May 6, 1941. E. PEREMI ET AL 2,240,942

REVOLVING DOOR

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Fig. 1.

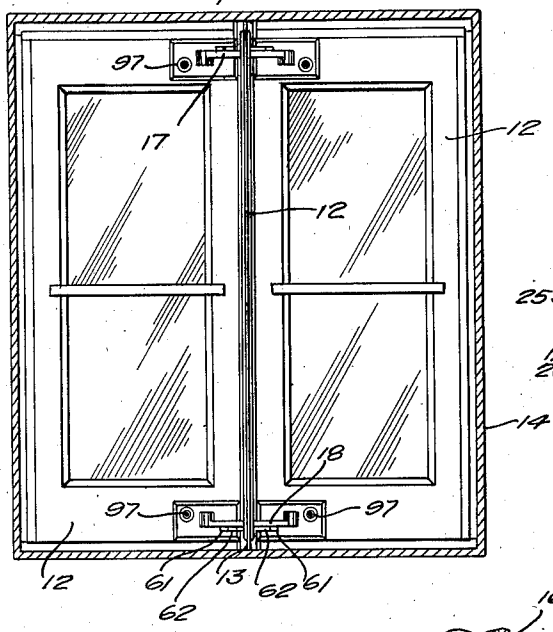


Fig. 2.

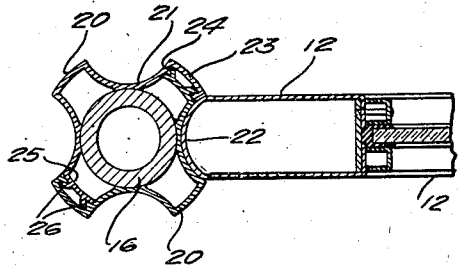
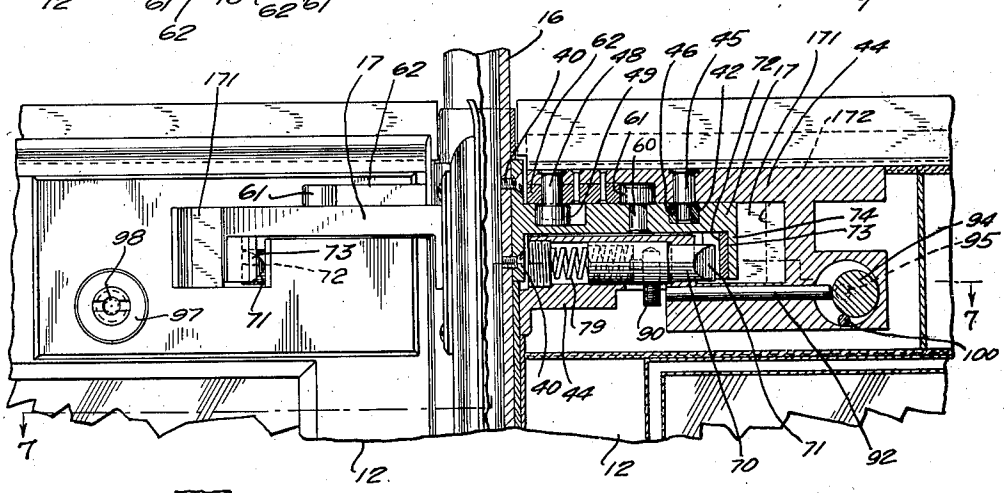


Fig. 3.



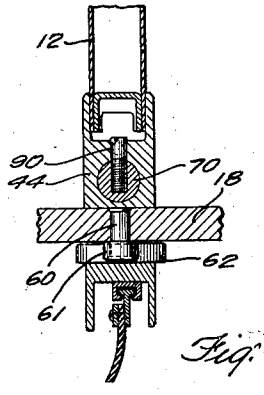


Fig. 4.

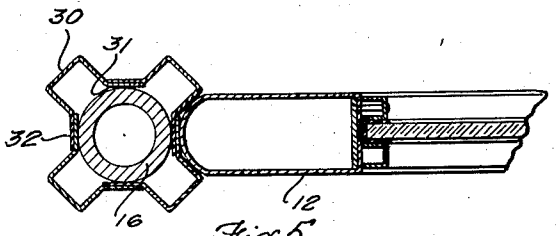


Fig. 5.

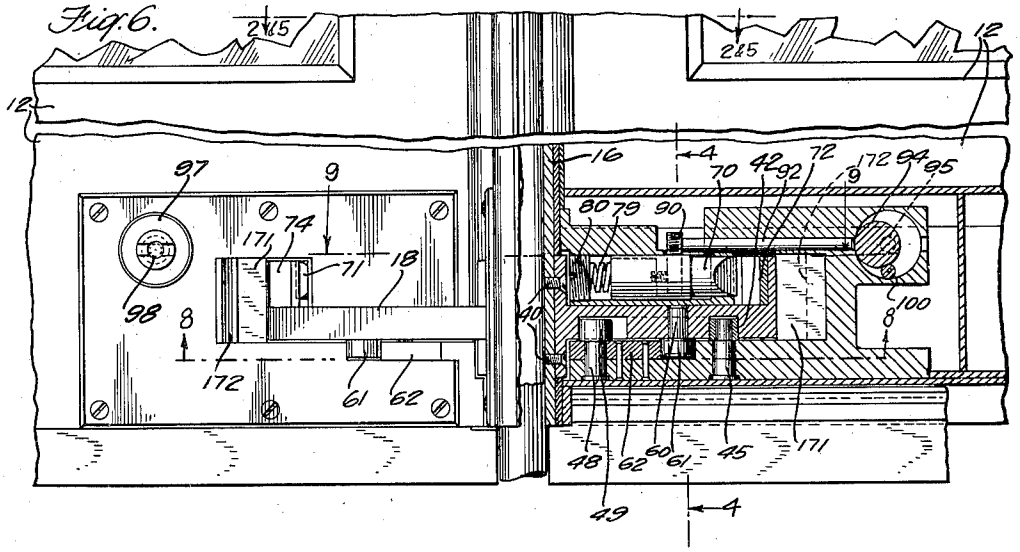
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Fig. 6.



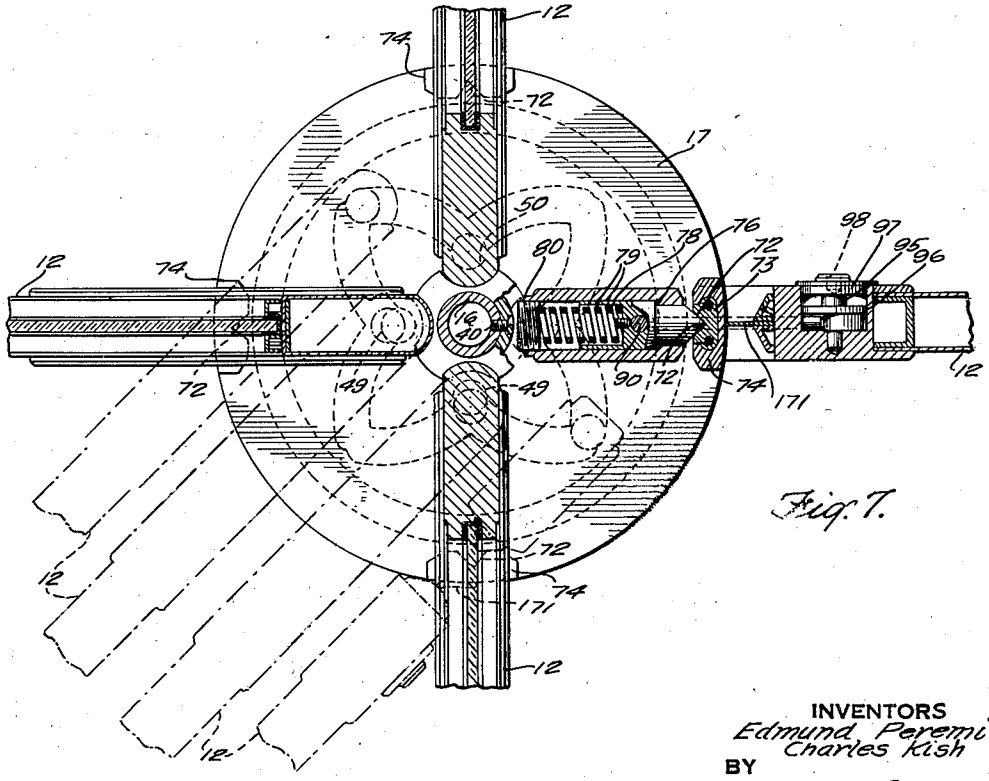


Fig. 7.

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Fig. 8.

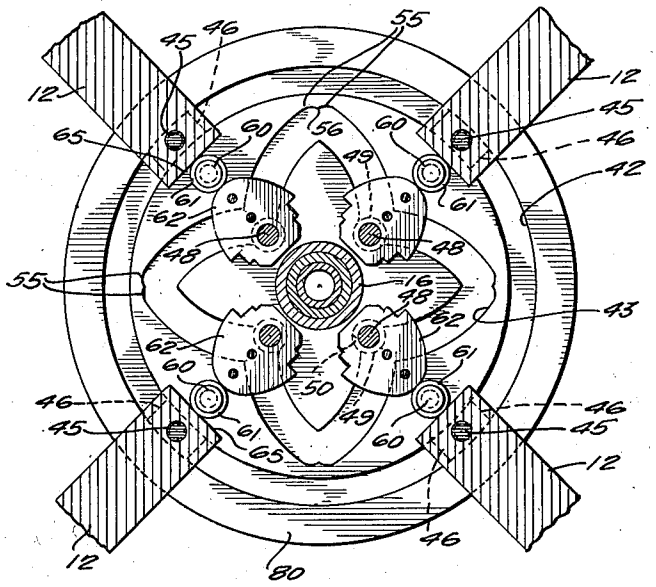
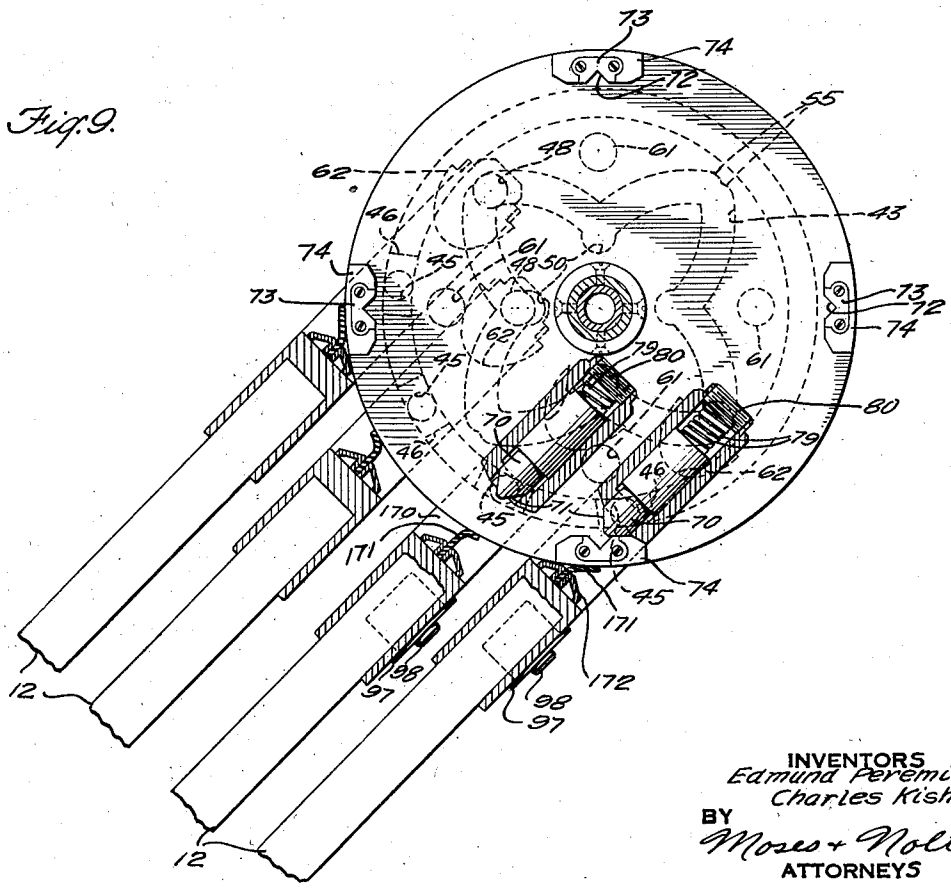


Fig. 9.



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UNITED STATES PATENT OFFICE

2,240,942

REVOLVING DOOR

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Application June 4, 1933, Serial No. 211,716

13 Claims. (Cl. 20—18)

This invention relates to revolving doors in which a plurality of leaves are mounted to project radially from a central rotary column or support. In the normal operation of the door, the leaves are fixed with relation to the central column and rotate with it, but they are adapted to fold in response to abnormal pressure occurring under panic conditions, so as to make an open passage through the doorway. The leaves may also be folded and moved to one side with the central column, when it is desired to clear the doorway for any purpose.

For holding the door leaves firmly in their radial positions while permitting them to fold or collapse under abnormal pressure, spring detent means are used, and it is an object of the invention to improve the construction of such spring detent means. More specifically, it is an object to provide spring detent means which will assist in holding the leaves so that their inner edges will fit closely against the column, instead of tending to push the leaves away from the column, as in the constructions at present in use.

It is a further object of the invention to provide means for unlocking the leaves by forcibly retracting the detent bolts against the tension of the bolt-holding springs when the door leaves are to be folded manually.

Further objects of the invention are to provide improvements in the pivotal mounting of the leaves; to provide an improved construction of casing of the column; and to improve other details of the construction, as will hereinafter more fully appear.

In the drawings forming a part of this specification:

Figure 1 is a view in front elevation of a door mounted in a housing shown in vertical section;

Figure 2 is a horizontal section through the door column and its casing and part of one of the door leaves;

Figure 3 is a view, partly in elevation and partly in vertical section, showing part of the door column and the upper disc and hanger, and portions of the leaves;

Figure 4 is a vertical section on line 4—4 of Figure 6 showing the lower part of one of the leaves;

Figure 5 is a horizontal section similar to Figure 2 showing a modified form of column enclosing casing;

Figure 6 is a view, partly in elevation and partly in vertical section, similar to Figure 3, but showing the disc and hangers at the bottom of the door.

Figure 7 is a view in horizontal section taken on line 7—7 of Figure 3, the folded position of the leaves being shown in dotted lines.

Figure 8 is a horizontal sectional view looking upwardly, taken on line 8—8 of Figure 6.

Figure 9 is a horizontal section taken on line 9—9 of Figure 6 showing the door leaves folded.

Referring to the drawings in detail, the door comprises a series of leaves or wings 12 mounted upon a central rotary column or support 13, to turn within a doorway or casing 14 of usual construction. As is customary, the supporting column 13 may have a pivotal bearing (not shown) in the floor of the doorway and its upper end may be suspended by a trolley and track (not shown) above the ceiling of the doorway. When the door is to be moved to one side of the doorway, the pivotal bearing at the bottom is disconnected, the leaves are folded and the leaves and column moved to one side by forcing the trolley along the track, all in a well understood manner, not necessary to illustrate or further describe.

The central supporting column comprises a strong and rigid shaft which may conveniently consist of a steel tube 16. Mounted on this tube, near the top and bottom, are means for supporting the door leaves or wings, such means being shown as comprising an upper disc 17 and a lower disc 18 which are preferably similar in construction, one facing upwardly and the other downwardly. The exposed portion of the central column between the discs is preferably provided with a tubular sheath or casing which is recessed or otherwise formed so as to provide a tight connection between the column and the inner edges of the door leaves, while at the same time not interfering with the folding of the leaves. Preferably this sheath or casing is made of a non-corrosive metal. One form of this casing is illustrated in Figure 2 and comprises two similar interlocked shapes which may desirably be formed of extruded bronze or aluminum, or other non-corrosive metal which can be extruded. In the construction shown, the casing comprises four projecting ribs 20 between which are curved recesses 21 adapted to receive the inner edges of the wings 12 which are curved as shown at 22. Each of the similar halves of the casing comprise a complete rib portion 20 and a partial rib 23 having a dovetailed groove 24 extending longitudinally thereof inside of said partial rib. Each of the casing sections also has a longitudinally extending inner rib portion 25 having diverging flanges 26 thereon which constitute a dove-tail adapted to interlock with the

groove 24 when the two portions of the casing are telescoped longitudinally before the door is erected. With this construction it is seen that a symmetrical and finished casing is provided by the use of two identical extruded sections.

In instances where it is desired to use a casing for the central column made out of sheet metal or metal which cannot be extruded, such for instance as stainless steel, the construction shown in Figure 5 may be used. In this construction the casing is made out of a plurality of similar rolled shapes, four being shown. Each of these shapes comprises a hollow rib portion 30 having two flanges 31 and 32 arranged at right angles and adapted to fit adjacent to the shaft 16. Preferably all of the sheet metal sections are identical, the flange 31 at one side underlying the flange 32 of the adjacent rib section, and the flange 32 at the opposite side of the first rib section overlying the flange 31 of the adjacent rib section on that side. The flanges may be secured together by welding or by screws or other holding devices (not shown).

The leaves may be pivotally mounted on the discs or supporting members 17 and 18 in any suitable manner. In the preferred construction illustrated we have shown an arrangement similar to that disclosed in our United States Patent No. 1,983,395, dated December 4, 1934, the present invention, however, embodying certain improvements in detail over the pivotal supporting means shown in said patent. The discs 17 and 18 are similar, except reversed in position on the shaft. The discs are secured to the shaft in any suitable manner, as by means of the screws 40. Each disc is provided in one face with an annular outer groove 42 and a four lobed or "clover leaf" groove 43. The door leaves are each provided with upper and lower hangers 44, each hanger carrying an outer pin 45 provided with an arcuate shoe or block 46 pivotally mounted thereon and arranged to slide in the annular groove 42. Each hanger is also provided with an inner pin 48 carrying an anti-friction roller 49 arranged to travel in the lobed groove 43. The lobed groove 43 is provided with four equally spaced sockets or recesses 50 adapted to receive the rollers 49 when the leaves are in radial position. The roller 49 travels outwardly from the socket through one or the other of the branching walls of the groove leading from the socket when a leaf is fully swung to the right or left, respectively. Where the groove portions forming the sides of a lobe come together at the apex of the lobe they may merge completely into a single apex as shown in our prior patent referred to, but preferably the groove portions do not completely merge at the apex, but each groove portion terminates in a shallow seat 55, these two seats being separated by an inwardly projecting cusp 56. When a leaf is completely folded its roller 49 moves into one of these seats 55, the other seat 55 serving to receive the roller on the adjacent door leaf in the event that the leaves are folded in the opposite direction. Each of the discs is provided with guide pins 60, each carrying an antifriction roller 61, and each leaf hanger is provided with a heart shaped cam 62 adapted to maintain contact with a roller 61 while the leaves are in radial position and during the first part of the folding movement of the leaf. The leaf hangers are also provided with transverse surfaces 65 adapted to contact the rollers 61 when the leaves are in radial position. When a leaf is folded from the radial position shown at Figure 8, the shoe 46 carried by the pin 45 slides in the groove 42 and at the same time pivots on the pin. By the time the leaf has pivoted 45° from its radial position, as illustrated by the two inner leaves in Figure 9, the roller 49 on pin 48 has moved partly out of its socket 50 in the lobed groove but the roller 61 is still in contact with the surface of cam 62, although the surface 65 on the hanger has moved away from contact with the roller 61. If the leaf is one of the outer leaves and moves to the fully folded position, as shown by the outer leaves in Figure 9, the shoe 46 has moved further around the annular groove, the cam 62 has moved entirely out of contact with the roller 61 and the roller 49 on the pin 48 has moved out through one of the branches of one of the lobes and into the socket 55 at the end of such branch. All of the leaves are capable of similar movements depending upon the position of the door when collapsed, and when the leaves are folded they are preferably parallel or substantially parallel, as shown in Figure 9. The operation of the parts so far described is very similar to that disclosed in our former patent.

In order to permit the leaves to fold to the 135° position of the outer leaves shown in Figure 9, the recesses 170 in the hangers which receive the discs 17 and 18 are made sufficiently deep so that the ends of the recesses will not contact the edges of the discs until the folding movement has taken place. In order to close the outer portions of these recesses when the leaves are in radial position so as to prevent the passage of drafts, flexible wind stops 171, preferably formed of rubber or the like are mounted on the end walls of the recesses 170 by means of clamping blocks 172 or in any suitable manner.

For holding the door leaves in radial position during normal use, while at the same time permitting them to yield under excessive pressure, spring pressed bolts are used, each leaf being preferably provided with bolts near its upper and lower edges adapted to engage recesses in lugs formed on the upper and lower discs respectively. The bolts are mounted in recesses in the hangers near the central column of the door and adjacent to the discs. The bolts are all similar and are designated by the numeral 70, and each bolt has a wedge shaped end 71 adapted to fit in a wedge shaped groove 72 formed in a block 73 preferably of hardened steel which is set in a recess in a lug 74 at the edge of the disc. There are four lugs and blocks on each disc corresponding to the radial positions of the leaves. The body of the bolt is provided with a shoulder 76 (see Fig. 7) which engages a shoulder in the bolt receiving recess and serves to limit the outward movement of the bolt. The rear end of the bolt is hollow, as shown at 78, and receives a compression spring 79. The inner end of the compression spring bears against a screw plug 80 which screws in the threaded inner portion of the recess in the hanger and constitutes an adjustable abutment for the spring. The tension on the spring is so set as to permit the release of the leaves under a predetermined pressure greater than the normal operating pressure or any expected wind pressure to which the door leaf is subjected. The panic release pressure is usually determined by ordinance in the cities where the door may be used. The resistance of the leaves to folding may also be affected by choosing a proper angle for the ends of the bolts and for the sockets in which they fit. If the angle is made more acute, the re-

sistance to folding will be greater for the same spring pressure and vice versa.

An important advantage of the present construction is that the bolts are urged outwardly by the springs so that the spring reaction against the hangers and door leaves mounted thereon is inward. The bolts and springs thus tend to force the leaves inwardly at all times, and hold the edges of the leaves closely to the column. In previous constructions, in which the bolts or spring pressed devices are mounted outside of the discs and pressed inwardly against peripheries of the discs, the springs tend to urge the leaves away from the central column. This has the result that any looseness in the pivotal connections of the leaves results in a sagging of the leaves away from the column which may permit leakage of air and which also may interfere with the proper frictional contact between the weather strips at the edges of the leaves and the door casing, thus interfering with the proper smooth operation of the door. As the door continues in use and the pivotal connections wear, this condition is accentuated. With our improved construction, however, slight looseness or wearing of the pivotal connections is unimportant because the spring bolts keep the leaves in proper position at all times.

Owing to the fact that the inner edges of the door leaves are pressed firmly into the grooves in the column by the spring pressure, the column serves to reinforce the leaves and thus thereby secure additional rigidity, a very firm and tight structure resulting.

Another advantage of the present construction is that the bolts are located near the central column and inside of the outer diameter of the discs. This produces a construction which is very compact and enables the hangers to be reduced in size to a minimum, thereby improving the appearance of the door and reducing the cost of construction.

When it is desired to fold the door leaves manually, for the purpose of collapsing the door and moving it to one side of the doorway, as is frequently done in warm weather, or for the purpose of moving large articles in and out of the building, it is desirable to provide means for unlocking the leaves so that they may be readily folded. In the present construction we accomplish this result by providing means for pushing the bolts into retracted or unlocked position against the tension of the springs and without in any way releasing or modifying the spring tension. In the construction illustrated, each bolt is provided with a pin 90 projecting from the side thereof and each hanger has a longitudinal push rod 92 mounted to slide radially in a bore in the hanger. The inner ends of these push rods are adapted to engage the pins 90 while the outer ends of the push rods bear against the surfaces of eccentrics 94 mounted in the hanger. Each eccentric is mounted on a shaft 95 which is provided with bearing discs 96 and 97 which are mounted to turn in a circular recess in the hanger. The outer end of the shaft 95 is exposed and is provided with a socket 98 or is otherwise formed for engagement with a suitable key or tool by which the shaft 95 and eccentric may be rotated through a half turn. A stop pin 100 is provided to limit the motion of the eccentric from one extreme position to the other. Figure 3 shows the eccentric rotated to its outermost position in which the push rod 92 is moved outwardly away from the door column, thereby releasing the bolt 70 and enabling it to be held firmly in engagement with its recess in the disc lug by the pressure of the spring 79. Figure 6 shows the eccentric rotated to its opposite position in which the push rod engages the pin 90 and pushes the bolt into a retracted position, where it is free from engagement with the notch on the disc so that the door leaf is free to be swung in either direction.

The bolts may also be used to hold the door leaves in folded relationship, as illustrated in Figure 9. As here shown, the bolts in the two outer leaves after having been retracted to permit the leaves to be folded, are released by turning the eccentrics. The bolts will then project over the lugs 74 which are adjacent thereto in the folded position of the leaves and will exert sufficient pressure against such lugs to maintain the leaves in their folded relationship. The two inner leaves of course will be retained in position between two outer leaves.

While we have illustrated and described in detail one preferred form of our invention, it is to be understood that changes may be made therein and the invention embodied in other structures. We do not, therefore, desire to limit ourselves to the specific construction illustrated, but intend to cover our invention broadly in whatever form its principle may be utilized.

We claim:

1. In a revolving door, a central column, a plurality of leaves pivotally mounted thereon, and means for yieldably retaining the said leaves in radial position comprising bolts mounted near the inner edges of the leaves and extending outwardly, spring means for urging said bolts outwardly, and keeper means fixed with relation to the column and engaged by said bolts.

2. In a revolving door, a central column, discs carried thereby, a plurality of leaves pivotally mounted on said discs, said discs having inwardly facing, notched lugs thereon, said leaves carrying outwardly projecting bolts near their inner edges, and spring means for yieldingly urging said bolts outwardly into engagement with the notched faces of said lugs.

3. In a revolving door, a central column, a supporting disc thereon, leaves pivotally mounted on said disc, bolts mounted near the inner edges of said leaves and lying within the periphery of said disc, spring means normally urging said bolts outwardly, and abutments carried by said disc adapted to be engaged by said bolts, said bolts and abutments constituting means for yieldably locking said leaves in radial position.

4. In a revolving door, a central column, a leaf supporting member fixed thereon and provided with keeper means, leaves pivoted on said supporting member, outwardly acting locking bolts on said leaves for engaging said keeper means and locking said leaves in spaced radial position, springs for yieldably forcing said bolts radially outward into locking position, and means for forcibly retracting said bolts against the spring pressure, said means being manually actuable to retract the bolts prior to displacement of the leaves from radial position.

5. In a revolving door, a central column, a disc thereon, leaves pivotally mounted on said disc, stops on the disc, outwardly acting bolts on the leaves, springs for urging said bolts radially outward into yielding engagement with said stops, push rods mounted in the leaves for pushing said bolts radially inward into retracted position, and

cams mounted in the leaves for operating said push rods.

6. In a revolving door, a supporting column, a disc mounted thereon having a lug near its periphery, said lug having a groove in its inner face, and a door leaf pivotally mounted on said disc, said door leaf having a radially extending recess therein, a bolt adapted to move in said recess and having a projecting wedge shaped face on its outer end adapted to engage in the groove in the lug on the disc, an adjustable plug mounted in the inner end of said recess, and a compression spring mounted between said plug and said bolt and acting normally to urge said bolt outwardly.

7. In a revolving door, a supporting column, a disc mounted thereon having a lug near its periphery, said lug having a groove in its inner face, and a door leaf pivotally mounted on said disc, said door leaf having a radially extending recess therein, a bolt adapted to move in said recess and having a projecting wedge shaped face on its outer end adapted to engage in the groove in the lug on the disc, an adjustable plug mounted in the inner end of said recess, and a compression spring mounted between said plug and said bolt and acting normally to urge said bolt outwardly, a push rod mounted to slide in a recess in the leaf and to engage said bolt, and an eccentric mounted to rotate about an axis transverse to the plane of the leaf and to engage the outer end of said push rod so as to cause said push rod to push said bolt into retracting position, said eccentric having means accessible from the outside of the leaf for rotating the same.

8. In a revolving door, in combination, a rotary central support, leaves foldably mounted on the support, and means holding the leaves to the support and positively guiding them in their folding movement in opposite directions comprising a disc on the support having an annular groove common to all leaves, a socket for each leaf, and outwardly extending cam grooves extending divergently from each socket, and partially merging at their outer ends to form two adjacent sockets, and a pair of guide elements on each leaf for cooperating, respectively, with the annular groove and with the cam grooves.

9. In a revolving door, a central column, discs carried thereby, leaves having bifurcated hangers, the members of which embrace the discs and are pivotally connected therewith, said discs having inwardly faced lugs thereon, said hangers carrying outwardly projecting bolts near the inner ends thereof, spring means for yieldingly urging said bolts outwardly into engagement with the notched faces of said lugs, and yielding wind stops mounted in the outer ends of the disc receiving recesses in the hangers and adapted to contact with the edges of the discs.

10. In a revolving door, a central column, a pair of discs, one fixed near the top and one near the bottom thereof, a plurality of leaves pivotally mounted on said discs, a plurality of inwardly facing keeper means on each disc corresponding with the radial positions of the respective leaves, and outwardly acting locking means mounted within said leaves engaging said keeper means to hold said leaves in radial position with respect to said column and draw the inner edges of said leaves toward said column.

11. In a revolving door, a central column, discs fixed near the top and bottom thereof, tracks in the discs, a plurality of leaves mounted on said discs, said leaves having guide elements cooperating with said tracks to permit movement of said leaves in relation to said column, means for locking said leaves in radial position in relation to said column, said means including keepers on said discs and outwardly acting spring pressed locking means engaging said keepers, said locking means normally urging the inner edges of said leaves in the direction of the column.

12. In a revolving door, a central column, discs fixed thereon, a plurality of leaves pivotally mounted on said discs, said discs having inwardly facing recessed lugs thereon, hard metal blocks in the recesses in said lugs, said blocks having notches formed on the inner exposed faces thereof, said leaves carrying outwardly projecting locking means near their inner edges and spring means for yieldingly urging said locking means outwardly into engagement with said notches.

13. In a revolving door, a central rotary column, leaves mounted thereon and projecting radially therefrom, said column including a central supporting member and a casing enclosing the central supporting member, comprising a pair of extruded sections of similar configuration, each section of the pair having identical complete ribbed portions, partial ribbed portions and inner portions fitting within the complementary partial ribbed portions, said partial ribbed portions having inwardly facing dovetailed grooves, said inner portions having flanges in the outer side thereof, said dovetailed grooves and said flanges being arranged to interlock longitudinally, and recesses between said ribbed portions adapted to receive the inner edges of said leaves.

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