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(54) Door closer kit for double swing door

(57) A door closer kit (40) for a double swing door includes a door closer (50) for concealedly mounting to a door leaf (71) and a mount (60) for concealedly mounting to a door frame (72). A shaft connector (64) of the mount (60) is connected with a turnable shaft (54) of the door closer (50) in such a way that the door leaf (71) is swung about an axis of the turnable shaft (54) upon receiving a push or pull force and the door leaf will return back to its initial position upon release of the force therefrom. The mount (60) includes a locating device (68) acting on the shaft connector (64) for adjusting and fixing the angular orientation of the shaft connector (64) relative to the door frame (72) such that the door leaf (71) can be conveniently adjusted to be in alignment with the door frame (72) in a coplanar manner when the door leaf (71) receives no external force.

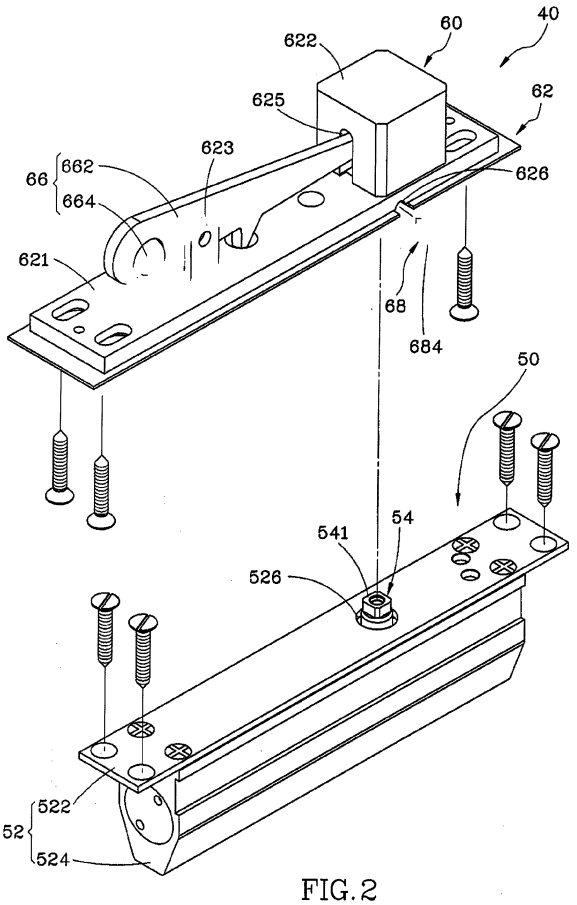

FIG.2

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates generally to door closers for a double swing door and more particularly, to such a door closer kit including a door closer that can be concealedly mounted in a door leaf, and a mount that can be concealedly mounted in a door frame and connected with a turnable shaft of the door closer.

2. Description of the Related Art

[0002] A door closer is an apparatus for automatically closing the door leaf after the door leaf is opened. By means of the door closer, the door leaf can be automatically returned to its closed position smoothly. Usually, the door closer is used in cooperation with a mount in such a way that the door leaf is in alignment with the door frame in a coplanar manner when the door closer is in a normal, force free situation.

[0003] FIG 1 is a schematic drawing showing that a conventional door closer kit including a mount **10** mounted in a door leaf **30** and a door closer **20** mounted in a floor **31**. Specifically speaking, the mount **10** is installed in a pocket **32** provided at a bottom side of the door leaf **30** and the door closer **20** is mounted in a mounting groove **34** of the floor **31** corresponding to the pocket **32** of the door leaf **30**. The door closer **20** includes a fixation casing **22** mounted in the mounting groove **34** of the floor **31**, a door closing device **24** disposed inside the casing **22**, and a top cover **26** mounted on the door closing device 2**4** for sealing the fixation casing **22**. The door closing device **24** has a pivot shaft 24**2** uprightly extending through the cover **26** and over the floor **31** at a predetermined height. The mount **10** has a connection hole **12** in which the pivot shaft **242** is inserted such that the pivot shaft **242** is connected with the mount **10.**

[0004] The top side of the door leaf **30** is pivotally connected with a door frame (not shown in the drawing) such that the door leaf **30** is swingable in double ways about the axis of the pivot shaft **242**. When an external force acts on the door leaf 30, the door leaf **30** will be swung about the axis of the pivot shaft **242** relative to the door frame. As soon as the external force is released from the door leaf 30, a rebound force provided by the door closer **20** will return the door leaf **30** back to its initial, force free position. In the process of assembling the door leaf **30**, the connection work between the pivot shaft **242** and the mount **10** shall be carefully conducted in order to return the door leaf **30** to the completely closed position after the external force is released from the door leaf **30**.

[0005] In fact, the non-coplanar alignment problem between the door leaf **30** and the door frame always exists in the process of assembling the door closer **20**, the mount **10** and the door leaf **30** and/or after use of the door for a long time. To resolve this problem, the worker has to dismount the cover **26** from the door closing device **24** firstly, and then change and fix the posture of the door closing device **24** in the fixation casing **22** to further adjust the angular orientation of the pivot shaft **242** relative to the fixation casing **22**. After the adjustment work is completed, the cover **26** needs to be mounted in position again. In order to precisely meet the coplanar requirement, the aforesaid adjustment works may have to be conducted repeatedly until the door leaf **30** is exactly stayed in the closed position when it receives no external force thereon.

[0006] It can be seen from the above description that the coplanar alignment adjustment for a conventional door closer kit is quite complicated, resulting in that the assembling work of the door leaf 30 and the door closer 20 becomes time- and cost-consuming. In addition, the fixation casing 22 of the door closer 20 has to pre-establish a sufficient inner space for the adjustment need of the angular orientation of the door closing device 24, such that the door closer 20 of the conventional door closer kit may occupy a large space.

SUMMARY OF THE INVENTION

[0007] The present invention has been accomplished in view of the above-noted circumstances. It is an object of the present invention to provide a door closer kit for a double swing door, which is convenient and time-saving to adjust the door leaf to be in alignment with the door frame in a coplanar manner.

[0008] To attain the above-mentioned object, the present invention provides a door closer kit for a double swing door, which comprises a door closer for concealedly mounting to a door leaf and a mount for concealedly mounting to a door frame. The door closer comprises a fixation casing for mounting to the door leaf, and a turnable shaft, which is turnable relative to the fixation casing upon receiving an external torque and turnable back to its initial angular orientation after the external torque is released therefrom. The mount comprises a bracket for mounting to the door frame, a shaft connector, which is mounted to the bracket in such a way that the shaft connector is biasable about an axis thereof relative to the bracket and provided with a connection hole in which the turnable shaft of the door closer is detachably inserted, and a locating device acting on the shaft connector for adjusting and fixing an angular orientation of the shaft connector relative to the bracket. As a result, when the door leaf is not coplanar with the door frame in a normal, force free situation, the door leaf can be conveniently adjusted to be coplanar with the door frame by means of using the locating device to adjust the angular orientation of the shaft connector relative to the bracket to further calibrate the angular orientation of the door leaf relative to the door frame. In other words, the return-to-zero scheme for the double swing door that is equipped with the door closer kit of the present invention can be carried

out conveniently.

BRIEF DESCRIPTION OF THE DRAWING

[0009] The present invention will become more fully understood from the detailed description given herein below and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

FIG. 1 is a schematic drawing showing that a conventional door closer kit including a mount installed in a door frame, and a door closer installed in the floor;

FIG 2 is an exploded view of a door closer kit in accordance with a preferred embodiment of the present invention;

FIG. 3 is a sectional view of the door closer of the door closer kit according to the preferred embodiment of the present invention, showing that a driven member of the door closer is in an initial position;

FIG. 4 is similar to FIG. 3, but showing that the driven member of the door closer is in a driven position;

FIG. 5 is an exploded view of the mount of the door closer kit according to the preferred embodiment of the present invention;

FIG. 6 is a sectional view of the mount of the door closer kit according to the preferred embodiment of the present invention;

FIG. 7 is a sectional view taken along line 7-7 ofFIG. 6; and

FIG. 8 is a schematic drawing showing the way of how the door closer kit is installed in the door frame and the door leaf.

DETAILED DESCRIPTION OF THE INVENTION

[0010] As shown in FIG. 2, the door closer kit, denoted by reference numeral 40, mainly comprises a door closer 50 adapted for a double swing door, and a mount 60.

[0011] The door closer 50 has a fixation casing 52 and a turnable shaft 54 extending from an inside of the fixation casing 52 to an outside of the fixation casing 52 and having a rectangular connection portion 541. The fixation casing 52 is configured with a rectangular base plate 522 and a shell 524 fixedly mounted on the base plate 522. The base plate **522** has a through hole **526** in communication with the inside of the shell **524** for the passing through of the turnable shaft **54** such that the rectangular connection portion **541** is exposed outside the base plate **522.** The door closer **50** is a linear gear driven type. Specifically speaking, as shown in FIG 3, the turnable shaft **54** is provided at its bottom end with a sector gear portion **542**, which is suspended within an elongated slot **562** of a driven member **56** that is moveably disposed inside the shell **524**. The driven member **56** is provided with two linear gear portions **564**, which are formed face-to-face with respect to each other at two opposite lateral walls of the elongated slot **562** and each have a length about equal to the circumference of the sector gear portion **542** of the turnable shaft **54**, and teeth matching the teeth of the sector gear portion **542**. Upon receiving a torque caused by an external force, the turnable shaft **54** will be turned about its axis relative to the shell **524** of the fixation casing **52**. Depending on the rotation direction of the turnable shaft **54**, i.e. a clockwise or counterclockwise turn of the turnable shaft **54**, the sector gear portion **542** will be selectively engaged with one of the linear gear portions **564** and will drive the driven member **56** to move form an initial position P1 as shown in FIG. 3 towards a driven position P2 as shown in FIG 4, such that a spring member **58** set between the driven member **56** and the shell **524** will be compressed. After the torque is released from the turnable shaft **54**, the spring rebound force of the spring member **58** will drive the driven member **56** back to its initial position P1 and at the same time the turnable shaft **54** is reversely turned back to its initial angular position relative to the shell **524** of the fixation casing **52**.

[0012] Referring to FIGS. 5-7, the mount **60** is configured with a bracket **62**, a shaft connector **64**, an adjustment device **66** and a locating device **68**. The bracket **62** includes a base plate **621**, a hollow column **622** mounted on the base plate **621** and a fulcrum post **623** mounted on the base plate **621** and spaced away from the hollow column **622**. The hollow column **622** has a cylindrical accommodation **642** with an opening located at the bottom surface of the base plate **621**. The hollow column **622** is further provided at a lateral wall thereof with an elongated through hole **625**, which is in communication with the accommodation **642**. The shaft connector 64 is a cylindrical block having a diameter slightly smaller than the diameter of the cylindrical accommodation **642**. A rectangular connection hole **642** runs through centers of top and bottom surfaces of the shaft connector **64**. On the outer periphery wall **643** of the shaft connector **64** a lateral through hole **644**, which communicates with the rectangular connection hole **642**, and two locating grooves **646**, which spacedly extend along a direction parallel to the axis of the shaft connector **64**, are provided. The shaft connector **64** is rotatably mounted in the accommodation **624** of the hollow column **622** in such a way that the lateral through hole **644** is communicated with the elongated through hole **625** of the hollow column 622 and the shaft connector **64** is clockwise and counterclockwise turnable about its axis in the accommodation **624**.

[0013] The adjustment device **66** has a lever **662** and a threaded shank **664**. The lever **662** is rockably supported on the fulcrum post **623** and has an end passing through the elongated through hole **625** of the hollow column **622** and the lateral through hole **644** of the shaft connector **64** and being located inside the connection hole **642** of the shaft connector **64**. The threaded shank **644** has a ball head rotatably fitted with the lever **662** at a position in proximity of the other end of the lever **662**,

and a threaded portion screwingly inserted through the base plate **621**.

[0014] The bracket **62** has two threaded through holes **626** respectively, inclinedly and upwardly extending from two opposite sides of the bottom surface of the base plate **621**, which are adjacent to the opening of the accommodation **624**, through the column **622**, communicating with the accommodation **624**, and corresponding in location to the two locating grooves **646** respectively, i.e. the extending directions of the two threaded holes 626 are offset from the axis of the shaft connector **64**.

[0015] The locating device **68** includes two screws **682** and **684**, which are screwingly and respectively threaded in the threaded through holes **626** and each have a tail aiming and being stoppable at one of the locating grooves **646**. When the screws **682** and **684** are screwingly threaded deeply in the threaded through holes **626**, the tails of the screws **682** and **684** will firmly abutted against the bottom walls of the locating grooves **646**, as shown in FIG. 7, so as to fix the angular orientation of the shaft connector **64** in the accommodation **624** and to prevent the shaft connector **64** from rotation about its axis.

[0016] The above-mentioned adjustment device **66** of the mount **60** is adapted for adjusting the protruding length that the shaft connector **64** protrudes outside the accommodation **624**, i.e. the length defined between the free end surface of the shaft connector **64** and the bottom surface of the base plate **621**. More specifically speaking, changing the height of the ball head of the threaded shank **664** above the upper surface of the base plate **621** by screwing deeply or shallowly the threaded shank **664** into the base plate **621** will change the relative heights of two ends of the lever **662** such that the end of the lever **662**, which is inserted into the lateral through hole **644** of the shaft connector **64**, will drive the shaft connector **64** to move axially in the accommodation **624** within the range of the longitudinal length of the elongated through hole **625**. That is to say, when the height of the ball head of the thread shank **664** is increased, the shaft connector **64** will, by means of the lever principle, be driven to move towards the opening of the accommodation **624** such that the protruding length of the shaft connector **64** will increase accordingly.

[0017] In addition to hold the shaft connector **64** in position, the above-mentioned locating device **68** of the mount **60** can fine adjust the angular orientation of the shaft connector **64** relative to the bracket **62**. For example, if the user wants to rotate the shaft connector **64** in the accommodation in a clockwise direction when it is viewed from the bottom side thereof, the user can slightly loosen the screw 684, i.e. screwingly move backward the screw **684**, to make its tail separate apart from the shaft connector **64** at a distance and then tighten another screw **682**, i.e. screwingly move foreword the screw **682**, to make its tail push on the shaft connector **64** so as to rotate the shaft connector 64 clockwise until the shaft connector **64** stops at the tail of the screw **684** again. By this way, the angular orientation of the shaft connector **64** relative to the bracket **62** can be adjusted without dissembling any parts of the mount **60**.

[0018] The structures of and the relationships between the elements constructing the door closer kit **40** of the present invention have been described as above-mentioned. The way of how the door closer kit **40** works in cooperation with the door leaf and door frame will be illustrated hereunder.

[0019] Referring to FIGS. 2-8, in order to install the door closer kit **40** with a door leaf 71 and a door frame **72**, the door closer **50** is mounted inside a pocket **712** recessed on a top side of the door leaf **71** by using screws to fix the fixation casing **52** of the door closer **50** and the door leaf **71** together, and the mount **60** is mounted inside a mounting groove **722** recessed on a top inner side of the door frame **72** by using screws to fix the bracket 62 of the mount **60** and the door frame **72** together. Thereafter, clockwise rotating the thread shank **664** of the adjustment device **66** to make the shaft connector **64** of the mount **60** protrude outside the base plate **621** at an appropriate distance to enable the rectangular connection portion **541** of the turnable shaft **54** of the door closer **50** to be inserted into the rectangular connection hole **642** of the shaft connector **64** so as to assemble the door leaf **71** with the door frame **72**. As a result, the turnable shaft **54** is fixedly connected with the mount **60** which is fixedly mounted in the door frame **72**, such that the turnable shaft **64** is stationary relative to the mount **60**.

[0020] It can be seen from FIG. 8 that in addition to the door closer kit **40** of the present invention, a pivot kit **80** is also installed between the door leaf **71** and the door frame **72**. The pivot kit 80 comprises a pivot mount **82** concealedly mounted in the bottom side of the door leaf **71**, and a pivot **84** concealedly mounted in the bottom inner side of the door frame **72** and pivotally connected with the pivot mount **82**. The axis of the pivot **84** is in alignment with the axis of the turnable shaft **54** of the door closer **50** in a line, such that the door leaf **72** is double-swingable about the axis of the turnable shaft **54** upon receiving an external pull or push force thereon.

[0021] When the door leaf **71** receives an external force for clockwise or counterclockwise swinging the door leaf 71, the fixation casing **52** will turn along with the door leaf **71** about the shaft 54 because the turnable shaft **54** is now motionless relative to the door frame **72**, resulting in that the sector gear portion **542** of the turnable shaft 54 will be engaged with one of the linear gear portions **564** of the driven member **56** to drive the driven member **56** to move towards the driven position P2 and compress the spring member **58**. As soon as the external force is released form the door leaf **71**, the spring rebound force of the spring member **58** will forcedly move the driven member **56** back to the initial position P2, which means that the door leaf **71** will reversely swing about the shaft **54** back to its initial, force free position. Since the driven member **56** has two face-to-face linear gear portions **564**, no matter the door leaf **71** is swung clockwise or counterclockwise the driving sector gear portion **542** of the

shaft **54** will be definitely engaged with one of the linear gear portions **564** to make the door leaf **71** be double-swingable and then returnable back to its initial, force free position.

[0022] In case the door leaf **71**, which is in the initial, force free position after installation or use for a long time, becomes noncoplanar with the door frame, showing that the door leaf **71** can not be fully closed, this problem can be solved by using the locating device 68 to adjust the angular orientation of the shaft connector 64 relative to the bracket 62 of the mount 60 so as to change the angular orientation of the shaft connector 64 relative to the door frame 72, which in turn will change the angular orientation of the door leaf 71 relative to the door frame 72. By this way, the coplanar alignment adjustment of the door leaf 71 with the door frame 72 can be conveniently and time-savingly done to make sure that the double swing door can be completely closed when the door leaf 71 is in the initial, force free position.

[0023] It will be appreciated that the door closer kit 40 of the present invention adopts the locating device 68 to adjust the angular orientation of the door leaf 71 relative to the door frame 72; therefore, the door closer is not limited to the linear gear driven type as the above embodiment described. In other words, the door closer can be of any kind as long as it can be concealedly mounted in the door frame and has a turnable shaft connectable with the shaft connector of the mount.

Claims

1. A door closer kit (40) for a double swing door, comprising a door closer (50) for concealedly mounting to a door leaf (71) and a mount (60) for concealedly mounting to a door frame (72), the door closer kit (40) being **characterized in that**:

   the door closer (50) comprises a fixation casing (52) for mounting to the door leaf (71), and a turnable shaft (54), which is turnable relative to the fixation casing (52) upon receiving an external torque and turnable back to its initial angular orientation after the external torque is released therefrom; and
   the mount (60) comprises a bracket (62) for mounting to the door frame (72), a shaft connector (64) mounted to the bracket (62) in such a way that the shaft connector (64) is biasable about an axis thereof relative to the bracket (62) and provided with a connection hole (642) in which the turnable shaft (54) of the door closer (50) is detachably inserted, and a locating device (68) acting on the shaft connector (64) for adjusting and fixing an angular orientation of the shaft connector (64) relative to the bracket (62).

2. The door closer kit of claim 1, **characterized in that** the bracket (62) of the mount (60) comprises an accommodation (624) in which the shaft connector (64) is biasably mounted, and a plurality of threaded through holes (626) communicating with the accommodation (624); the locating device (68) comprises a plurality of screws (682, 684) screwingly and respectively threaded in the threaded through holes (626) and each having a tail abutting against the shaft connector (64) for adjusting and fixing the angular orientation of the shaft connector relative to the bracket.

3. The door closer kit of claim 2, **characterized in that** the bracket (62) of the mount (60) comprises a base plate (621) and a column (622) mounted to the base plate (621) and provided with the accommodation (624), which has an opening at a bottom surface of the base plate (621).

4. The door closer kit of claim 3, **characterized in that** the threaded though holes (626) respectively, inclinedly and upwardly extend from the bottom surface of the base plate (621) through the column (622) and communicate with the accommodation.

5. The door closer kit of claim 4, **characterized in that** the shaft connector (64) is provided on an outer periphery thereof with two locating grooves (646), which respectively and spacedly extend along a direction parallel to the axis of the shaft connector; the threaded though holes (626) includes two threaded through holes respectively, inclinedly and upwardly extend from two opposite sides of the bottom surface of the base plate (621) through the column (622) and correspond to the two locating grooves (646) respectively.

6. The door closer kit of claim 5, **characterized in that**:

   the door closer (50) comprises:

      a driven member (56) mounted inside the fixation casing (52), moveable between an initial position (P1) and a driven position (P2), and provided with two linear gear portions (564) which are spacedly and face-to-face arranged; and
      a spring member (58) exerting on the driven member (56) a spring rebound force tending to move the driven member (56) towards the initial position (P1); and

   the turnable shaft (54) of the door closer (50) comprises a sector gear portion (542) which is selectively engaged with one of the linear gear portions (564) of the driven member (56), when the turnable shaft (54) receives the external torque, so as to drive the driven member (56) to

move towards the driven position (P2).

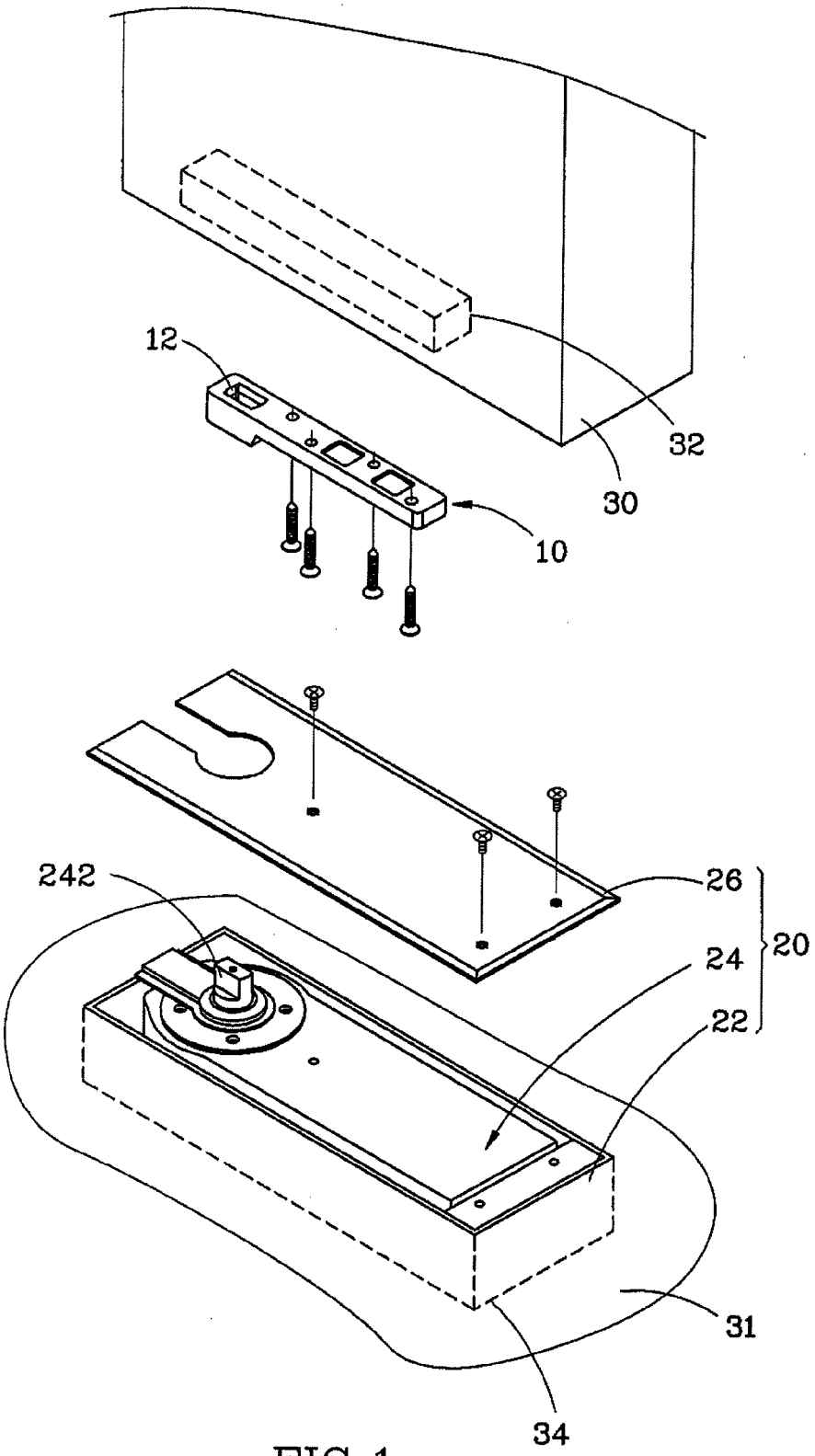

FIG. 1
PRIOR ART

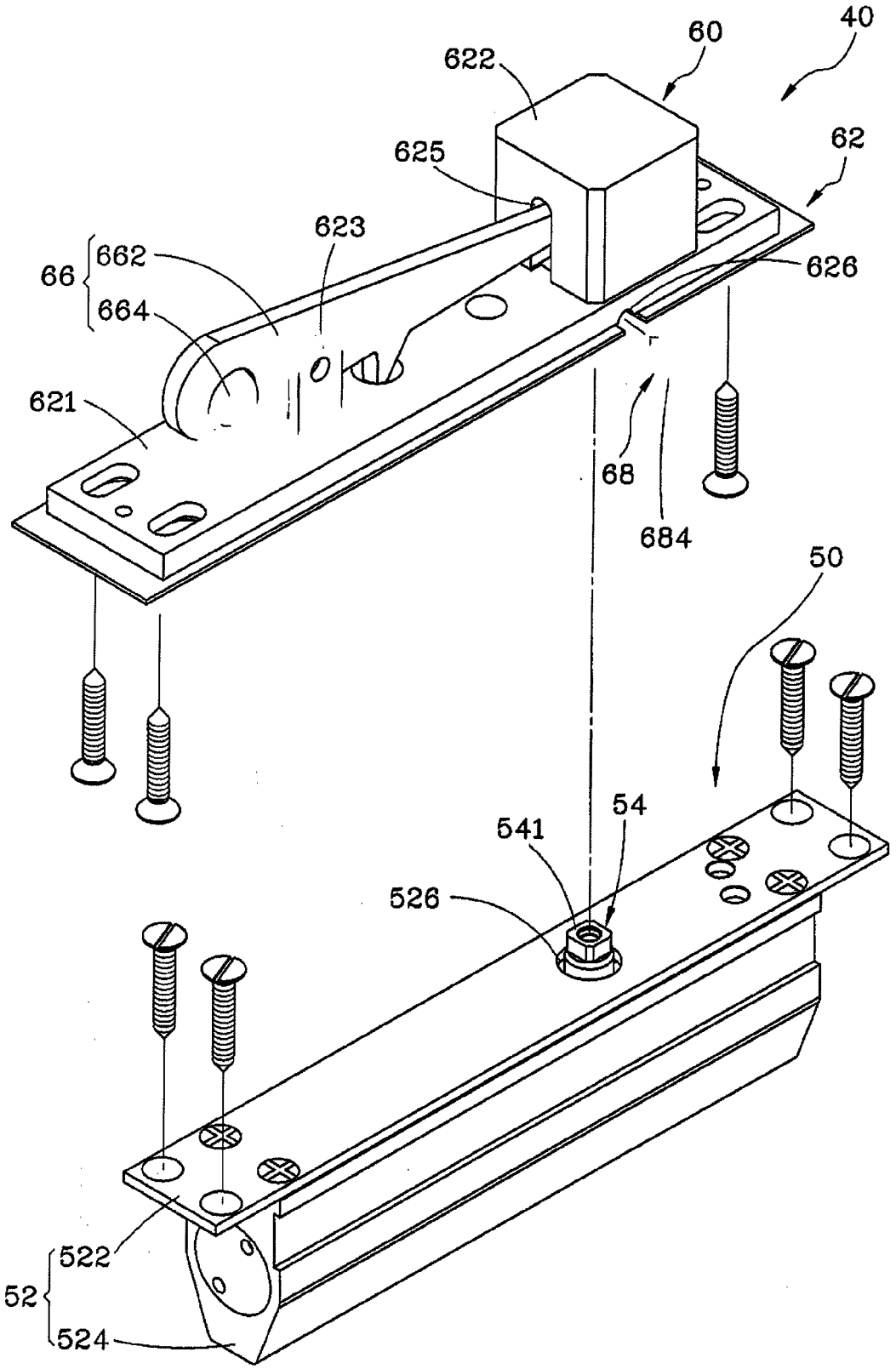
40
60
622
62
625
623
66
662
664
626
621
68
684
50
54
541
526
52
522
524

FIG. 2

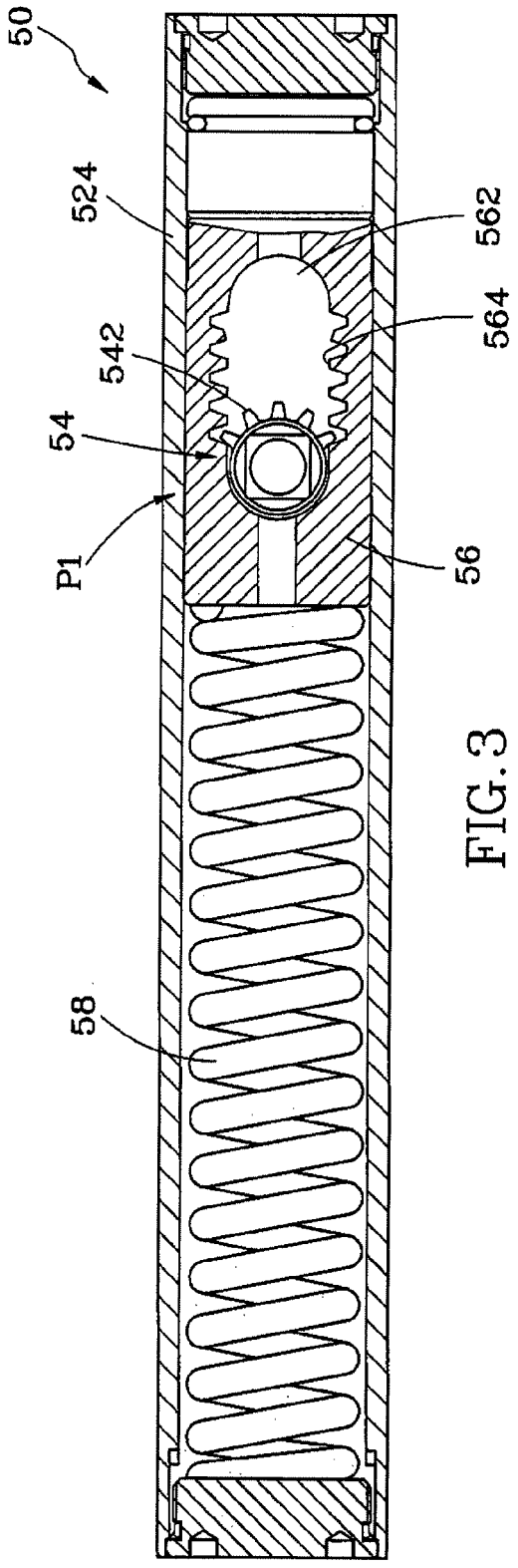

FIG. 3

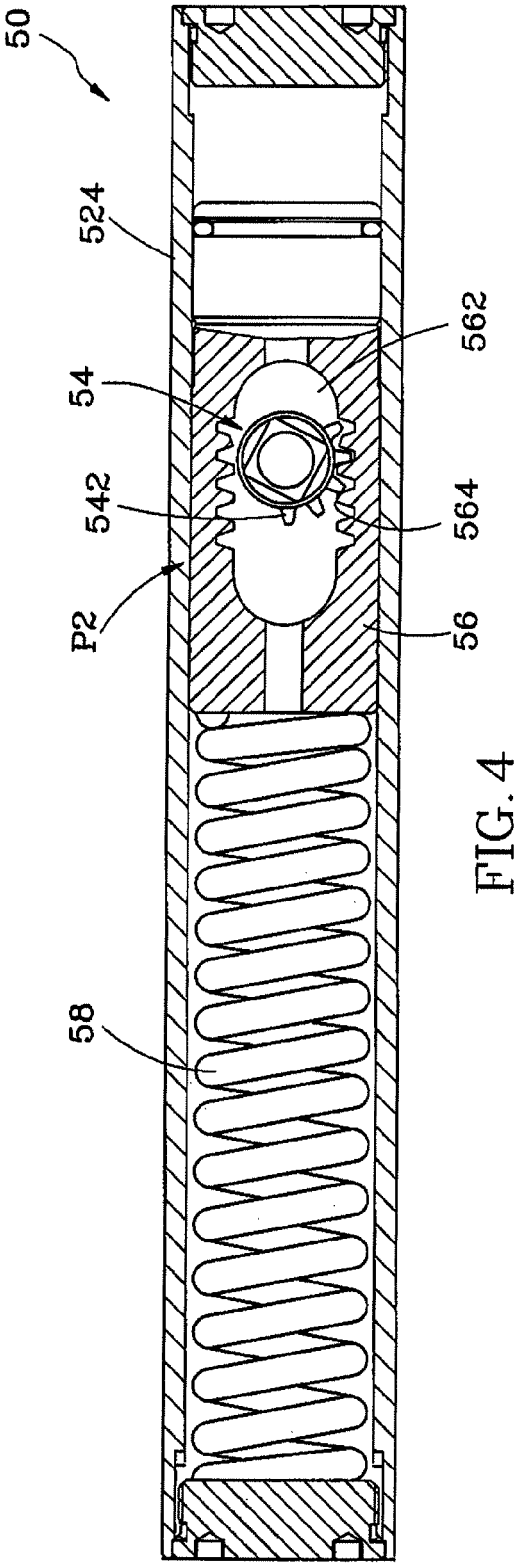

FIG. 4

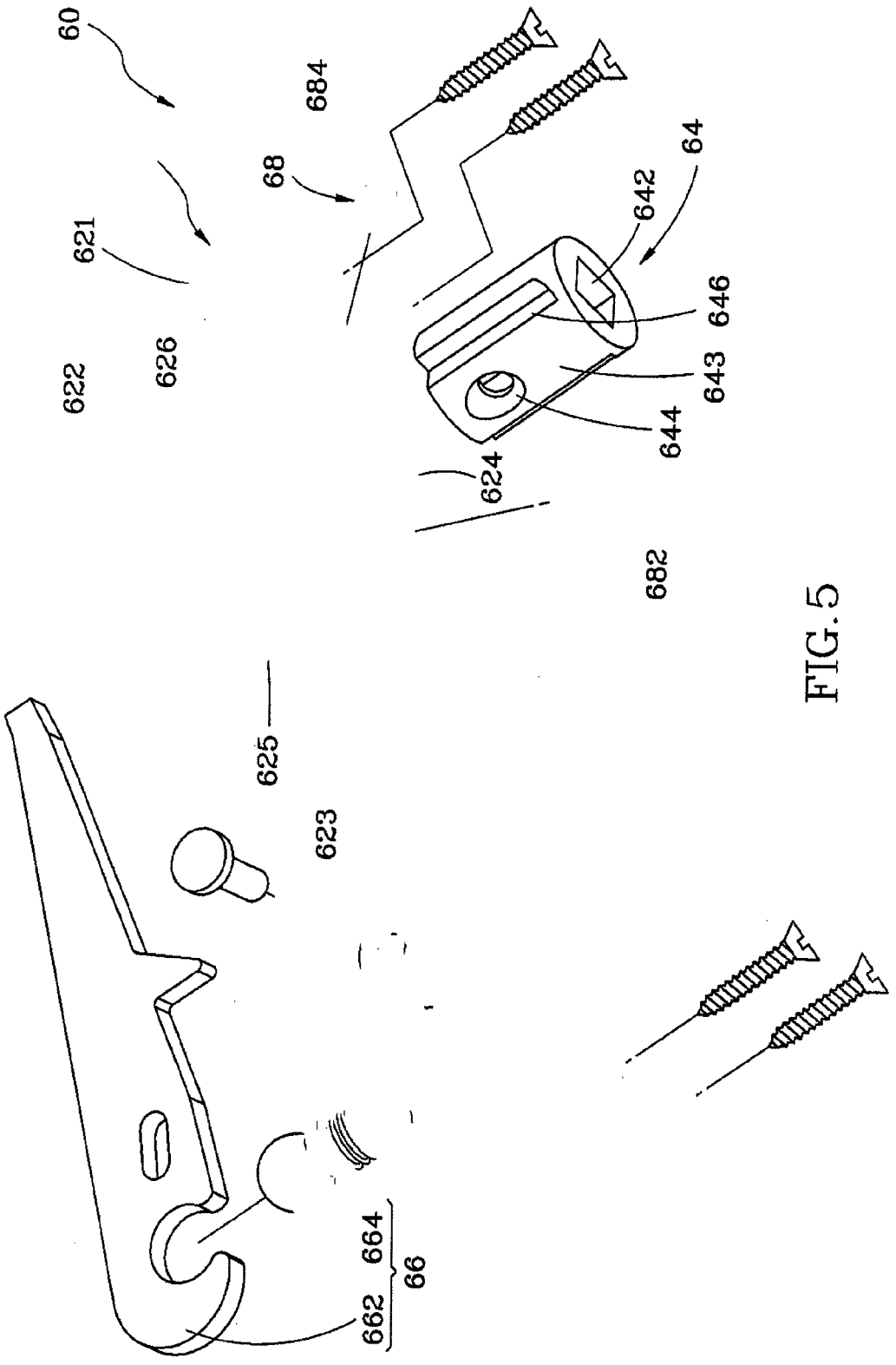
60
684
68
621
642
64
646
622
626
643
644
624
682
625
623
664
66
662

FIG. 5

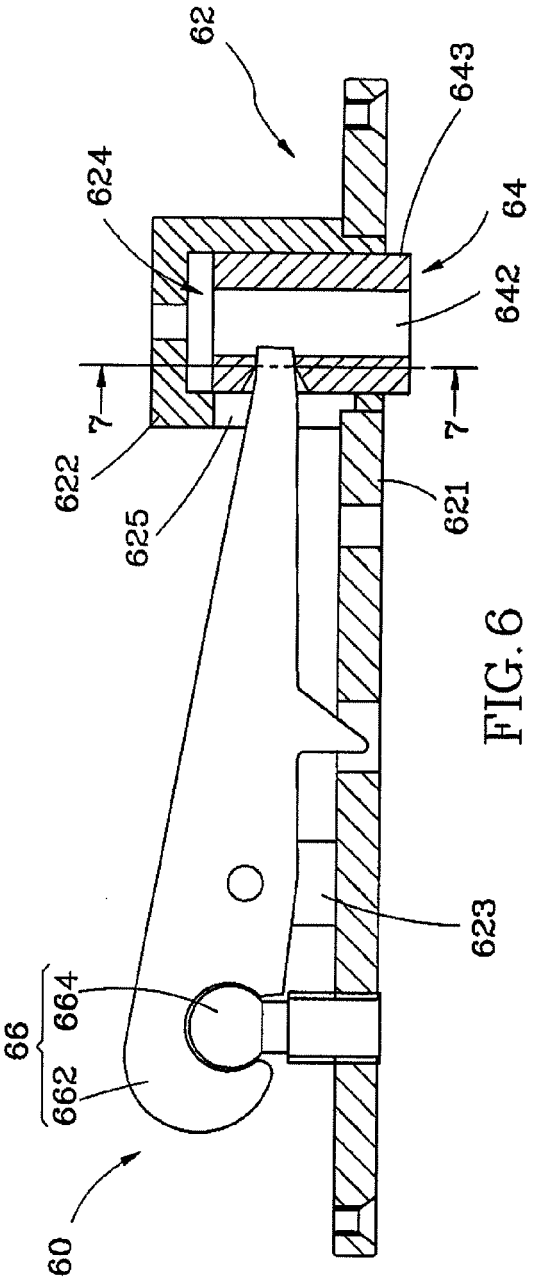
62
643
624
64
642
7
7
622
625
621
623
66
664
662
60

FIG. 6

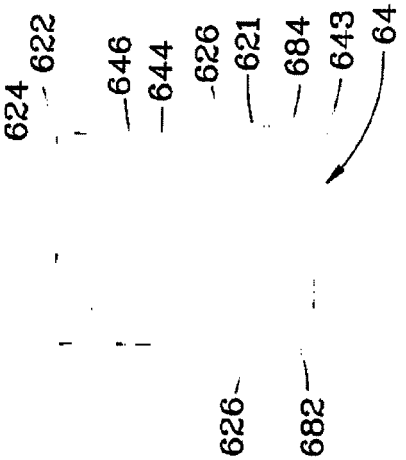
624
622
646
644
626
621
684
643
64
626
682

FIG. 7

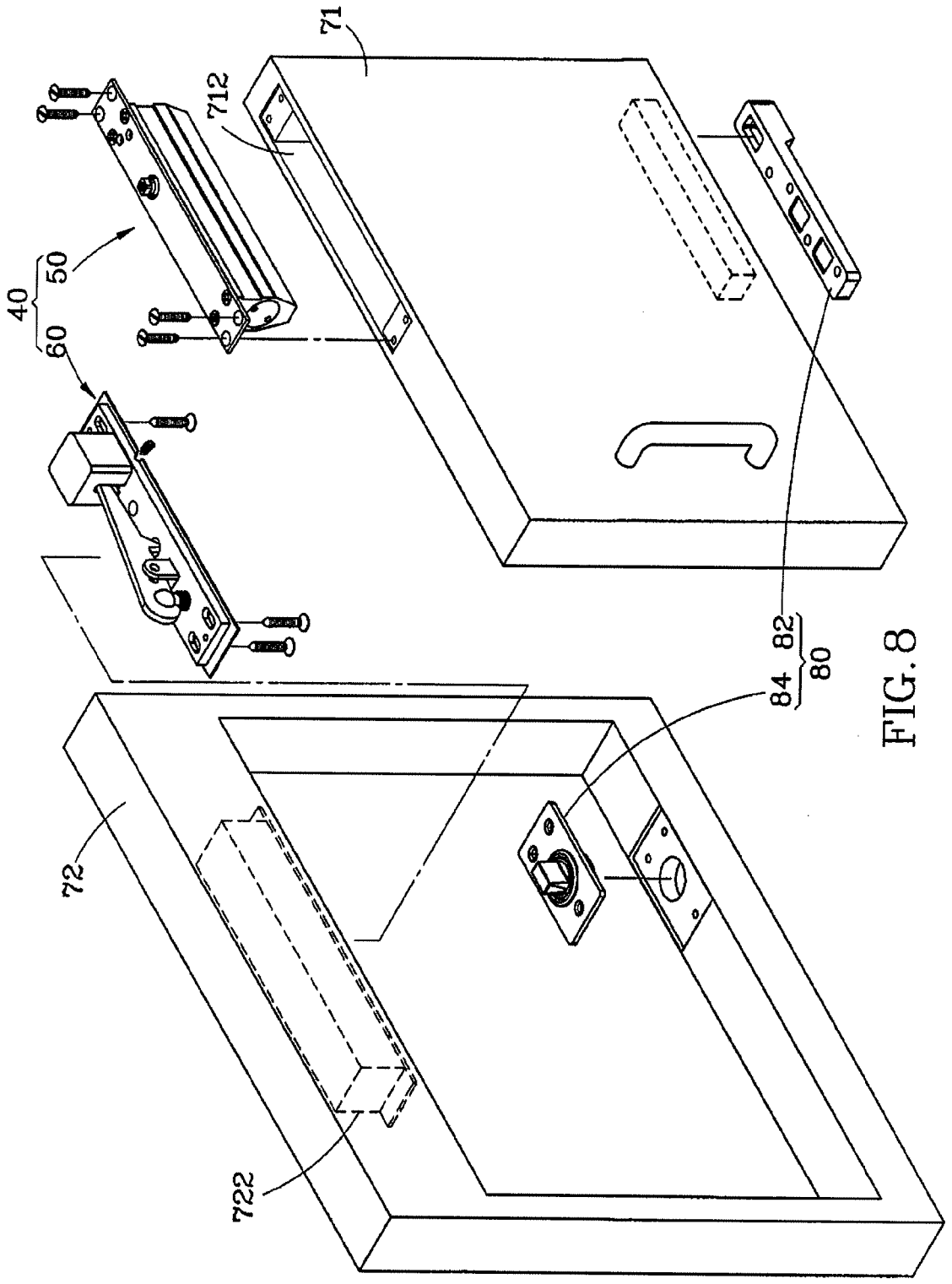

FIG. 8