United States Patent [19]

Sheckells

[11] **3,762,098**

[45] **Oct. 2, 1973**

[54] **COLLAPSIBLE REVOLVING DOOR HAVING REMOVABLE WINGS**

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[22] Filed: **July 12, 1971**

[21] Appl. No.: **161,552**

[52] **U.S. Cl.** **49/44**

[51] **Int. Cl.** **E05d 15/02**

[58] **Field of Search** 49/43, 44, 45

[56] **References Cited**

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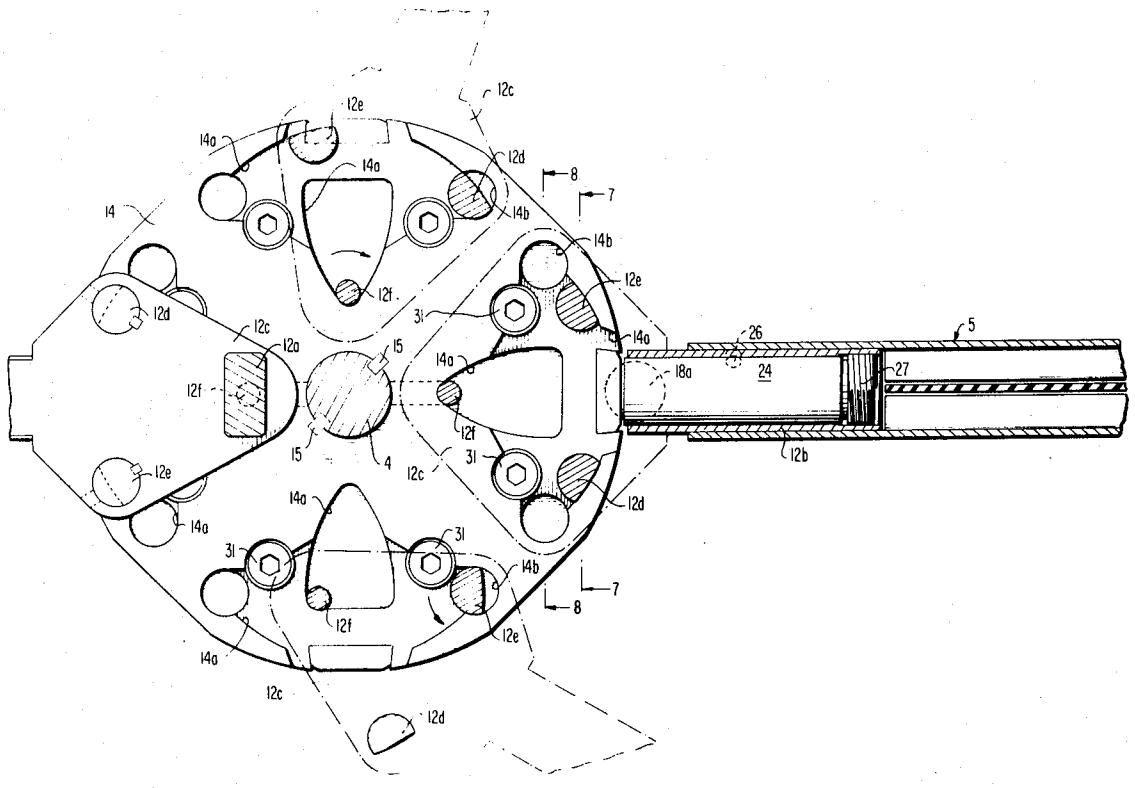
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Attorney—Rupert J. Brady et al.

[57] **ABSTRACT**

A collapsible revolving door having removable wings, each operatively connected to the door center post by a hanger bar rigidly connected to the wing frame and pivotally connected to a respective hanger disc secured to the end of the door center post. A detent assembly is selectively mounted in either the hanger bar or hanger disc to releasably hold the respective wing in normal operative position but permitting collapse of the wings in case of panic or when it is desired to fold the wings for clearing the doorway. The hanger assembly is provided with removable portions to facilitate the removal or disconnection of the door wing from the center post.

13 Claims, 24 Drawing Figures



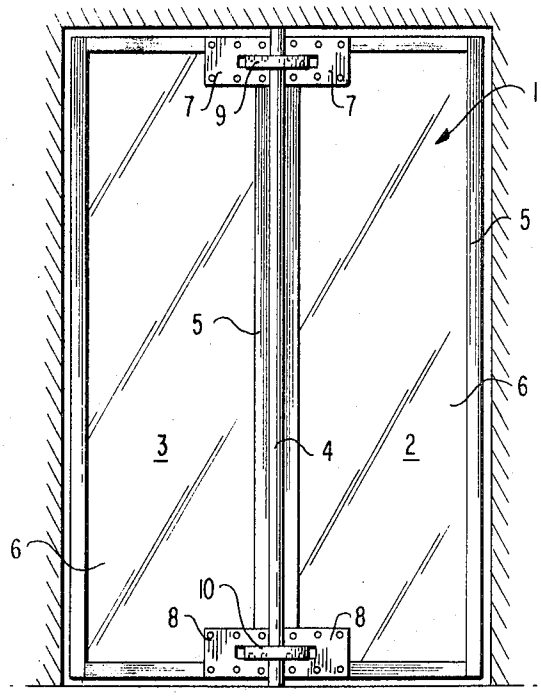


FIG. 1 PRIOR ART

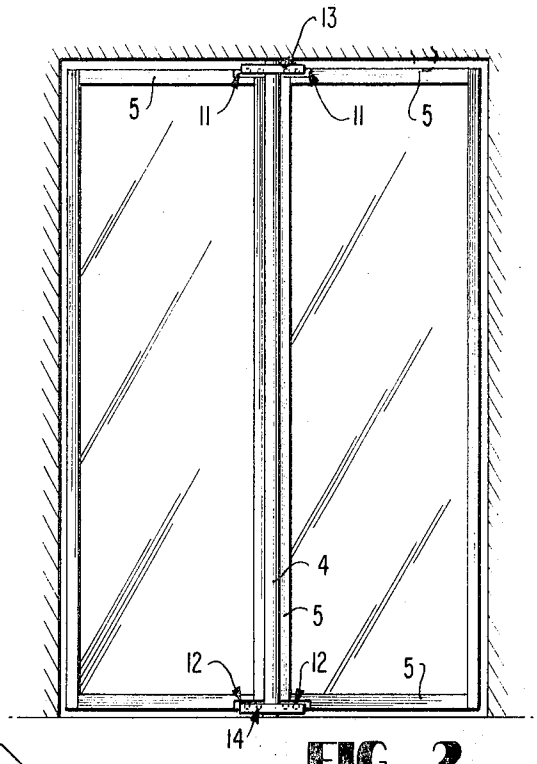


FIG. 2

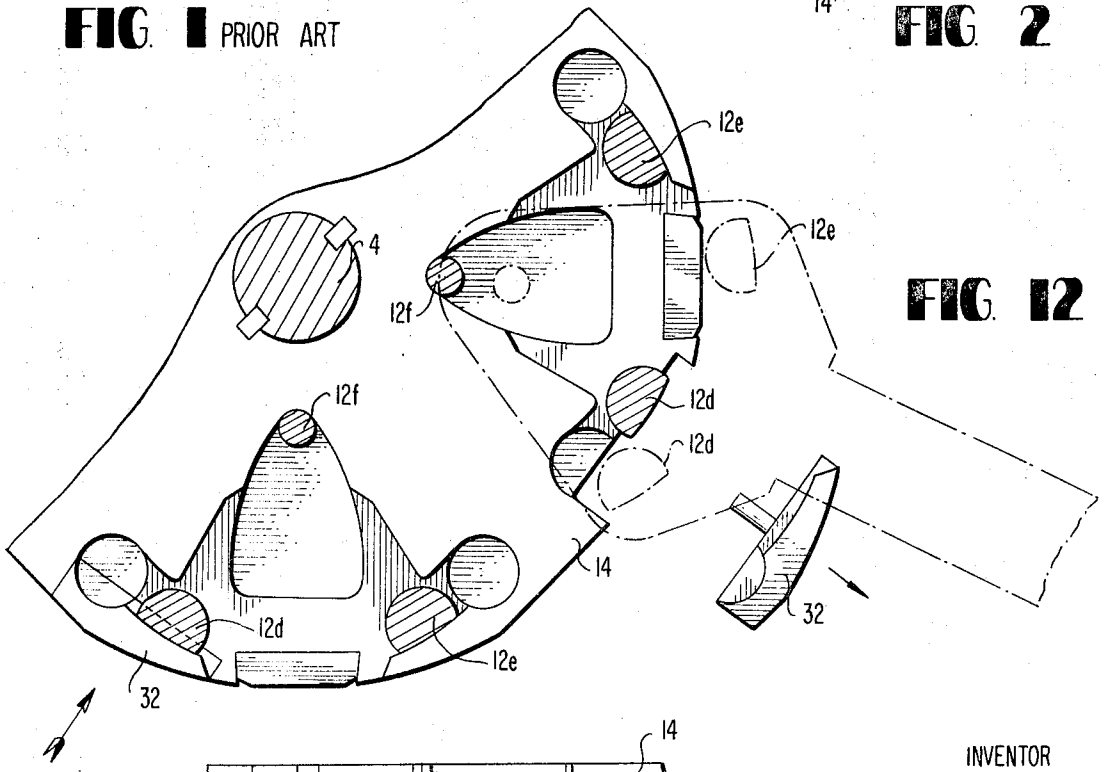


FIG. 12

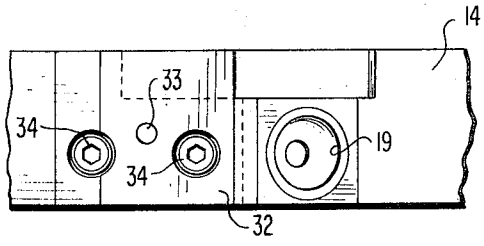


FIG. 13

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ATTORNEYS

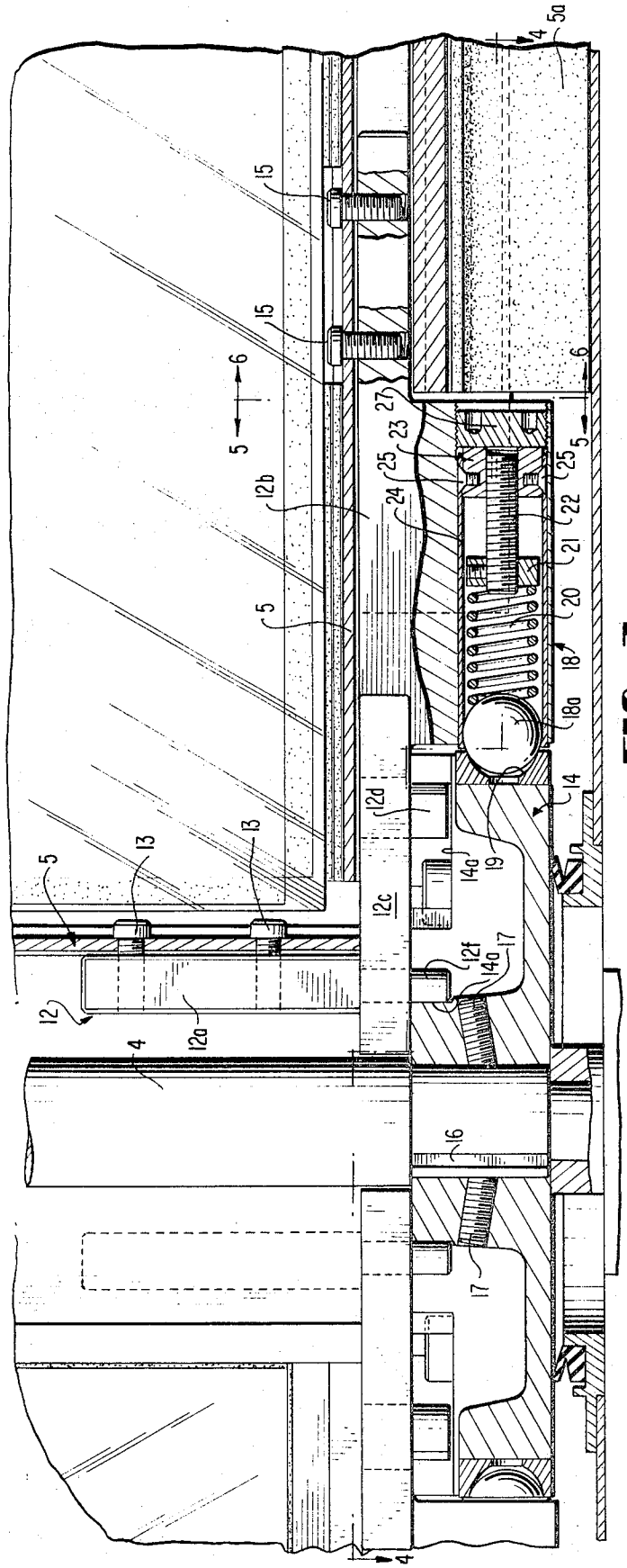


FIG. 3

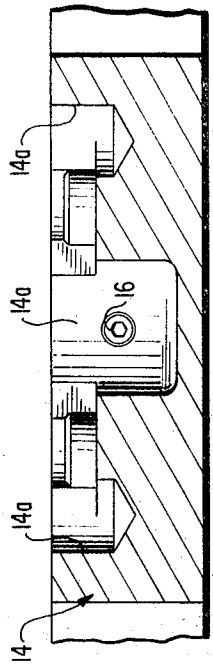


FIG. 8

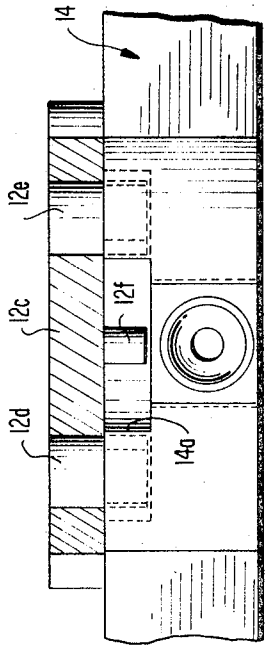


FIG. 7

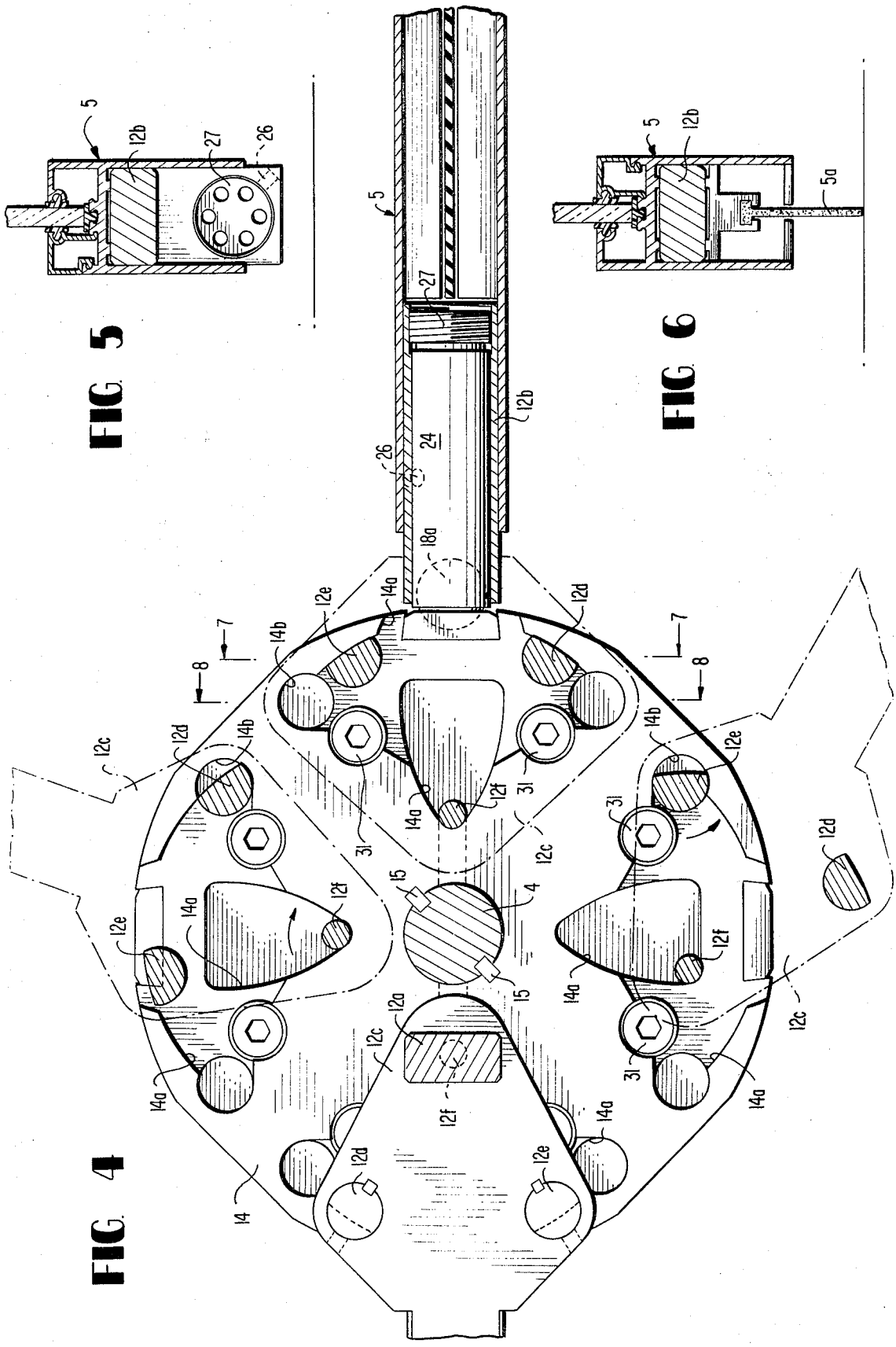
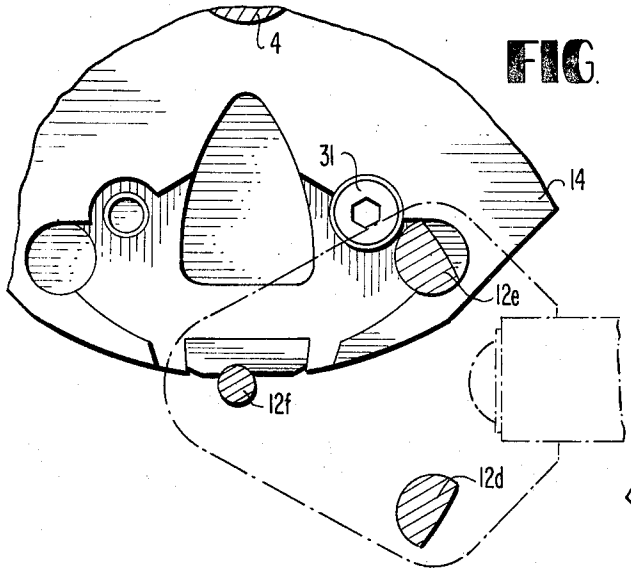


FIG 5

FIG 6

FIG 4

FIG. 9



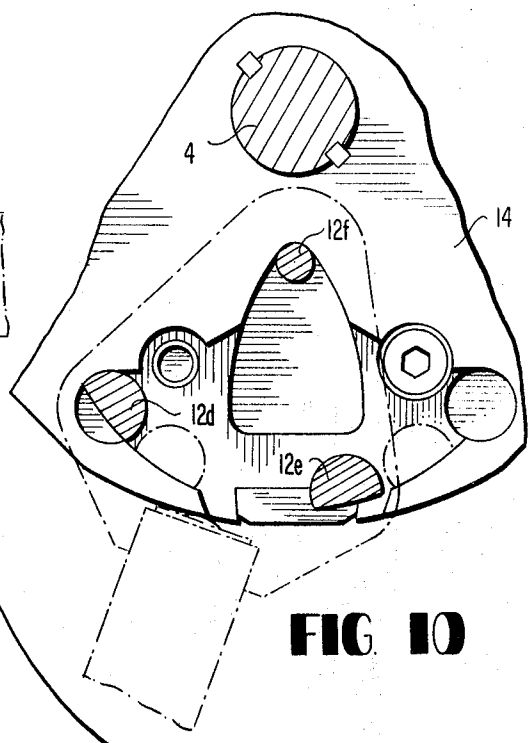


FIG. 10

FIG. 11

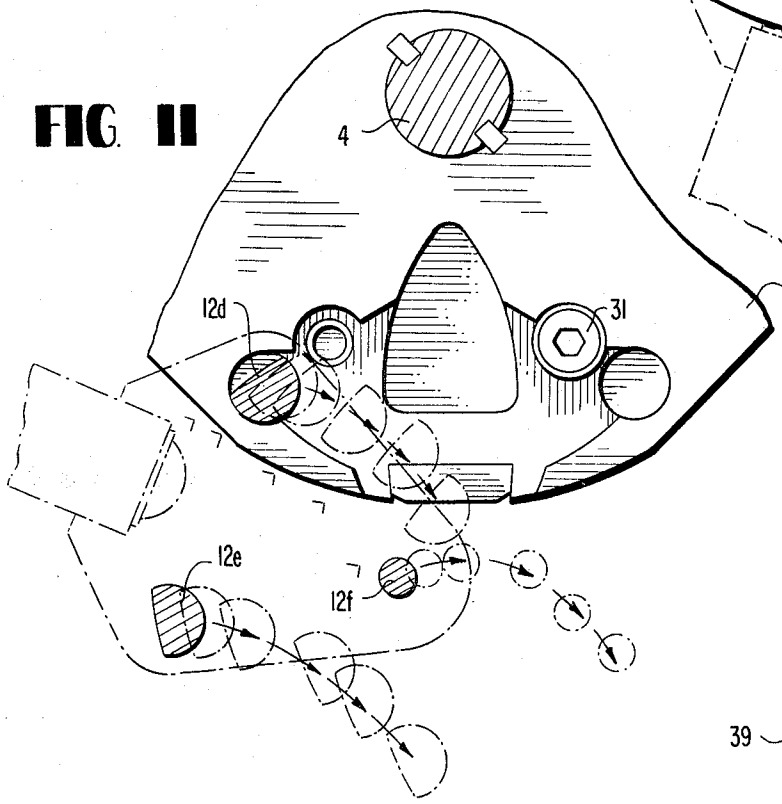
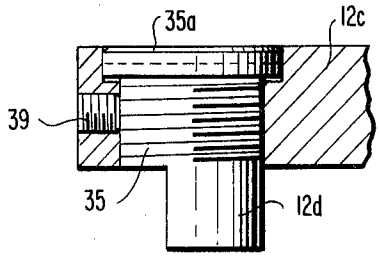


FIG. 15



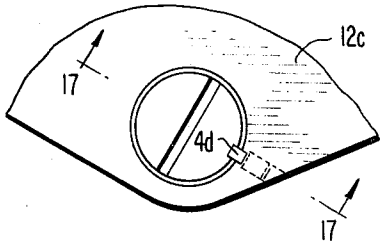


FIG. 16

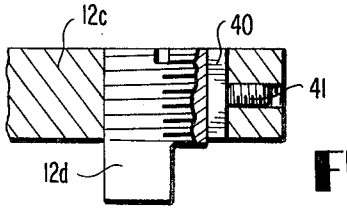


FIG 17

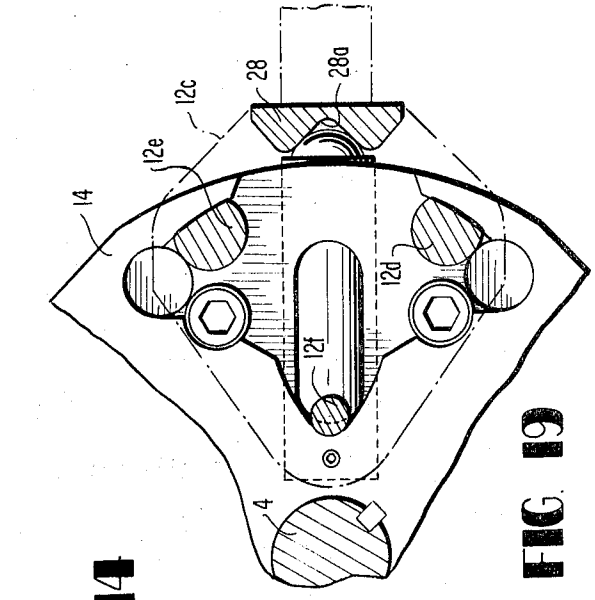


FIG. 14

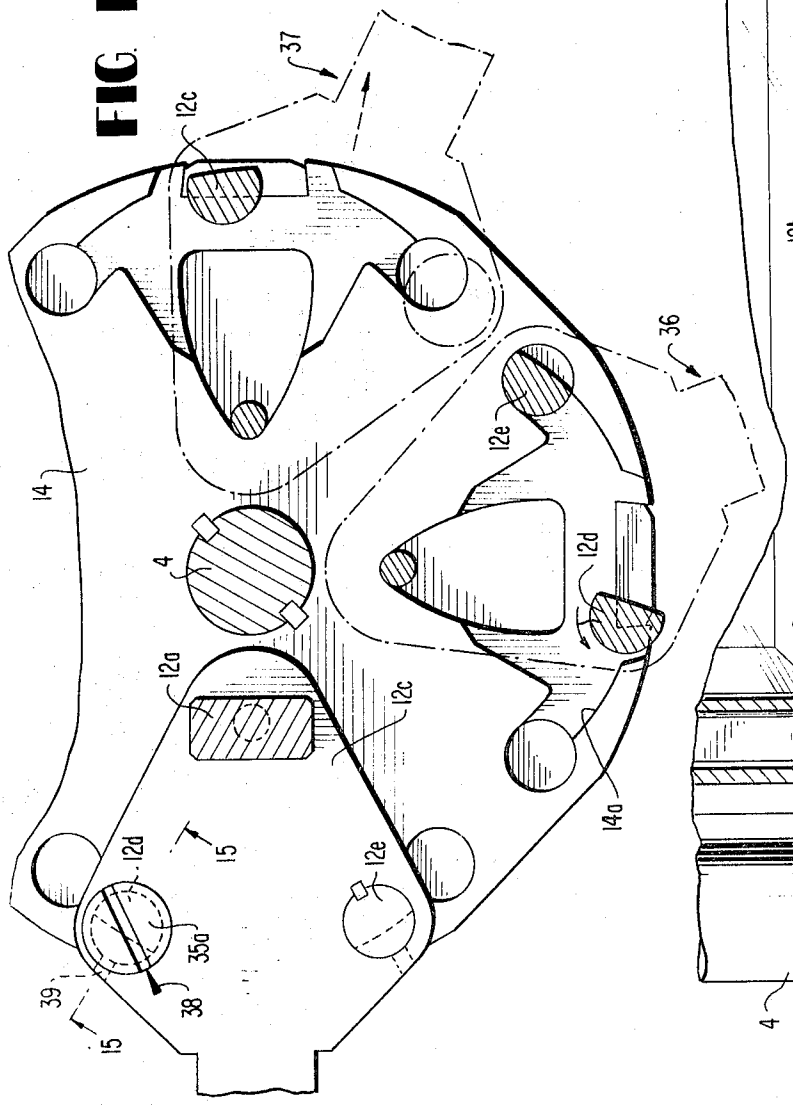


FIG. 19

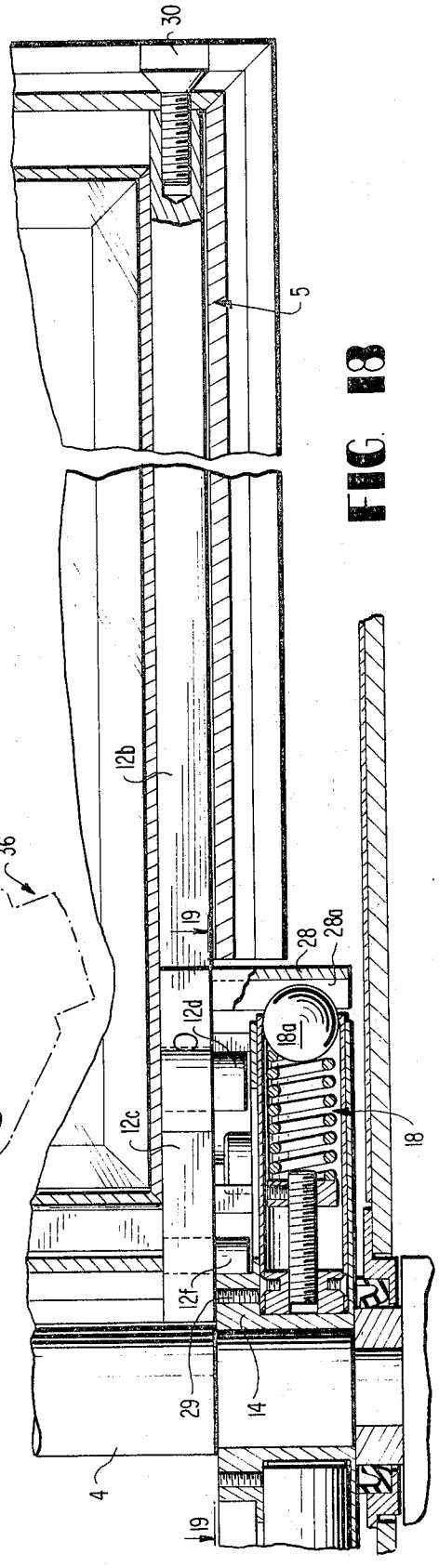


FIG. 18

FIG. 20

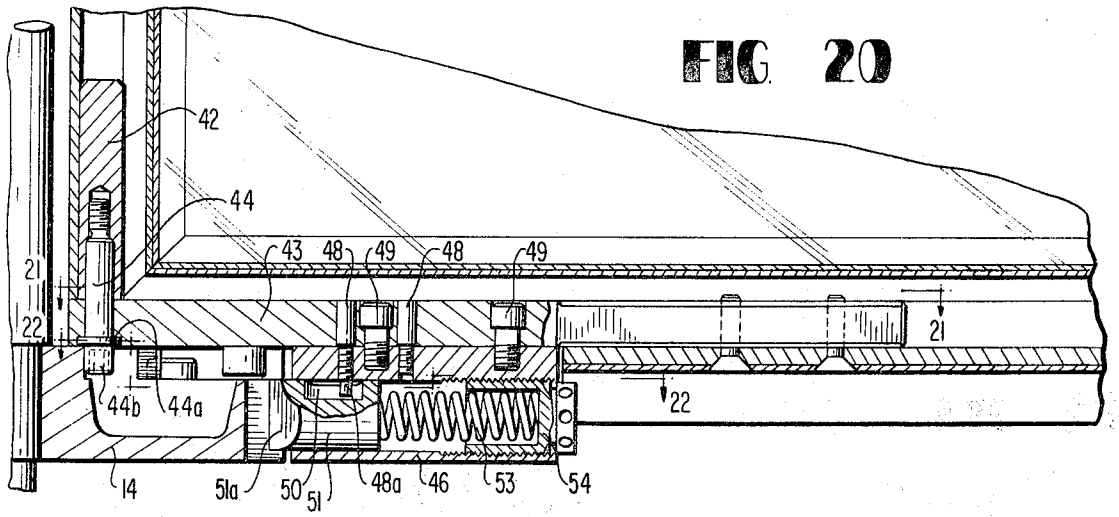


FIG. 21

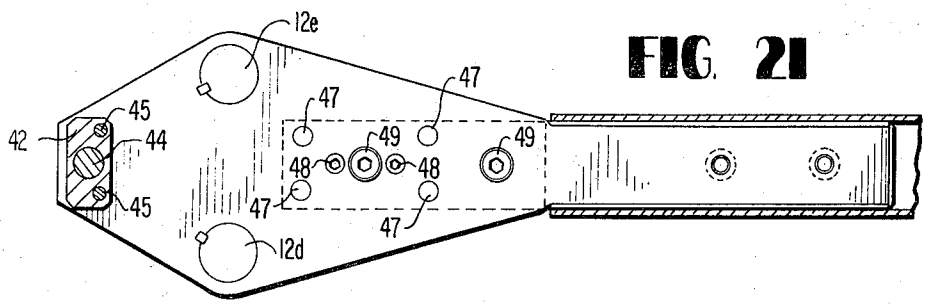


FIG. 22

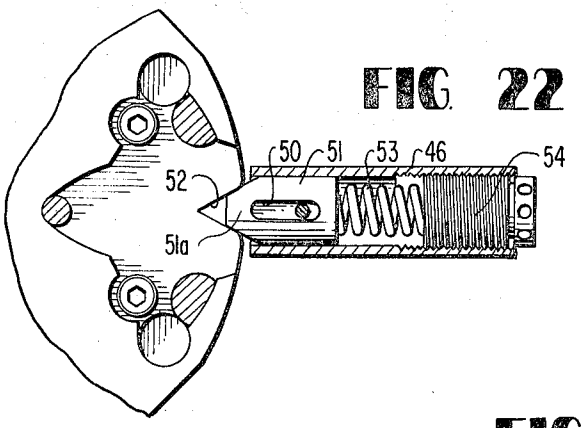


FIG. 24

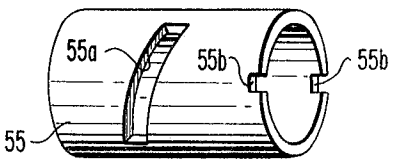
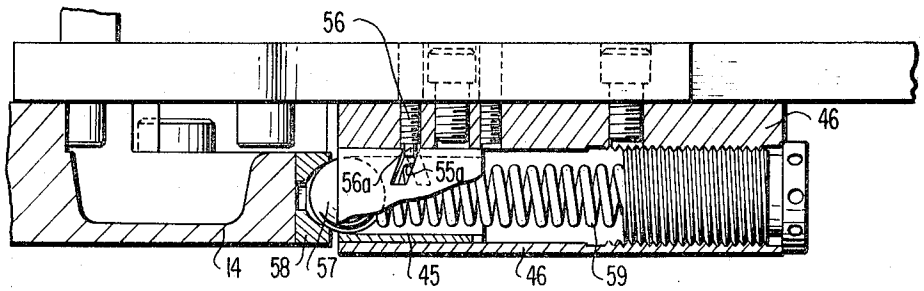


FIG. 23



COLLAPSIBLE REVOLVING DOOR HAVING REMOVABLE WINGS

BACKGROUND OF THE INVENTION

Various types of revolving doors have been proposed which include a plurality of wings extending radially from a vertically extending shaft or center post and connected thereto by suitable hardware which permits collapse of the wings in case of panic where efforts are made to revolve the door in reverse directions simultaneously, or in cases where it is desired to fold the wings of the door for clearing the doorway. The hardware employed for mounting each wing on the center post usually included a bifurcated bracket secured to the door wing and pivotally connected to a disc secured to the center post, the wing being held in normal operative position by a spring biased detent extending between the bifurcated bracket and the disc. While these doors have been satisfactory for their intended purpose, they have been subject to certain objections. One objection raised against the conventional hardware employed in revolving doors is the hardware's obstruction of the glass panel area of the door which does not conform to today's architectural designs which require thin, straight, uninterrupted frames and panels.

Another objection raised against the conventional hardware is the difficulty of removing or disconnecting the wings from the center post disc when it was necessary to repair or replace a wing.

To overcome the above-noted disadvantages experienced with the conventional revolving door hardware, the assembly of the present invention has been devised which comprises, essentially, a hanger bar secured to a respective wing frame, the hanger bar having pins pivotally connected to a hanger disc secured to the end portion of the door center post, the wing being held in normal operative position by a spring biased detent mounted between the hanger bar and the disc. The hanger assembly of the present invention is constructed and arranged in such a manner that the hanger bar and disc are disposed in a plane extending through the thin frame of the door wing carrying the glass panel, whereby the revolving door will be architecturally coordinated with the building within which it is mounted. In order to facilitate the removal or disconnection of the door wing from the center post, the wing hanger assembly is provided with removable portions. In one embodiment, the removable portion consists of a shoulder bolt threaded into the disc, in another embodiment, a peripheral portion of the disc is detachably mounted thereon, and in a further embodiment, one of the pivot pins, carried by the hanger bar, is threadably secured thereto.

IN THE DRAWINGS:

FIG. 1 is an elevational view of a revolving door having the conventional hardware for mounting the wings on the door center post;

FIG. 2 is an elevational view of a revolving door employing the hardware of the present invention for mounting the wings on the door center post;

FIG. 3 is a fragmentary, elevational view, partly in section, showing the details of the hanger assembly of the present invention at the lower end of the door center post, and wherein the detent assembly for holding the wing in its normal operative position is mounted within the hanger bar;

FIG. 4 is a view taken along line 4—4 of FIG. 3;

FIG. 5 is a view taken along line 5—5 of FIG. 3;

FIG. 6 is a view taken along line 6—6 of FIG. 3;

FIG. 7 is a view taken along line 7—7 of FIG. 4;

FIG. 8 is a view taken along line 8—8 of FIG. 4;

FIGS. 9, 10 and 11 are fragmentary top plan views, partly in section, of the hanger disc and hanger pivot pins, with the hanger bar and associated wing shown in phantom, illustrating the removal of the door wing from the hanger disc;

FIG. 12 is a view similar to FIGS. 9, 10 and 11 but illustrating another embodiment of the invention wherein a peripheral portion of the hanger disc is removed to facilitate the disconnection of the wing from the center post;

FIG. 13 is a side elevational view of the removable peripheral portion of the hanger disc as shown in FIG. 12;

FIG. 14 is a fragmentary top plan view, partly in section, of the hanger disc and hanger bar showing a further embodiment of the invention to facilitate the removal of the wing from the disc wherein one of the hanger bar pivot pins is threadably secured to the hanger bar, the steps of disconnecting the wing from the disc being illustrated in phantom;

FIG. 15 is a view taken along line 15—15 of FIG. 14;

FIG. 16 is a fragmentary top plan view of another embodiment of the removable pivot pin similar to pin illustrated in FIG. 15;

FIG. 17 is a view taken along line 17—17 of FIG. 16;

FIG. 18 is a fragmentary, elevational view, partly in section, of the hanger assembly of the present invention similar to FIG. 3; however, showing the detent assembly mounted within the hanger disc;

FIG. 19 is a view taken along line 19—19 of FIG. 16;

FIG. 20 is a fragmentary, elevational view, partly in section, illustrating another embodiment of the hanger assembly of the present invention at the lower end of the door center post;

FIG. 21 is a view taken along line 21—21 of FIG. 20;

FIG. 22 is a view taken along line 22-22 of FIG. 20;

FIG. 23 is a framentary, elevational view, partly in section, illustrating another embodiment of a detent assembly employed in the hanger assembly of the present invention; and

FIG. 24 is a perspective view of a tube for housing portions of the spring and ball employed in the detent assembly illustrated in FIG. 23.

Referring to the drawings and more particularly to FIG. 1, a revolving door 1 is illustrated which includes a plurality of wings 2, 3 extending radially from a center post 4, it being understood that another pair of wings would extend radially from the center post and disposed 90° with respect to wings 2 and 3. Each of the wings includes a peripheral frame 5 in which a glass panel 6 is mounted. Each wing of the revolving door shown in FIG. 1 is secured to the center post 4 by conventional hardware which includes bifurcated brackets 7, 8 secured to the top and bottom edge portions, respectively, of the wings and connected to respective discs 9 and 10 secured to the center post. The revolving door illustrated in FIG. 1 employing the conventional hardware would not conform to the architecture of the building in which it is mounted if the building is characterized by today's architecture of thin, straight uninterrupted frames and unobstructed glass panels. In order to conform revolving doors to today's architecture and

to coordinate the door to the building within which it is mounted, the hardware of the present invention has been devised which provides unobstructed glass panels together with thin peripheral frames enclosing the panels. This is accomplished, as will be seen in FIG. **2**, by positioning the hanger bar or brackets **11, 12** within the confines of the peripheral frame **5** and mounting the hanger discs **13** and **14** in close proximity to the lintel and bottom, respectively, of the passageway containing the revolving door. By this construction and arrangement, the hanger bars and hanger discs are disposed in substantially the same planes containing the peripheral frame **5**.

The details of the lower hanger assembly are illustrated in FIGS. **3** and **4** wherein it will be seen that the hanger bar **12** comprises a right-angle bracket in which one leg **12***a* is secured to the vertically disposed portion of the wing frame **5** by bolts **13** and the other leg **12***b* is secured to the horizontally disposed portion of the wing frame by bolts **15**, this portion of the frame also having a suitable seal **5***a* depending therefrom. The portion of the hanger bar where the legs **12***a* and **12***b* intersect is formed with a divergent head portion **12***c* from which pins **12***d*, **12***e* and **12***f* depend, the pins cooperating with a grooved portion **14***a* formed in the hanger disc **14** whereby the door wings are mounted for guided, independent, realtive swinging movement with respect to the center post **4** to which the hanger disc is secured by keys **16** and set screws **17**.

In order that the wings may be held in normal operative position relative to the center post, a detent assembly **18** is provided which comprises a ball **18***a* engaging a spherical seat **19** formed on the peripheral portion of the hanger disc **14**, the ball being biased against the seat by a compression spring **20** which engages a nut **21** threadably mounted on a stem **22**, the stem being threadably mounted within a sleeve **23** secured to one end of a cylindrical housing **24** by suitable screws **25**, the opposite end of the housing **24** having a reduced inside diameter for retaining the ball therein, the detent assembly thus forming a cartridge which is insertable within the leg portion of **12***b* of the hanger bar and contained therein by a set screw **26** (FIG. **4**) and plug member **27**. The biasing force of the spring is varied by adjusting the position of the nut **21** on the stem **22**, a fine adjustment of the biasing force is accomplished by changing the position of the stem **22**, carrying nut **21**, relative to the sleeve **23**.

In lieu of mounting the detent cartridge in one leg of the hanger bar as shown in FIG. **3**, it can be mounted in the hanger disc **14** as shown in FIGS. **18** and **19**. In this arrangement, the head portion **12***c* of the hanger bar is provided with a depending flange **28** formed with a seat portion **28***a* which engages the spring biased ball **18**, the detent cartridge being held in the disc **14** by a set screw **29**. Also in the arrangement shown in FIG. **18**, in lieu of the bolts **14** securing the leg portion **12***b* of the hanger bar to the frame **5** as shown in FIG. **3**, the leg portion **12***b* can extend the width of the wing and be secured to the vertical frame portion or molding of the wing by a bolt **30**.

In the operation of the revolving door, thus far described, the detent assemblies maintain the door wings in a normal operative radial position relative to the center post **4**; however, in case of panic or when it is desired to fold the doors for clearing the doorway, a force is applied to the door wings overcoming the biasing force of the detents, thereby allowing the wings to pivot about pins **12***f*, **12***d* and **12***e* carried by the hanger bar. This collapse or folding of the wings is illustrated in phantom in FIG. **4** wherein it will be seen that the initial pivoting of the wing is about pin **12***f* until pin **12***e* or **12***d*, depending upon which direction the wing is being collapsed, slides on the disc grooved portion **14***a* and enters the circular recess portion **14***b* of the disc groove, whereupon the pivoting of the wing is about pin **12***e* or **12***d*.

An important feature of the present invention is the relative ease with which the wings may be disconnected from the hanger discs **11** and **14** for repair or replacement of the wing. As will be seen in FIG. **4**, the hanger disc **14** is provided with a plurality of shoulder bolts **31** threadably mounted therein and being positioned adjacent a respective recess **14***b* in the disc groove. These bolts limit the extent to which the wing can be folded since the pins **12***e* or **12***d* would ultimately abut the shoulder bolts when the wing is pivoted to its folded or collapsed position. The disconnection of a door wing is illustrated in FIGS. **9, 10** and **11**, wherein it will be seen in FIG. **9** that the door wing is pivoted about pin **12***e* to a folded position to thereby render one of the shoulder bolts **31** accessible for the removal thereof from the disc. The wing is then pivoted in the opposite direction about pins **12***f* and **12***d*, respectively, as shown in FIG. **10**. The pivoting of the wing about pin **12***d* is shown in FIG. **11** and allows pins **12***e* and **12***f* to become removed from the disc. Since the shoulder bolt adjacent the pin **12***d* has been removed from the disc, the pin **12***d* is allowed to follow the path shown in phantom whereby the door wing becomes disconnected from the disc.

Another embodiment of the door removal feature of the present invention is illustrated in FIGS. **12** and **13** wherein, in lieu of the shoulder bolts **31**, the disc **14** is provided with a removable peripheral portion **32** positioned on the disc by a dowel pin **33** and secured to the disc by suitable bolts **34**. To remove the door wing, the peripheral portion **32** is removed from the disc and the wing is pivoted about pin **12***f* to a position where the pin **12***e* is removed from the grooved portion of the disc, thus permitting the door wing to be removed from the disc as shown in phantom in FIG. **12**.

A further embodiment of the door removal feature of the present invention is illustrated in FIGS. **14** and **15** wherein the hanger bar pivot pin **12***d* is provided with a threaded portion **35** extending through the hanger bar portion **12***c*, and having a slotted head portion **35***a*. By this construction and arrangement, the door wing is disconnected from the hanger disc by pivoting the wing to the position designated as **36** in FIG. **14** to thereby disengage the pin **12***d* from the disc grooved portion **14***a*. While in this position, the pin **12***d* is unscrewed from the hanger bar and the wing is pivoted in the opposite direction to a position, designated as **37** in FIG. **14**, whereby the pin **12***e* is disengaged from the disc grooved portion **14***a*, thus freeing the wing for removal from the hanger disc. Suitable indicia **38** is inscribed on the hanger bar head portion **12***c* adjacent the bore through which the pin **12***d* extends to that when the pin is reinserted into the hanger bar, the head portion **35***a* can be set to the position whereby the proper surface of the pin **12***d* conforms to the grooved portion of the hanger disc, the adjusted position being maintained by a set screw **39**.

Another embodiment of the removable pin is illustrated in FIGS. **16** and **17** wherein, in lieu of the alignment indicia **38** shown in FIG. **14**, the threaded portion of the pin **12***d* and the adjacent surface of the tapped bore in hanger bar head portion **12***c* are formed with aligned axial slots for receiving a locating key **40** held therein by a set screw **41**.

While the hanger bar assembly illustrated in FIG. **3** shows the leg **12***a* integrally connected to the horizontally disposed leg **12***b* of the right-angle bracket, and the detent assembly being inserted within an enlarged portion formed integrally on the leg **12***b*, the assembly illustrated in FIG. **20** shows an embodiment wherein the vertically extending leg and detent assembly are bolted to the horizontal leg of the right-angle bracket. In this arrangement, the vertically extending leg **42** is secured to the horizontally disposed leg **43** by a bolt **44** and the capscrews **45** (FIG. **21**), the bolt **44** having a flanged portion **44***a* and a head portion **44***b* which extends into the grooved portion of the disc **14** and provides a pivot point equivalent to the pivot pin **12***f* shown in FIGS. **3** and **4**. The capscrews **45** are disposed adjacent the bolt **44** in such a manner that when tightened, they shear part of the flanged portion **44***b* to thereby lock the bolt **44** in the leg **43** whereby loosening of the bolt is prevented when the door is collapsed.

The detent mechanism employed in the hanger bar assembly of FIG. **20** comprises a cylindrical housing **46** secured to the horizontal leg **43** by dowel pins **47** (FIG. **21**), set screws **48** and bolts **49**; one of the set screws having an end portion **48a** extending within a slot **50** formed within the upper surface of a plunger **51** slidably mounted within the housing. One end of the plunger is provided with a beveled portion **51***a* adapted to engage a similarly shaped notch **52** formed in the hanger disc **14**. The opposite end of the plunger is engaged by one end of a coil spring **53** the opposite end of the spring engaging a plug **54** threadably mounted within the end of the housing **46**. By this construction and arrangement, the biasing force of the spring **53**, urging the beveled end of the plunger into the notch **52**, may be varied by adjusting the position of the plug **54** in the housing **46**; and the set screw portion **48***a* prevents the plunger **51** from being forced out of the housing when the door is collapsed.

Another embodiment of the detent mechanism is shown in FIGS. **23** and **24** wherein a tube **55** is mounted within the housing **46** and is secured therein by a set screw **56** having an end portion **56***a* extending within a helical slot **55***a* formed in the wall of the tube. The end of the tube is provided with notches **55***b* for receiving a suitable tool whereby the axial position of the tube within the housing may be adjusted. A ball **57** extends from one end of the tube and engages a spherical slot **58** formed on the periphery of the hanger disc **14**, the ball being biased against the seat by coil spring **59** abutting the plug **54**.

While the hanger bar assembly of the present invention has been described for the lower end of the revolving door, it will be understood that the hanger bar assembly at the upper end portion is identical to the assembly on the lower end except that the hanger bar pivot pins project upwardly into the grooved portion of the hanger disc. When removing the door wings, the portions of the upper hanger assembly are removed which correspond to the identical portions in the lower hanger assembly.

From the above description, it will be readily apparent to those skilled in the art that the construction and arrangement of the hanger assembly of the present invention provides an improved assembly which facilitates the removal of the door wings from the center post than hitherto provided by the conventional revolving door hardware. By positioning the hanger bars within the confines of the peripheral frame of the door wings and by mounting the hanger discs in close proximity to the lintel and bottom of the passageway containing the revolving door, the hanger bars and discs are thus disposed in substantially the same planes containing the wing frames, whereby the revolving door conforms to today's architecture and is coordinated to the architecture of the building in which it is mounted.

The terms and expressions which have been employed herein are used as terms of description and not of limitation, and there is no intention, in the use of such terms and expressions, of excluding any equivalents of the features shown and described or portions thereof but it is recognized that various modifications are possible within the scope of the invention claimed.

I claim:

1. In a collapsible revolving door of the type having a plurality of wings extending radially from a center post and connected thereto by hanger assemblies disposed at either end portion of the center post, each hanger assembly including a hanger disc secured to the center post and a hanger bar secured to the respective door wing, said hanger bar having pins extending within a grooved portion formed in the hanger disc whereby the door wings are mounted for guided, independent, relative swinging movement relative to the center post for moving the door to the collapsed position; the improvement comprising, means operatively connected to the grooved portion of the disc to restrict the pivotal movement of the door wing between predetermined limits to the collapsed position, said means being detachable from the grooved portion of the disc to permit pivotal movement of the door wing beyond the predetermined limits, whereby the door wings can be disconnected from the center post.

2. A collapsible revolving door according to claim **1** wherein the means operatively connected to the grooved portion of the disc comprises shoulder bolts threadably mounted on said hanger disc.

3. A collapsible revolving door according to claim **1** wherein the means operatively connected to the grooved portion of the disc comprises, peripheral portions on the hanger disc detachably mounted thereon.

4. A collapsible revolving door according to claim **1** wherein the means operatively connected to the grooved portion of the disc comprises, at least one of the hanger bar pivot pins threadably mounted within the hanger bar.

5. A collapsible revolving door according to claim **1** wherein detent means extend between the hanger bar and the hanger disc to hold the door wing in a normal operative position relative to the center post.

6. In a collapsible revolving door of the type including a plurality of wings extending radially from a center post and connected thereto by hanger assemblies disposed at either end portion of the center post, each wing having a panel portion surrounded by a peripheral frame, each hanger assembly including a hanger disc secured to the center post, and a hanger bar secured to the respective door wing, said hanger bar having pins

extending within a grooved portion formed in the hanger disc whereby the door wings are mounted for guided, independent, relative swinging movement relative to the center post for moving the door to the collapsed position; the improvement comprising, forming the hanger bar as an L-shaped bracket having one leg mounted on a horizontal portion of the peripheral frame and the other leg mounted on the vertical portion of the frame, mounting the hanger discs in close proximity to the lintel and bottom of the passageway containing the revolving door, the pins on the hanger bar at the lower end of the door extending downwardly into the grooved portion of the lower disc, the pins on the hanger bar at the upper end of the door extending upwardly into the grooved portion of the upper disc, whereby the hanger bars and discs are confined substantially within the vertical and horizontal planes containing the peripheral frame, whereby the panel portion of each wing is unobstructed by the hanger assembly.

7. A revolving door according to claim **5** wherein the detent means comprises, a cartridge having a spring biased ball projecting from one end thereof, the opposite end of said cartridge having a sleeve secured therein and a stem threadably mounted within said sleeve, a nut threadably mounted on said stem and engaging one end of a compression spring having its opposite end biased against said ball, whereby the biasing force of the spring may be varied by adjusting the position of the nut on the stem, and a fine adjustment of the biasing force by changing the position of the stem relative to the sleeve.

8. A revolving door according to claim **7** wherein the detent cartridge is mounted within the hanger bar, and the spring biased ball engages a spherical seat formed in the peripheral portion of the hanger disc.

9. A revolving door according to claim **8** wherein the detent cartridge is mounted within the hanger disc, and the spring biased ball engages a seat formed on the hanger bar.

10. A detent assembly comprising, a cartridge having a spring biased ball projecting from one end thereof, the opposite end of said cartridge having a sleeve secured therein and a stem threadably mounted within said sleeve, a nut threadably mounted on said stem and engaging one end of a compression spring having its opposite end biased against said ball, whereby the biasing force of the spring may be varied by adjusting the position of the nut on the stem, and a fine adjustment of the biasing force by changing the position of the stem relative to the sleeve.

11. A revolving door according to claim **5,** wherein the detent means comprises, a housing secured to a portion of the hanger bar, a plunger slidably mounted in said housing, said plunger having a beveled end portion adapted to engage a similarly shaped notch portion formed in the periphery of said hanger disc, a spring mounted in said housing and having one end thereof engaging the opposite end of said plunger, the opposite end of said spring engaging a plug threadably mounted in said housing whereby the biasing force of the spring urging the beveled end portion into the notch may be varied; a slot formed in the surface of the plunger, and pin means mounted in said housing and extending into said slot to thereby prevent the plunger from being biased outwardly from the housing when the door is moved to a collapsed position.

12. A revolving door according to claim **5,** wherein the detent means comprises, a housing secured to a portion of the hanger bar, a tube slidably mounted in said housing, a ball mounted in said tube and protruding from one end thereof, said ball adapted to engage a spherical seat formed on the peripheral edge of said hanger disc, a spring mounted within said housing and extending within said tube, one end of said spring engaging said ball and the opposite end thereof engaging a plug threadably mounted within said housing whereby the biasing force of the spring urging the ball into the spherical seat may be varied, a helical slot formed in the wall of said tube, and pin means extending through said housing and into the helical slot, whereby the axial position of the tube within the housing may be adjusted by rotating the tube.

13. A revolving door according to claim **6,** wherein bolt means connects said other leg to said one leg of the L-shaped bracket, said bolt means extending through said hanger disc and forming one of the pins in the grooved portion of the hanger disc.

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