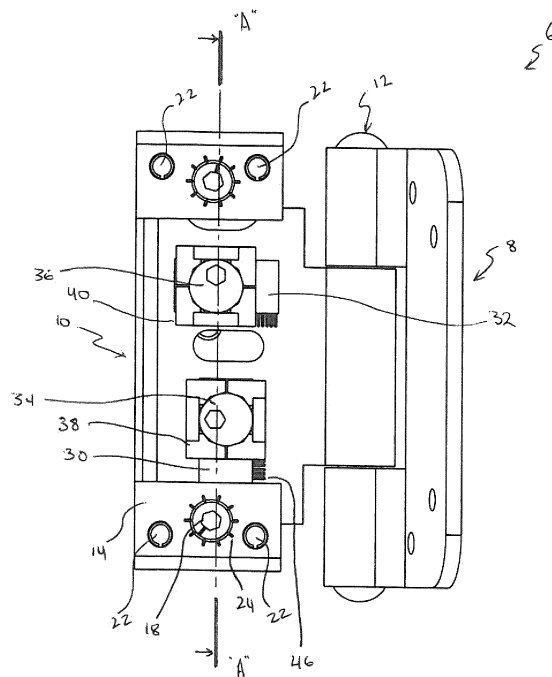


Figure 2.

Description

[0001] This invention relates to hinges for windows, doors or the like, in particular this invention relates to adjustable hinges.

[0002] When hanging a door or window in a frame, it is often a difficult and highly skilled job to ensure that the door or window is aligned properly in the frame as alignment is needed at least two, and often three axis. Linear alignment is needed to align the door or window in the frame in the vertical axis and in one of two perpendicular horizontal axis. This multiple alignment can make hanging a labour intensive and highly skilled job which is commonly done in one of two ways, either by attaching the hinges and then removing material from the edges of the door or window such that it fits correctly in the frame, or by moving the hinges up or down, and/or placing shims behind the hinges to pack them out. Types of hinges on which doors or window are currently hung are well known in the art and typically comprise two hinge plates pivotally attached to one another.

[0003] Adjustable hinges have been known for use in cabinetry some time, and can be used when mounting doors or windows. Usually adjustment is made by turning a screw which alters the separation of two hinge parts by driving them apart, which in turn alters the position of one of the hinge plates (by which the hinge is attached to the door or frame etc.) relative to the hinge pivot.

[0004] One type of adjustable butt type hinge is described in GB patent application GB2464950.

[0005] It is the purpose of the current invention to provide a simple to use adjustable hinge.

[0006] According to the present invention there is provided an adjustable hinge for mounting an openable member to a frame, the hinge comprising: a fixed plate, an adjustable plate and a pivot member pivotally connecting the fixed plate and the adjustable plate. The adjustable plate comprises: a fixing plate for fixed attachment to one of the openable member and the frame; a floating plate movable relative to the fixing plate in a first axis and in a second axis and configured for pivotal connection to the fixed plate, said floating plate having a first slot; a first adjustment means comprising a first eccentric cam rotatable in said first slot to adjust the position of the floating plate relative to the fixing plate in a first axis; and a second adjustment means to adjust the position of the floating plate relative to the fixing plate in a second axis.

[0007] The floating plate may have a second slot therein, and the second adjustment means may comprise a second eccentric cam rotatable in said second slot to adjust the position of the floating plate relative to the fixing plate in a second axis; said first and second slots being perpendicular to one another. In this way the same type of mechanism can be used for the adjustment in both the first and the second axis.

[0008] The first slot may extend longitudinally along the floating plate and rotation of the first eccentric cam can apply a force to a side of the first slot so as to move

said floating plate in a direction traverse to said first slot. The second slot may extend traverse the floating plate and rotation of the second eccentric cam can apply a force to a side of the second slot so as to move said floating plate longitudinally along the fixing plate. Rotation of each cam can therefore move the floating plate in one direction so that independent adjustment along two axis is achieved.

[0009] In one arrangement the adjustable hinge comprises two bearing surfaces substantially parallel to the sides of the first slot, and the separation of the two bearing surfaces substantially corresponds to the external dimension of a cam surface of the first eccentric cam. The first eccentric cam is thereby maintained in contact with the sides of the first slot so as to reduce backlash in the first adjustment means.

[0010] A first saddle may be located in and extend through the first slot and the first saddle can comprise two guide surfaces parallel to, and in sliding contact with, the sides of the first slot. The bearing surfaces may be provided on the first saddle.

[0011] The adjustable hinge may comprise two bearing surfaces substantially parallel to the sides of the second slot, and the separation of the two bearing surfaces substantially corresponds to the external dimension of a cam surface of the second eccentric cam.

[0012] A second saddle may be located in and extend through the second slot and the second saddle can comprise two guide surfaces parallel to, and in sliding contact with, the sides of the second slot. The bearing surfaces substantially parallel to the sides of the second slot can be provided on the second saddle. The second eccentric cam is thereby maintained in contact with the sides of the second slot so as to reduce backlash in the second adjustment means.

[0013] The first and second eccentric cam may each comprise a circular cam surface, said cam surface having a diameter substantially equal to the separation of the corresponding two bearing surfaces. Further, each eccentric cam may comprise a location surface comprising a regular polygon having an even number of sides, said sides of the location surface of each eccentric cam aligning with the circular cam surface substantially at their centre, and extending beyond the cam surface at either end. The two bearing surfaces parallel to the first and/or second slot can have an undercut therein. At least one of said first and/or second eccentric cams may be movable between a first position in which the cam surface is located between the bearing surfaces and the location surface extends into the undercut, and a second position in which the location surfaces are located between the bearing surfaces. Said first and/or second eccentric cam can be resiliently biased into the second position. This enables the cam to move between two positions wherein in the first position the circular cam is located between the bearing surfaces, and the location surface is in the undercut and the cam is therefore free to rotate such that rotation moves the floating plate, and in the second po-

sition the opposite flat sides of the location surface locate between the bearing surfaces and rotation is thereby prevented, effectively securing the floating plate in that particular position.

[0014] The fixing plate of the hinge may comprise a first fixing plate section and a second fixing plate section, the second fixing plate section being adjustable relative to the first fixing plate section in a direction perpendicular to both the first slot and the second slot, and the floating plate can be mounted on said second fixing plate section. In this way adjustment in the third axis is effected.

[0015] The adjustable hinge may further comprise clamping means for clamping said adjustable plate to said fixing plate

[0016] Specific embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows a perspective view of a closure pivotally attached to a frame

Figure 2 shows a front view of an adjustable hinge in accordance with the invention;

Figure 3 shows a cross section on the line "A"- "A" of Figure 2;

Figure 4 shows a perspective view of the adjustable plate; and

Figure 5 shows an exploded view of the hinge.

[0017] Referring to Figure 1, a closure member 2 is shown attached to a frame 4 by means of an adjustable hinge 6. The hinge 6 allows pivotal movement of the closure member 2 with respect to the frame 4. The closure member 2 may be a door, in particular it may be a composite door. Composite doors are traditional looking doors that are made of composite materials, for example they could be, without limitation, timber with a GRP skin, a GRP skin with a foam interior, or a metal skin with a foam interior. They have the benefit of a traditional look combined with low maintenance. One part of the adjustable hinge 6 may be recessed into the closure member 2 and the pivot of the hinge may extend forwards of the door resembling a traditional butt type door hinge.

[0018] Referring to Figures 2 to 5 details of the hinge 6 are shown. The hinge 6 has two main halves, a fixed plate 8, and an adjustable plate 10. A pivot pin 12 passes through and connects the fixed plate 8 and adjustable plate 10 on one side thereof so that the two plates may pivot relative to one another. In use this enables the door or window to pivot on the frame 4 so that it can open and close.

[0019] The fixed plate 8 is of standard construction and is similar to one half of a standard butt hinge that will be known to the person skilled in the art.

[0020] The adjustable plate 10 has a new construction

that allows for adjustment of the hinge 6 in at least two axis. The adjustable plate 10 comprises a fixing plate 14 which can be fixed to either the closure member or the frame, whichever the fixed plate 8 is not attached to, and a floating plate 16. The floating plate 16 is movable relative to the fixing plate in a first axis and in a second axis has a tubular section 28 through which the pivot pin 12 passes, thereby pivotally attaching it to the fixed plate 8.

[0021] The floating plate 16 has a first and a second slot therein. The first slot 30 is a longitudinal slot, i.e. it runs along the length of the floating plate 16 and the second slot 32 runs traverse the floating plate. The two slots 30, 32 are therefore at ninety degrees to one another.

[0022] A first 34 and a second 36 eccentric circular cam are provided and are retained in a manner such that they can rotate relative to the fixing plate 14. The first and second cam pass through the first and second slot respectively such that rotation of the first cam 34 adjusts the position of the floating plate 16 relative to the fixing plate 14 in the first axis and rotation of the second cam 36 adjusts the position of the floating plate 16 relative to the fixing plate 14 in the second axis. This is achieved by rotation of the cam causing a force on the sides of the slot with which it is associated. As the slots 30, 32 are at ninety degrees to one another movement caused by one cam acting on the sides of one slot is not prevented by the cam in the other slot as the perpendicular slot allows for the required freedom of movement.

[0023] In the embodiment shown the cams 34, 36 do not bear directly upon the sides of their associated slot 30, 32. A first saddle 38 is located in and extends through the first slot 30 a second saddle 40 is located in and extends through the second slot 32. The first 38 saddle comprises two guide surfaces parallel to, and in sliding contact with, the sides of the first slot 30 and the second saddle 40 comprises two guide surfaces parallel to, and in sliding contact with the sides of the second slot 32. In this manner each saddle is free to slide along the length of its respective slot, and its rotation is prevented by the guide surfaces.

[0024] Each saddle 38, 40 has a pair of bearing surfaces 42, 44 which are substantially parallel to the sides of their associated slot 30, 32, and the separation of the two bearing surfaces 42, 44 substantially corresponds to the minimum external dimension of the eccentric cams 34, 36. In this way rotation of each of the cams in opposite directions bear directly on the bearing surfaces 42, 22 with little or no backlash.

[0025] Although described herein as being flat surfaces the skilled person will appreciate that the bearing surfaces need not necessarily be parallel to the sides of the slots for the cam to effect movement of the floating plate. The bearing surfaces could be at an angle to the sides of the slot or could be curved, although parallel surfaces are preferred.

[0026] As the guide surfaces of the saddles 38, 40 are parallel to and in sliding contact with the sides of the slots,

rotation of the cams 34, 36 imparts a moving force on the sides of the slots 30, 32, via the saddle 38, 40.

[0027] Graduations 46 can be provided adjacent the edges of one or both of the slots 30, 32 at a set interval, for example 0.5mm. The user can therefore accurately set the hinge using the graduations 46 as visual indicators of the degree to which he is adjusting the hinge.

[0028] The cams 34, 36 each have, in addition to their circular cam surface, a location surface 48 positioned adjacent the cam surface. The location surfaces 48 are in the shape of a regular polygon having an even number of sides. The sides of the location surface 48 of each eccentric cam align with the circular cam surface substantially at their centre, and extend beyond the cam surface at either end, i.e., viewed from the top (Figure 3) the circle formed by the cam surface fits exactly inside the polygon of the location surface 48. In the embodiment shown the location surface is in the form of a decagon. By having an even number of sides, opposite sides of the polygon are always parallel and as the sides of the location surface align with the circular cam surface substantially at their centre the distance between opposite sides of the location surface 48 is equal to the diameter of the circular cam surface. In this manner the eccentric cams 34, 36 can be moved along their axis of rotation between a first position in which the cam surface is located between the bearing surfaces 42 and a second position in which the location surfaces 48 are located between the bearing surfaces 42.

[0029] The bearing surfaces 42 parallel to the first 30 and/or second 32 slot have an undercut provided in them so that, in the first position, as the cams 34, 36 are rotated the location surface 48 can extend into the undercut and rotate therein so as to not inhibit adjustment of the floating plate 16. Once adjusted to the desired position opposite parallel sides of the location surface can be aligned with the bearing surface 42 and the cam 34, 36 moved to its second position. Preferably the eccentric cams 34, 36 are provided with a spring 50 to resiliently bias them into the second position. In this manner the user can place a tool, for example an allen key, in a suitably provided recess in the face of the eccentric cam, depress the cam 34, 36 against the spring 50 so as to move it into its first position, rotate the cam 34, 36 so that the cam surface acts on the bearing surface 42 to adjust the position of the floating plate, and then release the cam 34, 36 with opposite sides of the location surface 48 aligned with the bearing surface 42 so that it moves into its second position. In its second position as parallel surfaces of the location surface 48 are aligned and adjacent the parallel sides of the bearing surface 42 further movement is prevented as in the second position the cam 34, 36 can not rotate. As will be appreciated the use of the location surface 48 provides for indexed adjustment by discreet amounts as opposed to continuous adjustment, although the skilled person will appreciate that the location surfaces 48 can be omitted if continuous adjustment is desirable.

[0030] In the embodiment shown adjustment is also provided in a third direction. The fixing plate 14 has a first fixing plate section 52 and a second fixing plate section 54. The second fixing plate section 54 is adjustable relative to the first fixing plate section 53 in a direction perpendicular to both the first slot 30 and the second slot 32. As can be seen the floating plate 16 is mounted on said second fixing plate section 54.

[0031] The first fixing plate section 52 has each end turned in to form a C shape defining a T slot when seen from the side. The second fixing plate section 54 sits in the T-slot and is attached thereto at either end by an adjusting screw 18. The adjusting screw moves the second fixing plate section 54 towards or away from the first fixing plate section 52, guided on location pins 22 which limit the movement of the second fixing plate section 54 to movement along the length of the location pins 22. An indicator line 26 may be provided on the top of the adjusting screw 18 and graduations 24 provided on the first fixing plate section 52 so that alignment of the indicator line 26 with the graduations 24 move the second fixing plate section 54 relative to the first fixing plate section 52 by a defined distance. For example, the distance between the graduations 24 can be such that rotation of the adjusting screw 18, so that the indicator line 26 moves from one graduation 26 to an adjacent graduation, moves the second fixing plate section 54 by 0.5mm.

[0032] Although not shown, the hinge may also be provided with clamping means for clamping the floating plate to the fixing plate so as to secure it in position, once it has been adjusted, and prevent accidental or unintentional movement in the adjustment mechanisms during use of the door or other closure to which it is fixed.

[0033] Fixing holes 56 are provided in the fixed plate 8 and the fixing plate 14 by which they can be attached to the closure and frame.

[0034] Although shown in Figure 1 with the fixed plate 8 attached to the frame and the fixing plate 14 attached to the closure, it will be appreciated that the hinge may be used in the opposite orientation. Furthermore it will be appreciated that the specific embodiment described herein includes features not essential to the invention, the scope of which is defined by the claims.

Claims

1. An adjustable hinge for mounting an openable member to a frame, the hinge comprising: a fixed plate, an adjustable plate and a pivot member pivotally connecting the fixed plate and the adjustable plate; wherein the adjustable plate comprises:

a fixing plate for fixed attachment to one of the openable member and the frame;
a floating plate movable relative to the fixing plate in a first axis and in a second axis and configured for pivotal connection to the fixed

- plate, said floating plate having a first slot therein;
- a first adjustment means comprising a first eccentric cam rotatable in said first slot to adjust the position of the floating plate relative to the fixing plate in a first axis; and
- a second adjustment means to adjust the position of the floating plate relative to the fixing plate in a second axis.
2. An adjustable hinge according to claim 1 wherein:
- the floating plate has a second slot; and
- the second adjustment means comprises a second eccentric cam rotatable in said second slot to adjust the position of the floating plate relative to the fixing plate in a second axis;
- wherein said first and second slots are perpendicular to one another.
3. An adjustable hinge according to claim 2 wherein:
- the second slot extends traverse the floating plate and wherein rotation of the second eccentric cam applies a force to a side of the second slot so as to move said floating plate longitudinally along the fixing plate.
4. An adjustable hinge according to any one of the preceding claims wherein:
- the first slot extends longitudinally along the floating plate and wherein rotation of the first eccentric cam applies a force to a side of the first slot so as to move said floating plate in a direction traverse to said first slot.
5. The adjustable hinge according to any one of the preceding claims further comprising two bearing surfaces substantially parallel to the sides of the first slot, and wherein separation of the two bearing surfaces substantially corresponds to the external dimension of a cam surface of the first eccentric cam.
6. The adjustable hinge according to claim 5 further comprising a first saddle located in and extending through the first slot and wherein the first saddle comprises two guide surfaces parallel to, and in sliding contact with, the sides of the first slot.
7. The adjustable hinge according to claim 6 wherein said bearing surfaces are provided on the first saddle.
8. The adjustable hinge according to any claim 2 or claim 3 further comprising two bearing surfaces substantially parallel to the sides of the second slot, and wherein the separation of the two bearing surfaces substantially corresponds to the external dimension of a cam surface of the second eccentric cam.
9. The adjustable hinge according to claim 8 further comprising a second saddle located in and extending through the second slot and wherein the second saddle comprises two guide surfaces parallel to, and in sliding contact with, the sides of the second slot.
10. The adjustable hinge according to claim 9 wherein said bearing surfaces substantially parallel to the sides of the second slot are provided on the second saddle.
11. The adjustable hinge according to claim 5 or claim 8 wherein said first and/or second eccentric cam each comprises a circular cam surface, said circular cam surface having a diameter substantially equal to the separation of its corresponding two bearing surfaces.
12. The adjustable hinge according to claim 11 wherein each eccentric cam further comprises a location surface comprising a regular polygon having an even number of sides, said sides of the location surface of each eccentric cam aligning with the circular cam surface substantially at their centre, and extending beyond the cam surface at either end.
13. The adjustable hinge according to claim 12 wherein the two bearing surfaces parallel to the first and/or second slot have an undercut therein.
14. The adjustable hinge according to claim 13 wherein at least one of said first and/or second eccentric cams is movable between a first position in which the cam surface is located between the bearing surfaces and the location surface extends into the undercut, and a second position in which the location surfaces are located between the bearing surfaces.
15. The adjustable hinge according to claim 14 wherein said first and/or second eccentric cam is resiliently biased into the second position.
16. The adjustable hinge according to any preceding claim wherein the fixing plate comprises a first fixing plate section and a second fixing plate section, and wherein the second fixing plate section is adjustable relative to the first fixing plate section in a direction perpendicular to both the first slot and the second slot, and wherein said floating plate is mounted on said second fixing plate section.
17. The adjustable hinge according to any preceding claim further comprising clamping means for clamping said adjustable plate to said fixing plate.

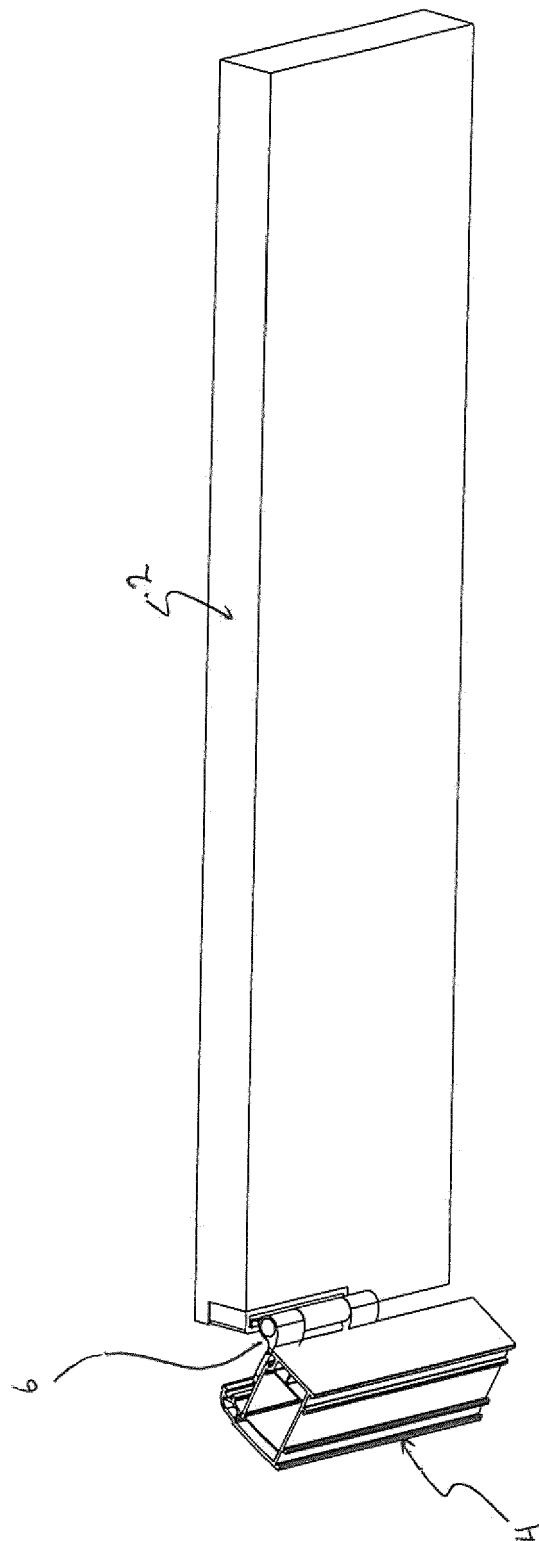


FIGURE 1.

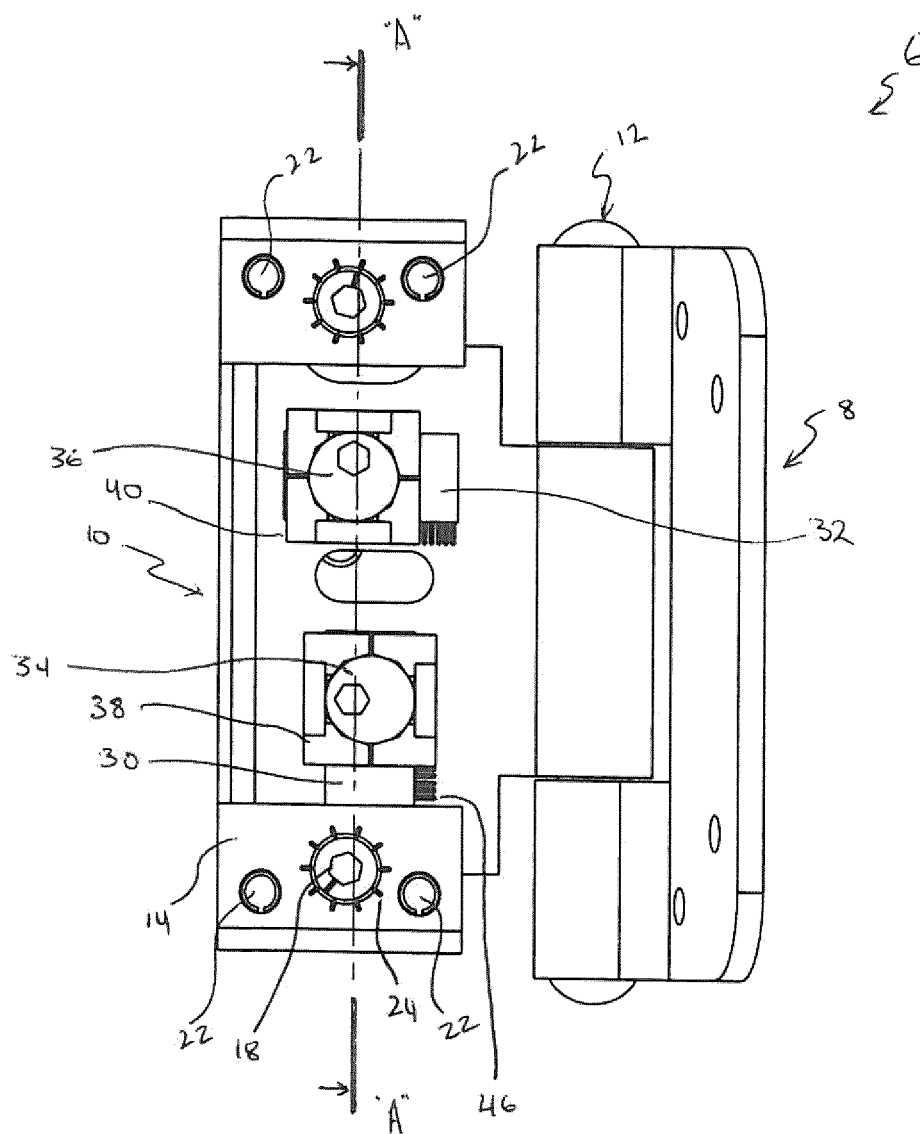


FIGURE 2.

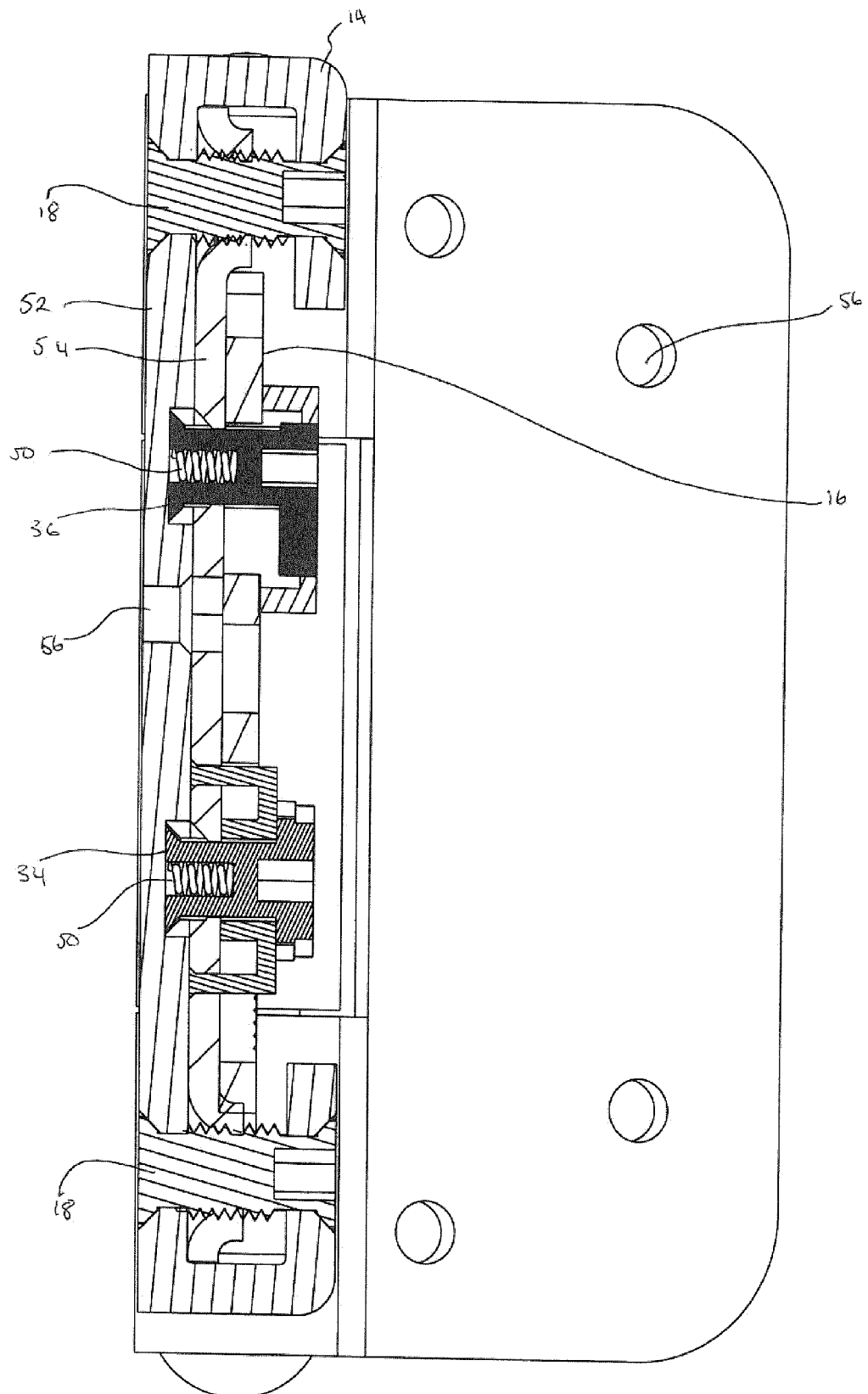


Figure 3

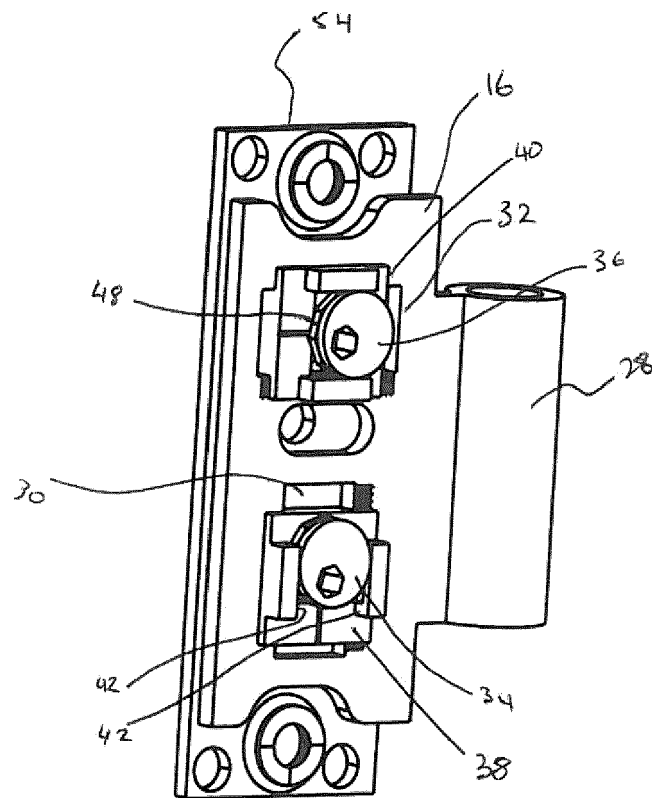


FIGURE 11

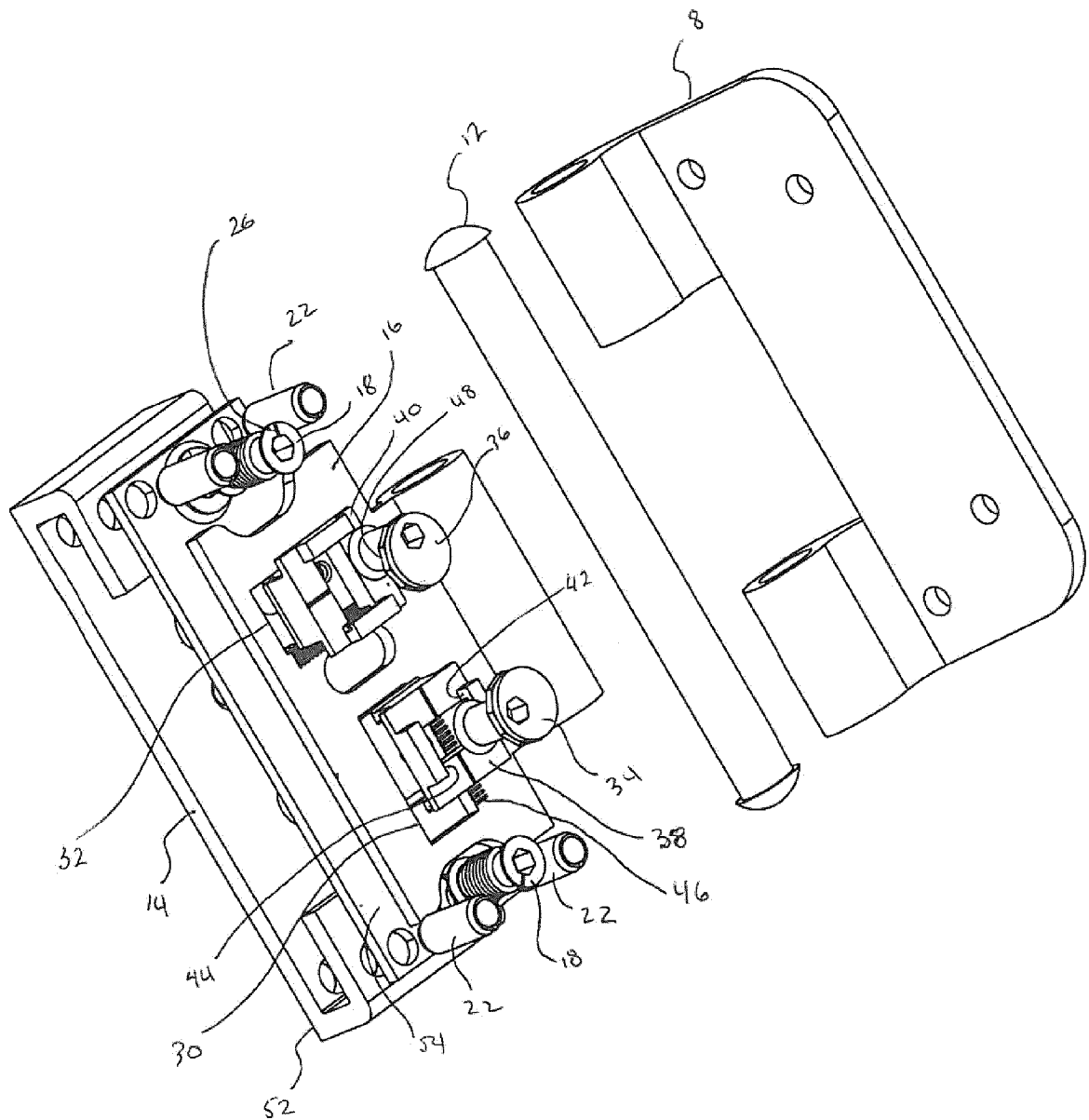


FIGURE 5.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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