United States Patent [19]

Johnson

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[45] **July 22, 1975**

[54] **PIVOT ASSEMBLY**

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[73] Assignee: **Lawrence Brothers, Inc.,** Sterling, Ill.

[22] Filed: **Mar. 11, 1974**

[21] Appl. No.: **449,321**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 352,878, April 20, 1973, abandoned.

[52] **U.S. Cl.** **16/151;** 49/388

[51] **Int. Cl.²** **E05D 7/08**

[58] **Field of Search** 16/129, 130, 134, 151, 16/168, 169, 185, 131, 132, 179, 166, 55; 49/242, 243, 381, 388

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Primary Examiner—Richard J. Scanlan, Jr.
Attorney, Agent, or Firm—Olson, Trexler, Wolters, Bushnell & Fosse, Ltd.

[57] **ABSTRACT**

The present invention relates generally to improvements in pivot assemblies for vertically hung doors and more particularly to novel practical pivot assemblies for use with door members of the type in which the pivoted vertical edge thereof is in substantial abutting relation with a complementary vertical door frame member when said door member is in closed position. The pivot assembly disclosed herein includes door fittings for attachment to the upper and lower corner portion of a door member and door frame fittings for association with the upper and lower horizontal sections of an associated door frame. Each door fitting carries a pintle fixed at one extremity to the door fitting and at the opposite extremity to a member or plate having a polygonally shaped periphery. The polygonally shaped member is nested within a recess in the door frame fitting defined by an internal periphery adapted to cooperate with said polygonally shaped member so as to effect horizontal displacement of the door member as said member is shifted from its closed position.

9 Claims, 15 Drawing Figures

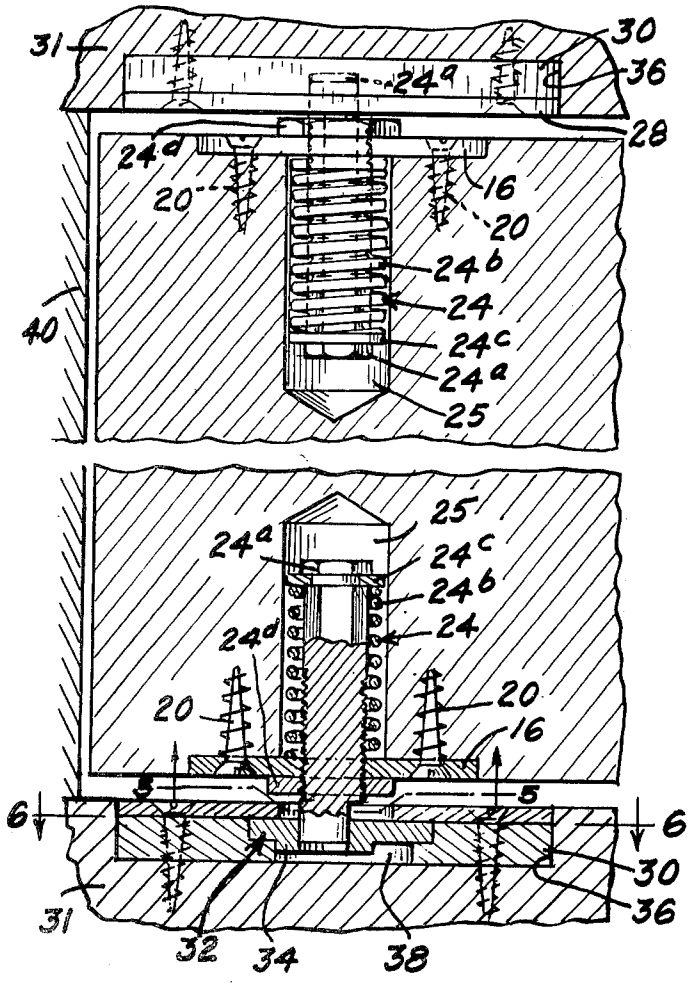


FIG. 1

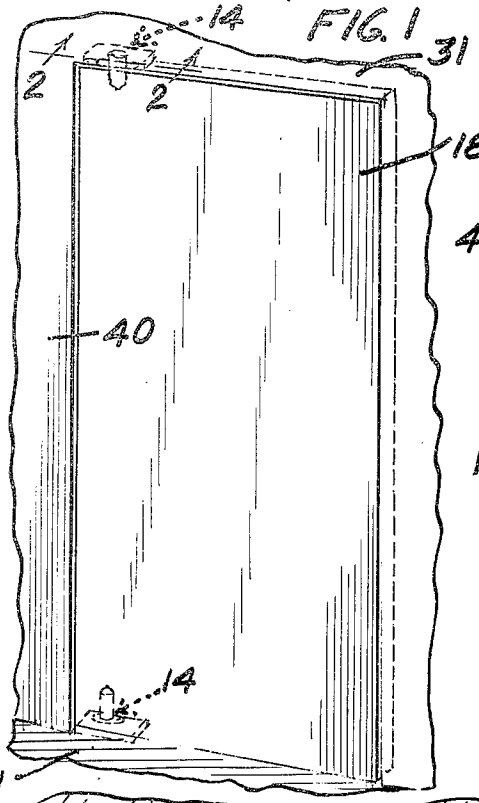


FIG. 3

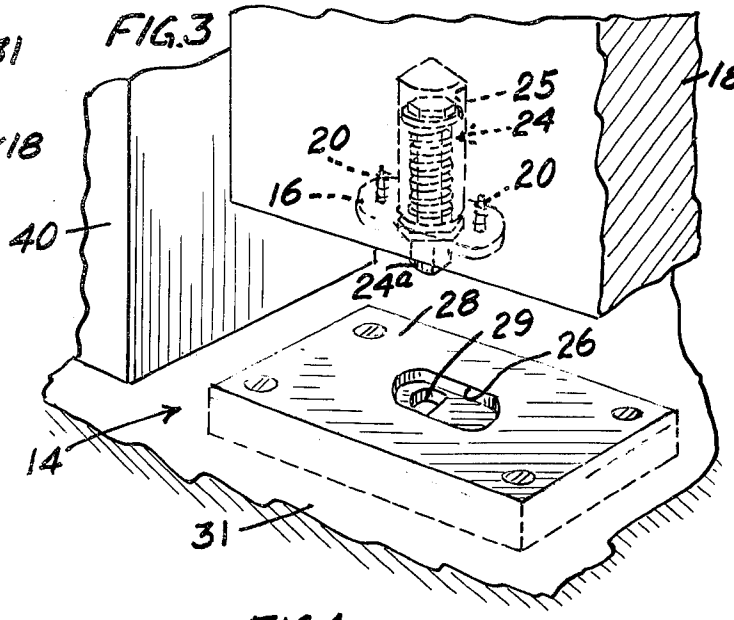


FIG. 2

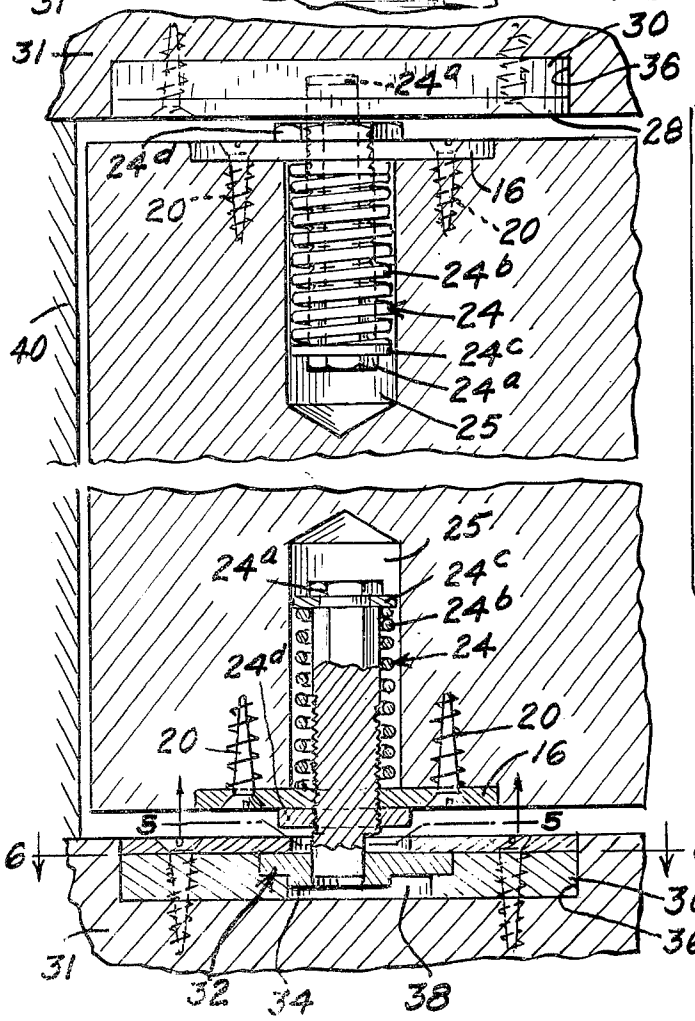


FIG. 4

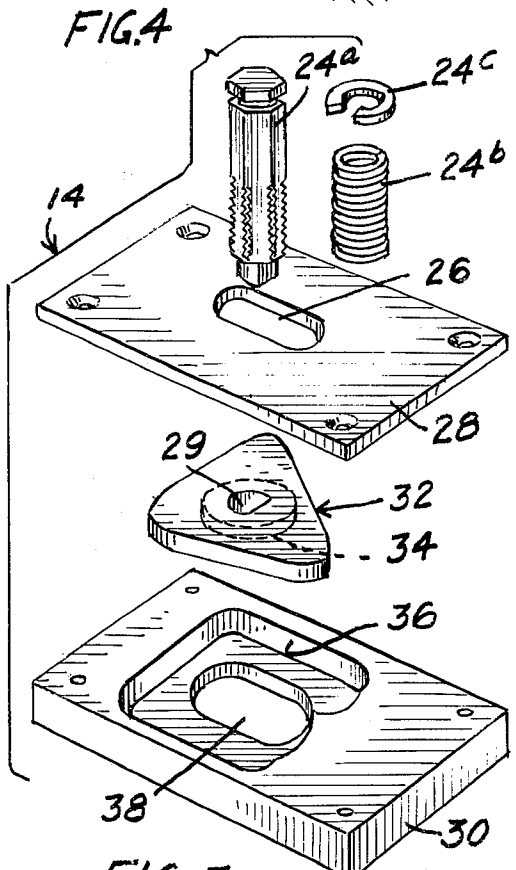
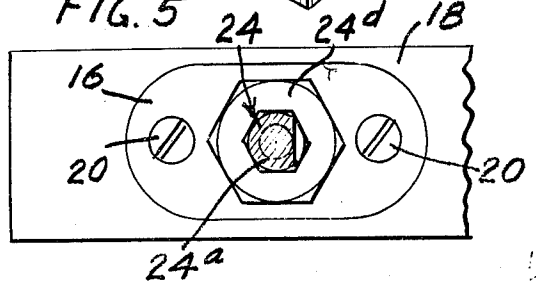


FIG. 5



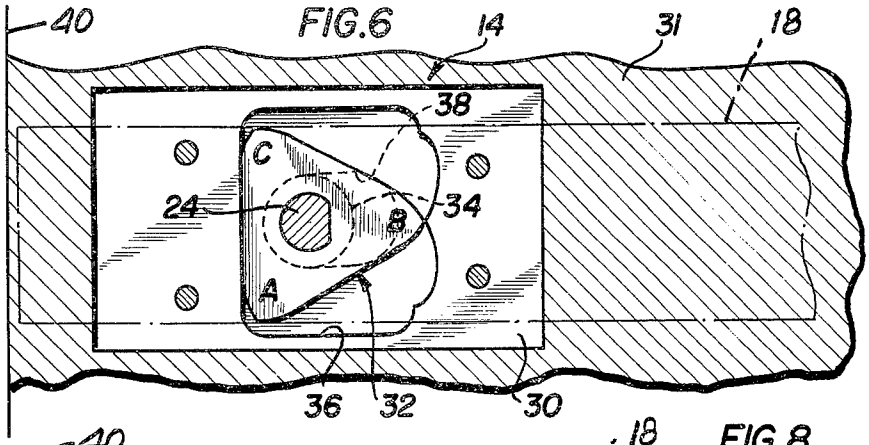


FIG.6

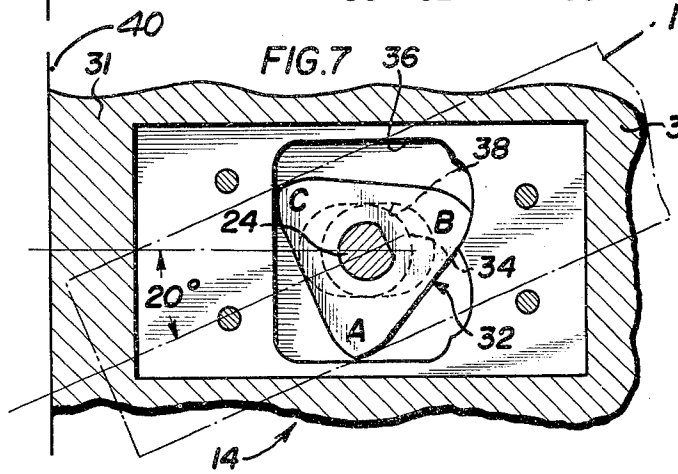


FIG.7

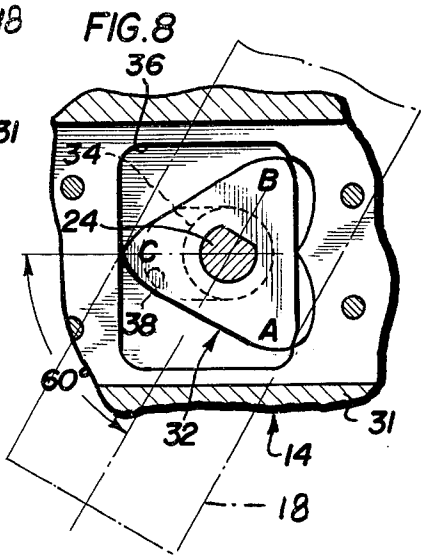


FIG.8

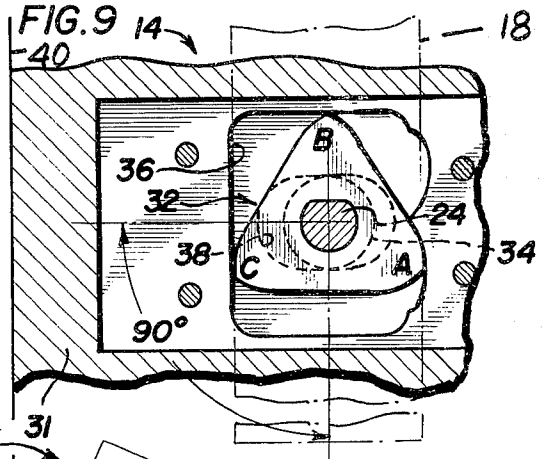


FIG.9

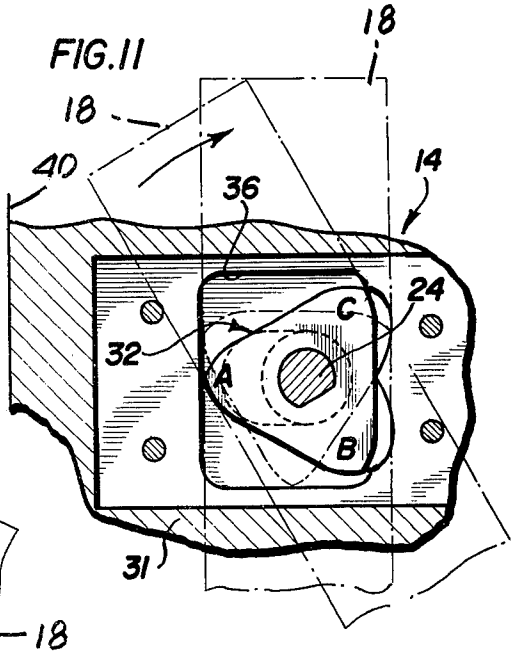


FIG.11

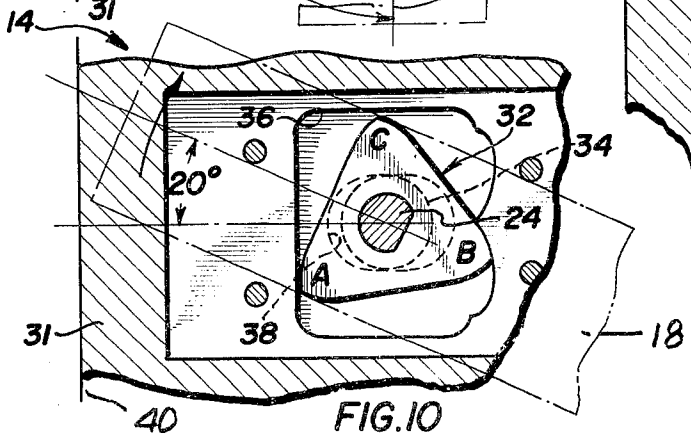
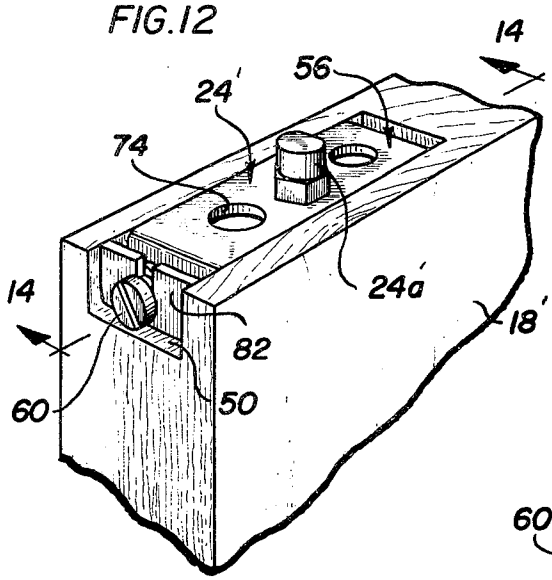


FIG.10

FIG.12



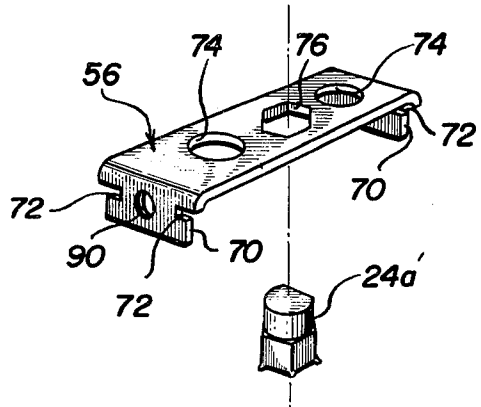


FIG.13

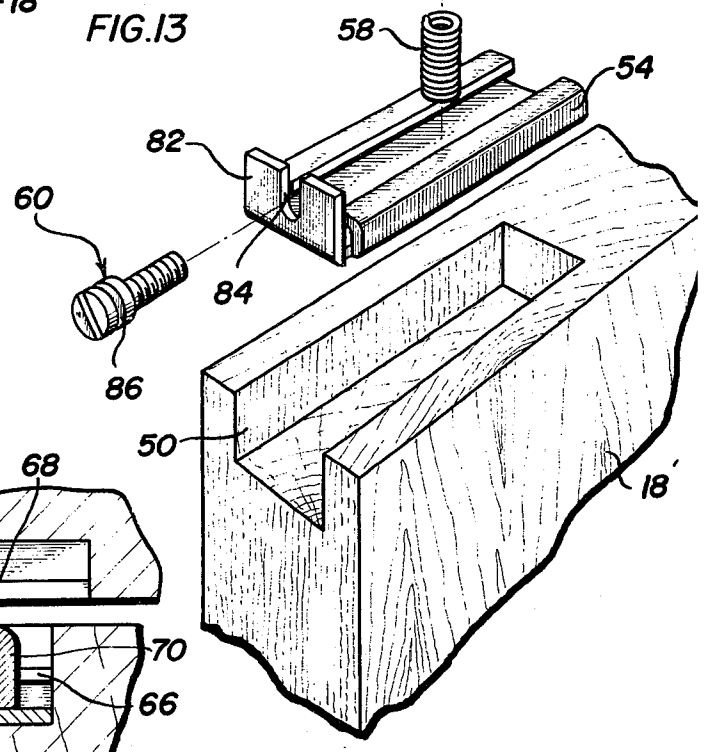


FIG.14

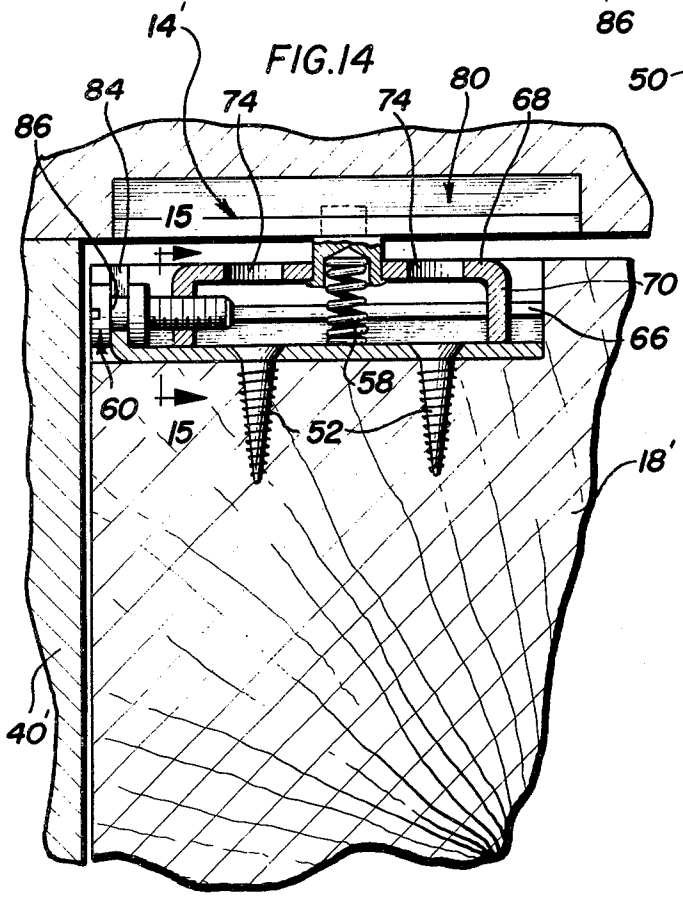
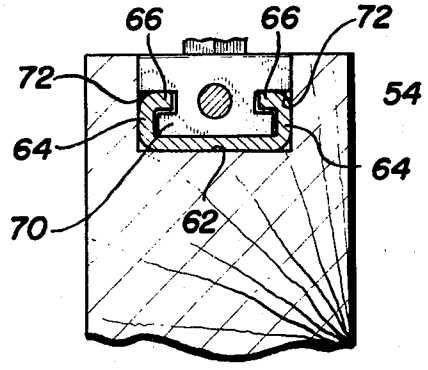


FIG.15



PIVOT ASSEMBLY

REFERENCE TO RELATED APPLICATION

The present application is a continuation in part of U.S. Pat. Application No. **352,878,** filed Apr. **20, 1973** and now abandoned.

SUMMARY OF THE INVENTION

In instances where it is essential for the pivoted vertical edge of a swingable door, when in closed position to be located immediately adjacent the vertical surface of a complementary door frame, it is necessary to horizontally shift the door member in order to permit free swinging or movement thereof from its closed position. In installations of the type referred to, it is not practical to employ conventional door hinges and it is one of the important objects of the present invention to provide improved, novel, and very practical pivot assemblies which permit horizontal shifting or separation of the vertical pivoted edge of the door member with respect to an adjacent vertical door frame surface immediately upon swinging or shifting said door member from its closed position

It is a further object of the present invention to provide an improved pivot assembly of the type referred to above which is adapted to be used with equal facility with doors swingable through **90°** in opposite directions. This is to be distinguished from arrangements wherein pivot assemblies employed in association with a door member swingable through **90°** in one direction could serve without installation modifications for use with doors swingable in the opposite direction.

More specifically, the present invention contemplates a novel pivot assembly device of extremely simple construction wherein a uniquely designed member rotatable with the door and having a polygonally shaped outer periphery cooperates a complementally shaped internal surface defining a recess in a fixed member to effect horizontal shifting of the door member.

There is also provided a novel, adjustable vertical pintle mechanism which enables the horizontal position of the pintle to be adjusted, and thus facilitates proper alignment and mounting of the door relative to the door frame.

The present invention also contemplates a very practical and improved pivot assembly for vertically hung door members which may be installed with a minimum amount of skill and effort.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring now to the drawings more in detail wherein like numerals have been employed to designate similar parts throughout the various views, it will be seen that:

FIG. **1** discloses a vertically hung door member and associated door frame, said door member and frame being equipped with a novel pivot assembly device contemplated by the present invention;

FIG. **2** is an enlarged fragmentary vertical sectional view of the upper and lower pivoted corners of the door member and associated door frame, said view being taken substantially along the line **2—2** of FIG. **1**;

FIG. **3** is a fragmentary perspective view of the lower corner structure shown in FIG. **2,** the door member being illustrated in an elevated or detached position to expose the parts of the lower pivot assembly otherwise hidden;

FIG. **4** is an exploded view of the elements of the pivot assembly, such as the pintle which is fixed to the door member, the slotted cover plate through which the pintle extends, the rotatable element or plate having a polygonally shaped external periphery, and the recessed base member or plate for accommodating said polygonally shaped member;

FIG. **5** is a fragmentary horizontal sectional view taken substantially along the line **5—5** of FIG. **2**;

FIG. **6** is a fragmentary horizontal sectional view taken substantially along the line **6—6** of FIG. **2,** the door member being illustrated by dot and dash lines in its closed position;

FIG. **7** is a view similar to FIG. **6** disclosing the door member shifted in a counter clockwise direction through an angle of **20°**;

FIG. **8** is a view similar to FIG. **7** illustrating the door member shifted in a counter clockwise direction through an angle of **60°**;

FIG. **9** is a view similar to FIGS. **7** and **8** disclosing the door member shifted to its completely open position after having been shifted in a counter clockwise direction through an angle of **90°**;

FIG. **10** is a view similar to FIGS. **7** to **9** inclusive disclosing the door member after having been shifted in a clockwise direction through **20°**;

FIG. **11** discloses the door member shifted in a clockwise direction through an angle of **60°**;

FIG. **12** is a partial perspective view of the novel, adjustable pintle mechanism mounted to the upper edge surface of a door;

FIG. **13** is an exploded perspective of the pintle mechanism of FIG. **12**;

FIG. **14** is a vertical sectional view, similar to the upper portion of FIG. **2,** and taken along a plane parallel to the plane of the door, and further illustrating the pintle engaged with the stationary mounting plate assembly affixed to the door frame; and

FIG. **15** is a vertical section view taken along the line **15—15** of FIG. **14.**

DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

Referring now to the drawings more in detail wherein like numerals have been employed to designate similar parts throughout the various views, it will be seen that pivot assembly devices or mechanisms which are representative of one embodiment of the present invention are designated generally by the numeral **14.** Each of the pivot assemblies includes a pintle arrangement and pintle receiving mechanism which in the present instance is in the form of camming means, as will be discussed more completely hereinafter. The camming means, in conjunction with the pintle arrangement, is effective to produce lateral displacement of the door member **18** relative to the jam or frame member **40** during opening movement; and further attains this end while permitting the door to open in either direction.

Turning now to a more detailed description of the pivot assemblies **14,** attention is directed initially to FIGS. **2–4.** As to the pintle arrangement, an aperture plate or bracket **16** is secured to the edge surface of the door, by means of screws **20,** or the like. A vertical pintle device **24** is fixed at one extremity within each plate or bracket members **16** and extend into vertical recesses **25** provided in the door member **18.** The other extremity of each of the pintle devices **24** projects or ex-

tends from the surface of the plate members **16.** The projecting extremity of each pintle device **24** is non-circular and is, as will be explained, accommodated by the pintle receiving camming means.

The camming means for each pivot assembly **14** is carried by the door frame **40.** Each said camming means includes a plate or base member **28** having a slot **26** therein, and overlies the base member **30** to serve as a cover therefor. In addition to the base member **30** and plate **28,** the camming means includes a polygonally shaped cam member **32,** viz., multi-lobular, which is provided with a non-circular aperture **29** for receiving the projecting extremity of the pintle device **24,** which is of a complementary shape. In addition, the cam member **32** also includes a depending, generally circular protuberance **34,** the purpose and function of which will be explained hereinafter.

Each of the base members or plates **30,** which are mounted within horizontal upper and lower door frame sections **31,** are provided with recesses **36,** FIG. **2,** for accommodating the polygonally shaped cam member **32.** The inner periphery of the recess **36** is complementally shaped with respect to the outer periphery of the polygonally shaped cam member **32** and defines a cam engaging surface. A shallow recess of slot **38** in the base member **30** serves to accommodate and guide the circular section **34** depending from the underside of the member **32,** thus mounting the cam member **32** for rotatable, longitudinal movement relative to said base member **30.**

It will be noted that each pintle device **24** includes a pintle member **24***a*, a coil spring **24***b*, a split ring washer **24***c* and a clamping nut **24***d*. The pintle members **24***a* are polygonal in cross sectional shape and are longitudinally adjustable within complementary polygonally shaped apertures within their complementary plates **16.** The clamping nuts **24***d* are accommodated by complementary threads of the pintle member **24***a*. The split ring washers **24***c* are accommodated by a peripheral recess at the inner extremity of a complementary pintle member and provide a shoulder against which the upper extremity of the coil spring **24***b* may bear. By rotating the nut **24***d*, the pintle member **24***a* may be vertically adjusted within the recess **25.** The coil spring **24***b* being interposed between the split ring washer **24***c* and the inner surface of the plate **16** constantly urges the clamping side of the nut **24***d* against the external surface of the plate **16** as will be clearly understood from FIG. **2.**

When the door member **18** is initially inserted within the door opening, the pintle members **24***a* must be fully retracted within the respective recesses **25.** After such insertion, the nut members **24***d* may be rotated so as to cause axial projection of the pintle members into telescopic association with their respective polygonally shaped plate members **32.** It will be apparent that the coil springs **24***b* also function to secure the clamping nuts **24***d* against unauthorized rotation with respect to an associated pintle member. Further, the nuts **24***d* and the adjustability afforded thereby provide an additional advantage in that the height of the door above the lower frame portion **31** can be altered. For example, the nuts **24***d* for the lower pivot assembly would be turned to increase the amount of projection of the pintle **24***a* from the plate **16**; correspondingly, the pintle **24***a* for the upper assembly would be retracted.

From the foregoing, it should be understood that when the door member **18** occupies its closed position as illustrated in FIG. **6,** the apices or lobes on the cam member **32** identified by the letters A, B and C occupy the position shown in FIG. **6.** In this position the apex or lobe B of the cam member **32** engages the midpoint of the internal surface portion defining the right side of the recess **36** as viewed in FIG. **6,** and the oppositely disposed peripheral portions defining the recess **36** is engaged by the periphery of the polygonally or triangularly shaped cam member **32** oppositely disposed from the lobe B. With the cam member **32** thus disposed within the recess **36,** the door member **18** is maintained in its normal closed position and in this position the pivoted vertical edge of the door is located closely adjacent the surface of the vertical door frame section **40.** As the door member **18** is shifted or swung in a counter clockwise direction as viewed in FIGS. **6** to **9** inclusive, the apices or lobes A, B and C maintain contact with complementary surface areas of the internal periphery which defines the recess **36.** The pintle **24** being non-rotatably coupled with the triangular cam member **32** causes said cam member to be rotated through the various angles of displacement indicated in FIGS. **7** to **9** inclusive. FIG. **9** discloses the relative positions of the apices A, B and C with respect to the peripheral surface defining the recess **36** when the door member **18** is in its fully open position.

FIGS. **10** and **11** illustrate the relative positions of the moving parts when the door member is shifted in a clockwise direction. FIG. **10** discloses the door member shifted through **20°.** The solid line position of the polygonal or triangular member **32** illustrates the relative positions of the parts when the door member is shifted through **60°** in a counter direction. The dot and dash line position of the member **32** in FIG. **11** illustrates the relative positions of the parts when the door member has been shifted in a clockwise direction to its full open position.

It should be noted that one of the extremely advantageous features of the present invention, in addition to its simplicity of construction, is the fact that it affords bi-directional operation of the door. That is to say, special constructions are not needed for left and right hung door, or for bi-directional doors

It will be understood from the foregoing description that as the door opens the polygonally or triangularly shaped cam member **32** begins to rotate from the position shown in FIG. **6** to the position illustrated in FIG. **7.** This rotative movement will bring the lobe C into engagement with the camming surface **36,** and due to the eccentric nature of the cam member **32,** this engagement produces a movement of the cam **32** longitudinally of the slot **38.** This movement, in turn, produces a lateral displacement of the vertical pivoted edge of the door member away from the adjacent surface of the vertical door frame **40.** This immediate horizontal shifting of the door member as it is swung from its closed position assures the required clearance between the vertical edge of the door and the adjacent surface of the vertical door frame section **40.** This is essential, as the pivoted edge is closely spaced with respect to said frame in the closed condition.

Continued opening movement will rotate the cam member **32,** as illustrated in FIGS. **7–9,** maximum lateral displacement being attained when the door has opened through an angle of **60°;** as shown in FIG. **8.**

With reference to FIG. 9, the door is fully opened, and it can be seen that the lobe A has come into contact with the scalloped portion of the camming surface 36. This causes the cam member 32 to move back toward initial position.

During closing, the sequence of operation is reverse, from that as discussed above; that is, the sequence is now from FIGS. 9–6. It should be noted in this regard, that as the door closes, the lobe portion B will be brought back into engagement with the scalloped portion essentially surface 36. This engagement produces a force tending to move the cam member 32 back toward its initial position, as shown in FIG. 6. Thus, during closing, there is provided a positive return action that will place the door edge into closely spaced relation with the door frame 40.

When the door is operated in clockwise direction, the sequence of operation is as shown in FIGS. 10 and 11. In this regard, the lobe A is brought into engagement with the camming surface 36, to produce the desired initial lateral displacement. The operation during further opening movement, and closing is essenttially the same as described above.

Turning now to FIGS 12–15, an additional feature of the present invention is disclosed, namely an adjustable mounting bracket for the pintle mechanism to be employed with the upper door portion. In this regard, previously described components will be designated by the same reference characters, with the addition of a prime (').

As will be apparent from the following description, pintle mechanism 24' of FIG. 12 can be employed with the cam type mechanism discussed previously, or with other conventional pivot assemblies. The primary feature of the pintle arrangement 24' is its adjustability which aids initial assembly and subsequent plumming of the door, as will be explained.

Looking now to FIGS. 12–15, the door member 18' is provided with a slot or cut-out 50 within which the pintle arrangement 24' is mounted, by screw member 52, FIG. 14. As can be seen from the exploded representation of FIG. 13, the pintle arrangement 24 includes a trough or channel shaped base member 54, a slide member 56 which is carried by base member 54, a pintle device 24*a'*, a biasing means in the form of a spring 58 and a drive screw 60.

The base member 54, as best seen in FIG. 15, has a generally u-shaped cross section. As such, there is provided a bight portion 62, and a pair of spaced, upstanding, parallel side flanges 64 integral with the bight portion 62. Each side flange 64 has the free edge thereof turned inwardly, to provide a pair of elongate guide tracks 66.

The slide member 56, best seen in FIG. 13, is also u-shaped and includes a generally planer bight section 68, and a pair of down-turned end flanges 70. End flanges 70 are notched at 72, to provide for acceptance of the guide rails 66, as shown in FIG. 15. The planer upper bight surface includes a pair of apertures 74 which enables a tool to be employed in driving home the screws 52. Further, there is provided an additional aperture 76 of non-circular configuration, which accommodates the pintle device 24*a'*.

Looking to FIG. 14, in conjunction with FIG. 13, it can be seen that the pintle device 24*a'* includes a first generally hexagonal portion which is received in the correspondingly shaped aperture 76. This engagement produces a non-rotatable coupling of the pintle device 24*a'* to the slide member 56. The upper most portion of the pintle device 24*a'* is also non-circular, and is adapted to be received by the element of the pivot assembly carried by the door frame, and designated 80 in FIG. 14. The spring 58 maintains the pintle device 24*a'* in an extended condition, relative to the surface 68 of slide member 56.

With reference to the preceding paragraph, the element 80 of the pivot assembly 14' of FIGS. 12–15 may be similar to the camming mechanism as discussed with regard to FIGS. 1–11. That is, there may be employed a camming surface and a cam member to which the pintle device 24*a'* is coupled, which cooperate to produce lateral displacement of the door 18'. Or alternately, the element 80 may be of more conventional construction.

In addition to the aforediscussed channel shaped segment of the base member 54, said member also includes a drive screw mounting flange 82. Flange 82 is notched at 84, and the drive screw 60 is provided with a grooved 86 in the head portion thereof, so that said head portion can be engaged with the notch 84, as shown in FIG. 14. The drive screw 60 further includes a threaded portion 88 which is engaged in a correspondingly threaded aperture 90 in one of the end flanges 70 of the slide member 56.

Accordingly, from the above it can be seen that the drive screw 60 is rotatably mounted to the flange 82. Upon rotation of said screw 60, the slide member 56 will be moved longitudinally of the base member 54. Thus, the position of the projecting portion of the pintle device 24*a'* may be altered as needed.

With the above in mind, it should be noted that once the bottom pivot assembly is engaged, the adjustable feature afforded by the pintle mechanism 24' of this invention aids considerably in completion of the assembly operation. In this regard, even if the pintle receiving device 80 has not been aligned properly, the position of the pintle 24*a'* can be adjusted to accommodate any misalignment. Once fully assembled, the adjustable pintle mechanism 24' can be used to plum the door and bring the pivoted edge thereof into close position with relation to the door frame 40'.

From the foregoing description, it will be apparent that the present invention contemplates extremely simple yet practical pivot assemblies which may be installed with a minimum amount of effort and skill. It will also be apparent that the above-described pivot assembly 14 may be used for both the upper and lower corners of the door member, and said door member may be shifted through 180 degrees without requiring any installation modifications. Certain types of available pivot assemblies require different installation modifications depending upon the direction in which the door member is to be swung. Applicant's device as disclosed herein permits door to be shifted or swung in opposite directions without any alteration or rearrangement of the parts forming the pivot assembly. The design of the above described pintle assembly 14 is such as to permit axial adjustment of the pintle members. This axial adjustment facilitates initial installation of the door and also enables vertical adjustment to accommodate variations in the height of the door opening.

While a specific structural embodiment of the present invention has been illustrated and described herein,

it should be appreciated that other modifications and changes are contemplated hereby and the present invention should only be limited by the spirit and scope of the appended claims.

The invention is claimed as follows:

1. The pivot assembly for a door member, the pivoted vertical edge of which when the door member is in the closed condition is in substantial abutting relation with a complementary vertical door frame member, said assembly including; a pintle mechanism for attachment to either the corner portion of a door member or a door frame member, and including a vertically disposed pintle device having an extremity adapted to project from the edge surface of said member; and camming means carried by the other of said door or frame members and including a base member having a recess therein defined by an internal peripheral cam surface of predetermined non-circular contour, a pintle accommodating cam member slidably and rotatably disposed in said recess, and including means for receiving the projecting extremity of said pintle device in non-rotating coupled engagement, said cam member further including a plurality of cam surface engaging lobes, such that rotation of the door member in either direction incident to opening will produce relative rotation of said pintle member and said cam member with respect to said base member, which rotation causes the lobes on said cam member to engage said cam surface to produce longitudinal movement of said cam element and said pintle mechanism relative to said base member, which movement is adapted to produce corresponding lateral displacement of a door member relative to a frame member, regardless of the opening direction.

2. A pivot assembly as defined in claim 1, wherein said pintle accommodating cam member is of a polygonal, generally triangular configuration providing three generally equi-spaced lobes for engaging the cam surface on said base member.

3. A pivot assembly as defined in claim 1, wherein said pivotal mechanism includes a plate member having an aperture therein adapted to receive said pintle device, said pintle device including an externally threaded portion on the projecting extremity thereof, and nut means threadably engaged with said threaded portion exteriorly of said plate means to control the degree of projection of said pintle device from said plate means, and spring means operatively engaged with said pintle device to bias same in a direction opposite the direction of projection, whereby the extent of projection of said pintle device from said plate member may be adjusted, by rotation of said nut.

4. A pivot assembly according to claim 1, wherein said pintle mechanism includes, a base element adapted for fixed positioning relative to the door or frame member carrying said mechanism, and means mounting said pintle device for longitudinal slidable movement relative to said base element, whereby the position of said pintle device may be adjusted to accommodate any misalignment of said camming means.

5. A pivot assembly according to claim 4, wherein said means mounting said pintle device for lateral movement, includes a slide member carried by said base element, said slide member having an aperture formed therein through which said pintle device projects, and drive means carried by said base member and engaged with said slide member and capable, upon the operation thereof to produce lateral movement of said slide member relative to said base member.

6. A pivot assembly for a door member, the pivoted vertical edge of which when the door member is in a closed position, is in substantial abutting relation with a complementary vertical door frame member, said pivot assembly comprising; pintle means carried by one of said door or door frame members and providing a pintle device projecting therefrom; and camming means carried by the other of said door or door frame members and adapted to be mounted in alignment with said pintle means, said camming means including means for receiving said pintle projection and providing for lateral displacement of said door member relative to said frame member upon opening movement thereof, the improvement in said camming means, wherein said door may be opened in either direction, said improvement comprising; a base member having a recess formed therein, the wall surfaces of which provide camming surfaces, a generally polygonal shaped cam member disposed in said recess for both rotative and longitudinal movement relative to said base member, and including at least three generally equi-spaced lobes, and means for non-rotatably connecting said pintle projection to said cam member so that upon opening of said door member in either direction, joint rotation of said cam member and said pintle member relative to said base member will be produced thereby causing one of said lobes on the cam member to engage said camming surface, which engagement produces a longitudinal movement of the cam member relative to said base member and camming surfaces, which longitudinal movement results in said lateral displacement of the door member relative to the door frame.

7. A pivot assembly as defined in claim 6, wherein said pivotal mechanism includes a plate member having an aperture therein adapted to receive said pintle device, said pintle device including an externally threaded portion on the projecting extremity thereof, and nut means threadably engaged with said threaded portion exteriorly of said plate means to control the degree of projection of said pintle device from said means, and spring means operatively engaged with said pintle device to bias same in a direction opposite the direction of projection, whereby the extent of projection of said pintle device from said plate member may be adjusted, by rotation of said nut.

8. A pivot assembly according to claim 6, wherein said pintle mechanism includes, a base element adapted for fixed positioning relative to the door or frame member carrying said mechanism, and means mounting said pintle device for longitudinal slidable movement relative to said base element, whereby the position of said pintle device may be adjusted to accommodate any misalignment of said camming means.

9. A pivot assembly according to claim 8, wherein said means mounting said pintle device for lateral movement, includes a slide member carried by said base element, said slide member having an aperture formed therein through which said pintle device projects, and drive means carried by said base member and engaged with said slide member and capable, upon the operation thereof to produce lateral movement of said slide member relative to said base member.

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