Aug. 13, 1935. E. PEREMI ET AL 2,010,825

REVOLVING DOOR

Filed May 26, 1932 7 Sheets-Sheet 1

Fig. 1.

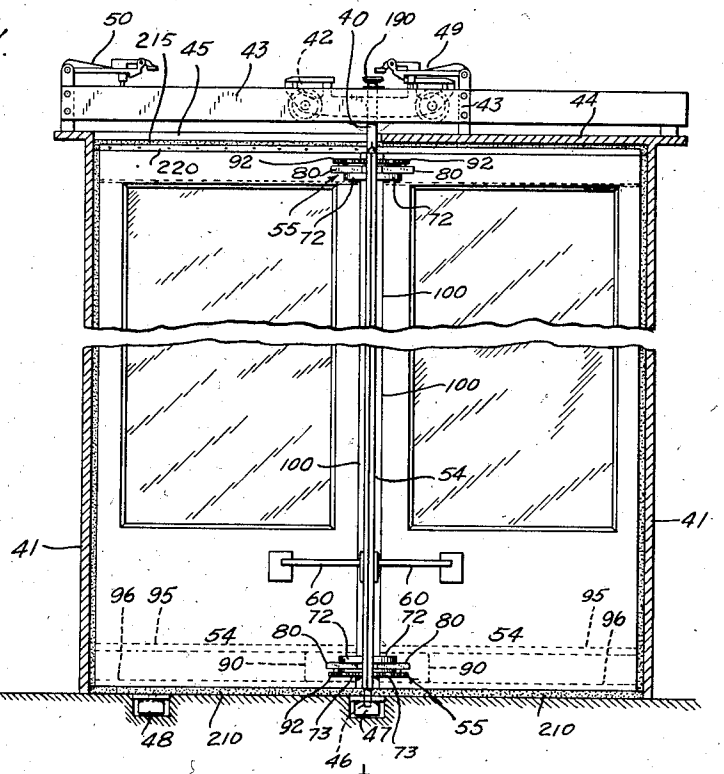
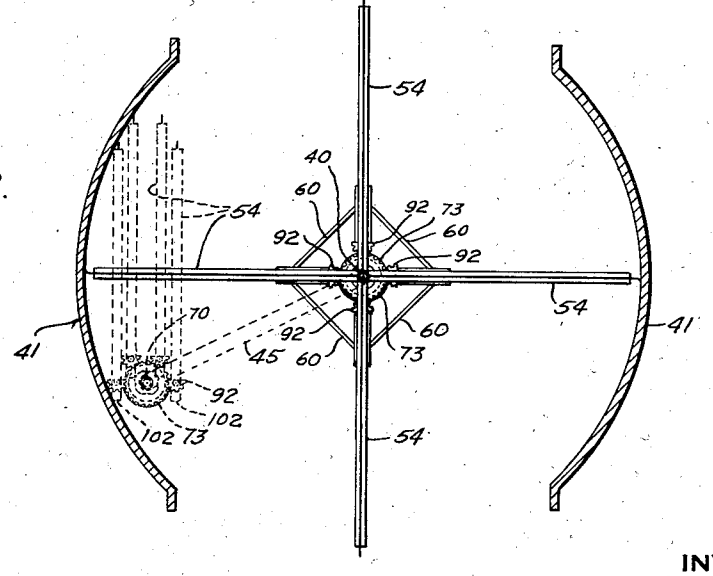


Fig. 2.



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Aug. 13, 1935. E. PEREMI ET AL 2,010,825

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Filed May 26, 1932 7 Sheets-Sheet 2

Fig. 3.

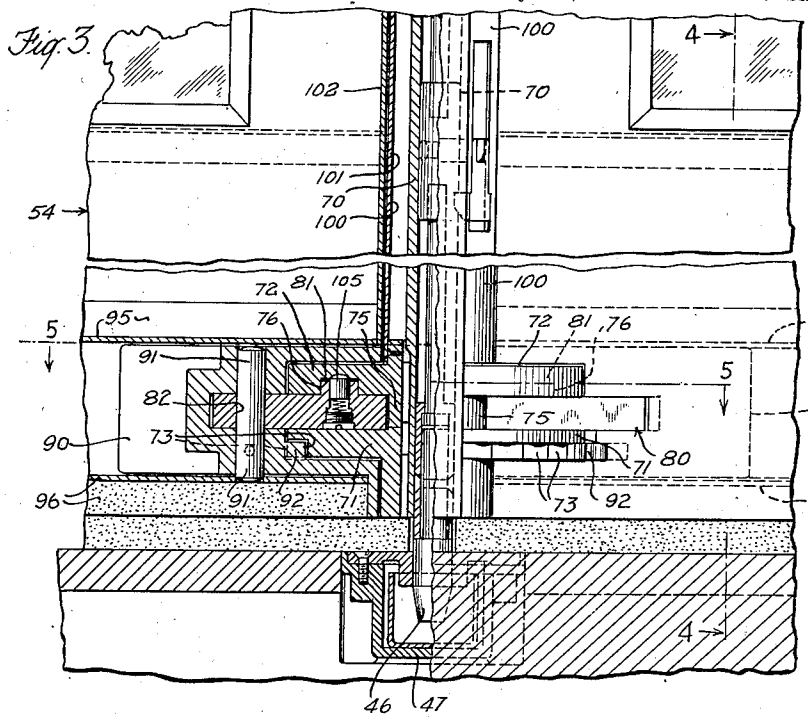
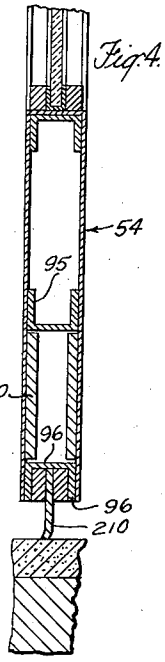


Fig. 4.



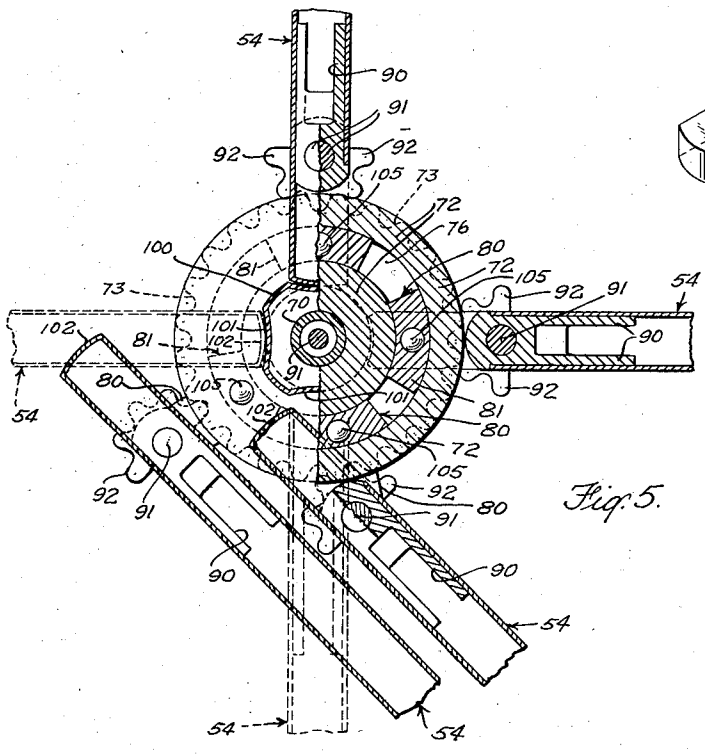


Fig. 5.

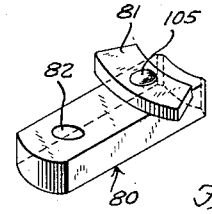


Fig. 6

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Aug. 13, 1935. E. PEREMI ET AL 2,010,825

REVOLVING DOOR

Filed May 26, 1932 7 Sheets-Sheet 3

Fig. 7.

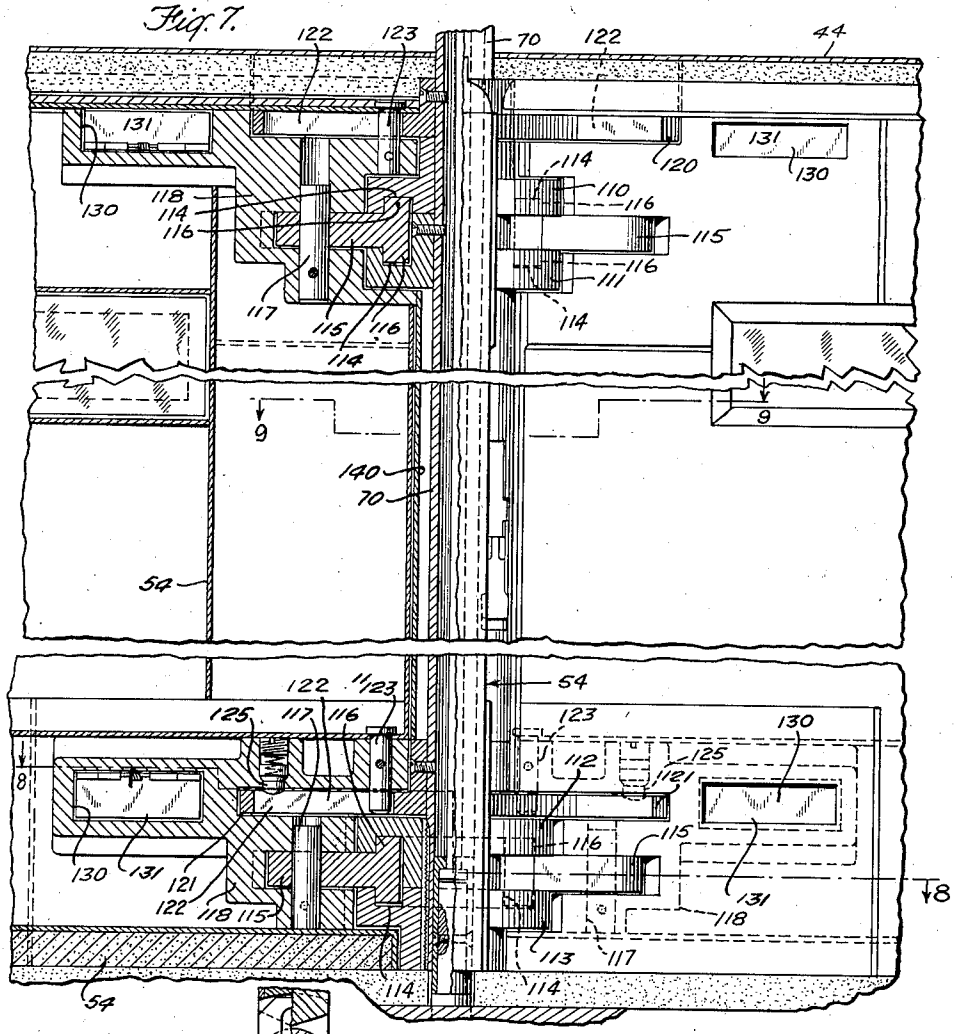


Fig. 8.

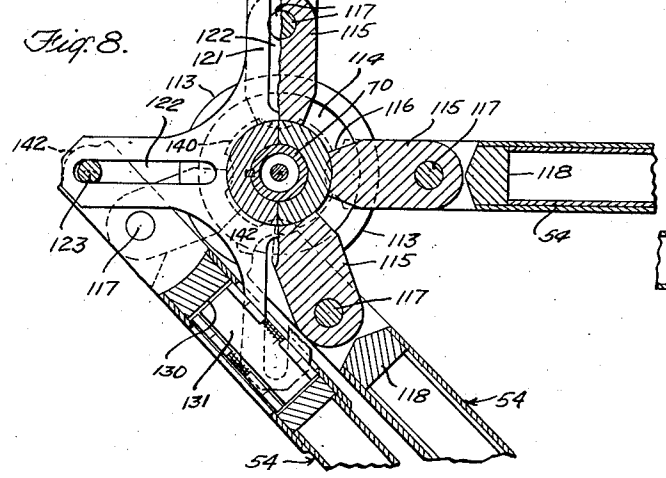
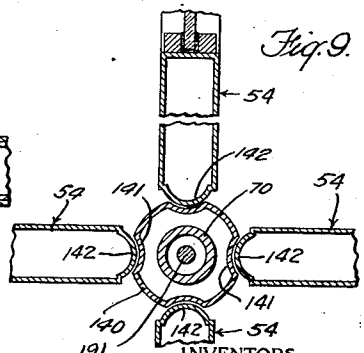


Fig. 9.



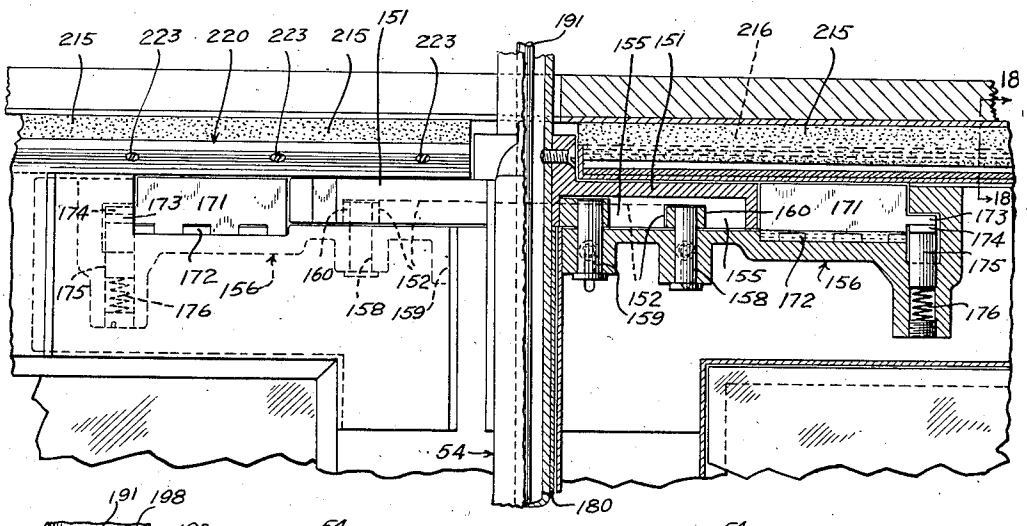
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REVOLVING DOOR

Filed May 26, 1932 7 Sheets-Sheet 4

Fig. 10.



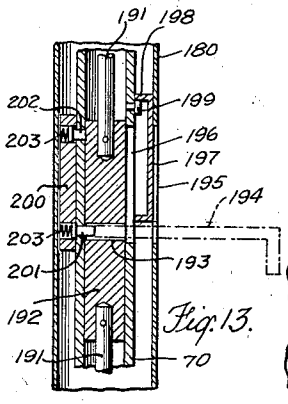


Fig. 13.

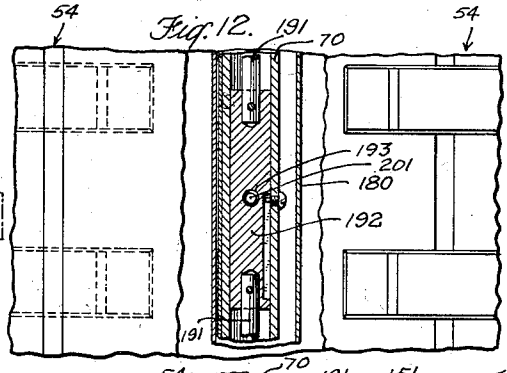


Fig. 12.

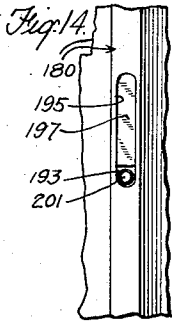


Fig. 14.

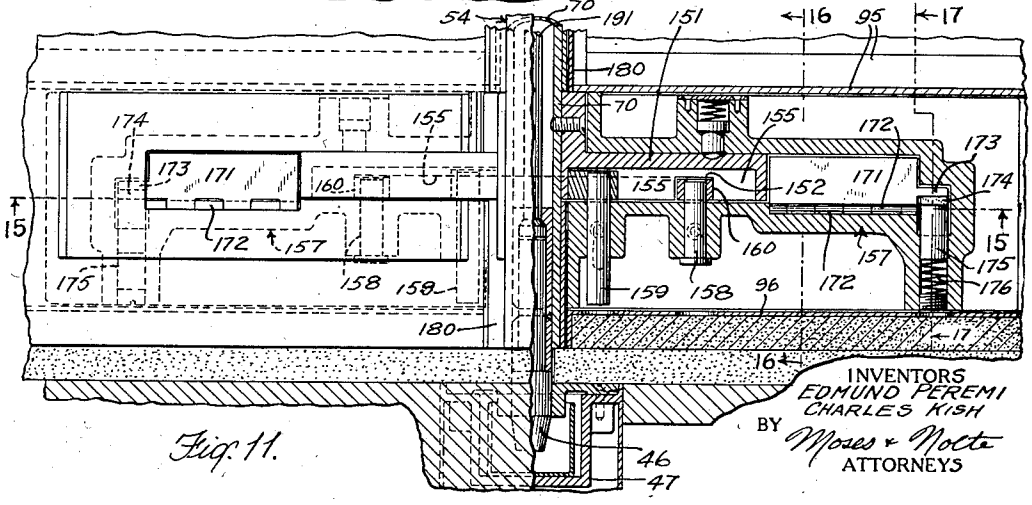


Fig. 11.

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Aug. 13, 1935. E. PEREMI ET AL 2,010,825

REVOLVING DOOR

Filed May 26, 1932 7 Sheets-Sheet 5

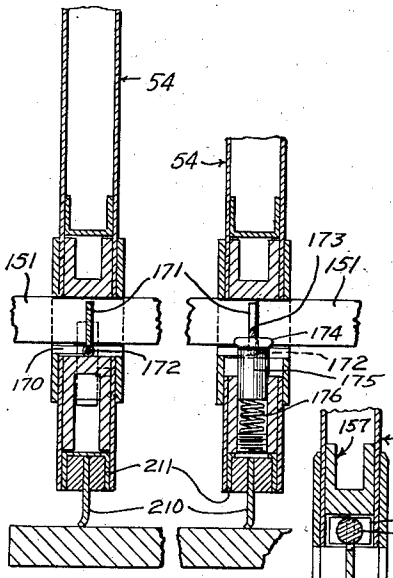


Fig. 16. Fig. 17

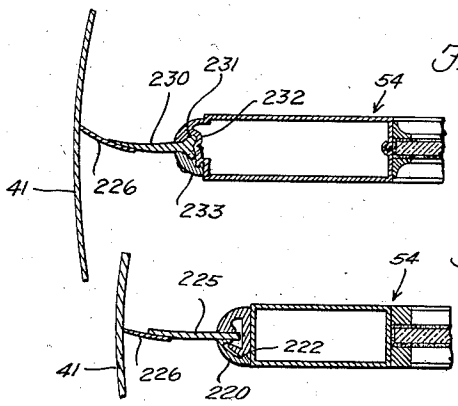


Fig. 20

Fig. 19.

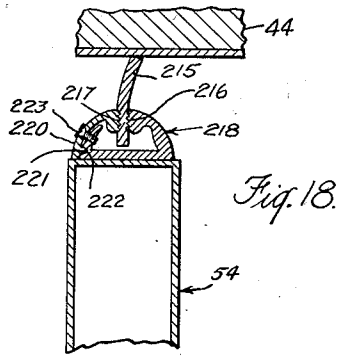


Fig. 18.

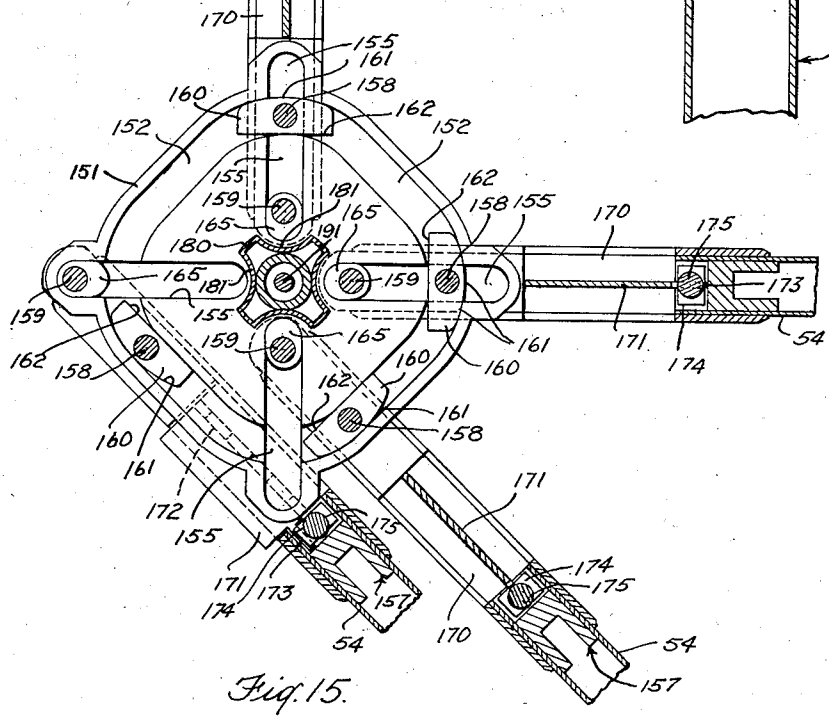


Fig. 15.

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REVOLVING DOOR

Filed May 26, 1932 7 Sheets-Sheet 6

Fig. 21.

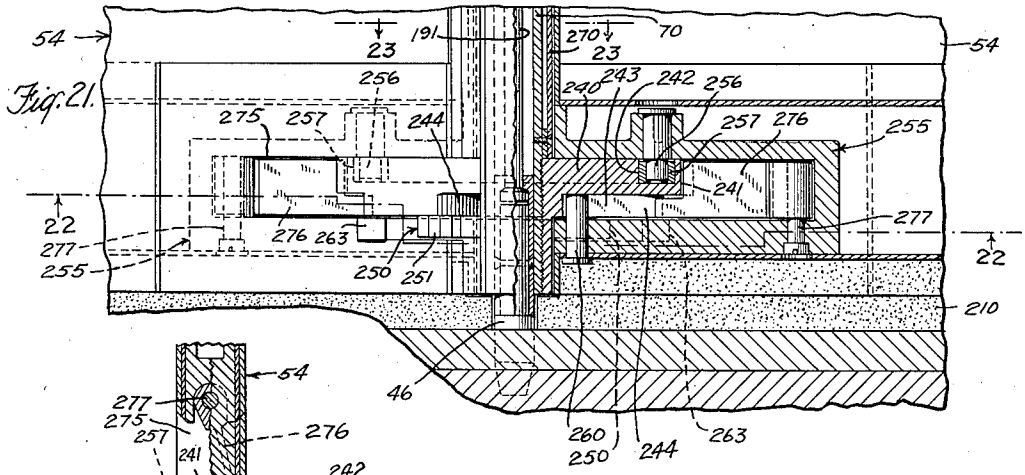


Fig. 22.

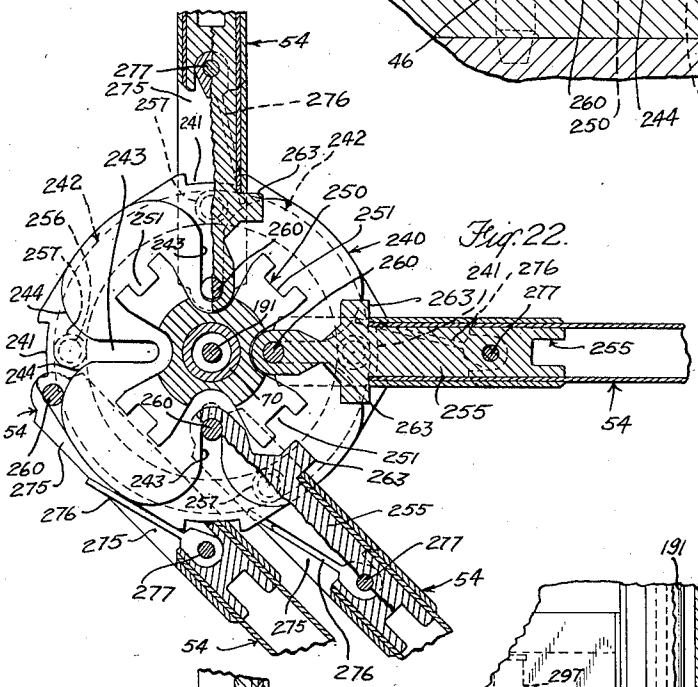


Fig. 23.

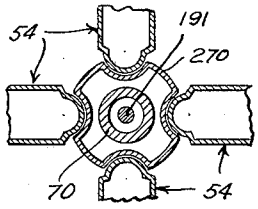


Fig. 24.

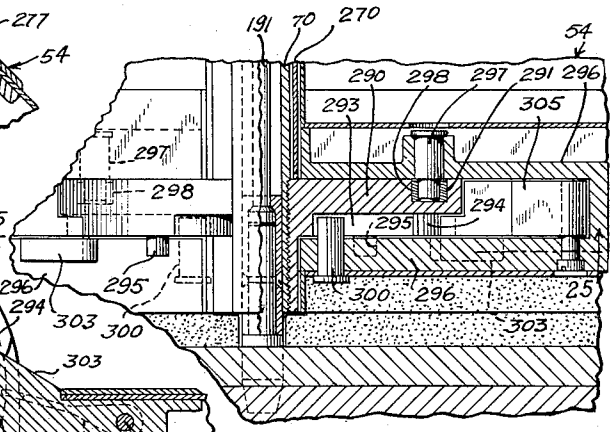
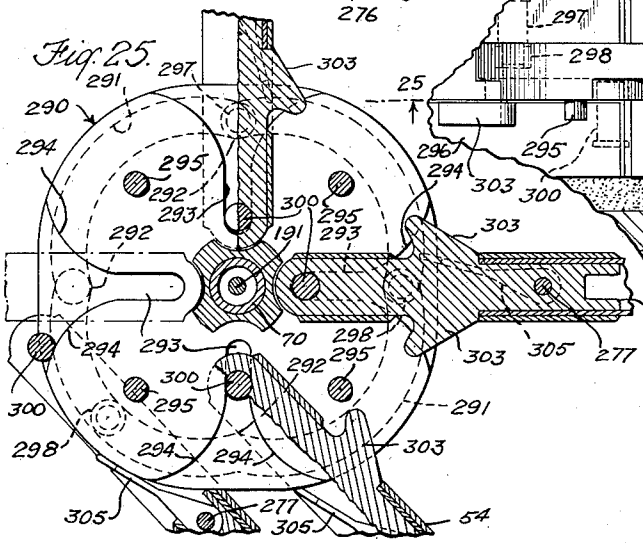


Fig. 25.



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Aug. 13, 1935. E. PEREMI ET AL 2,010,825

REVOLVING DOOR

Filed May 26, 1932 7 Sheets-Sheet 7

Fig. 26.

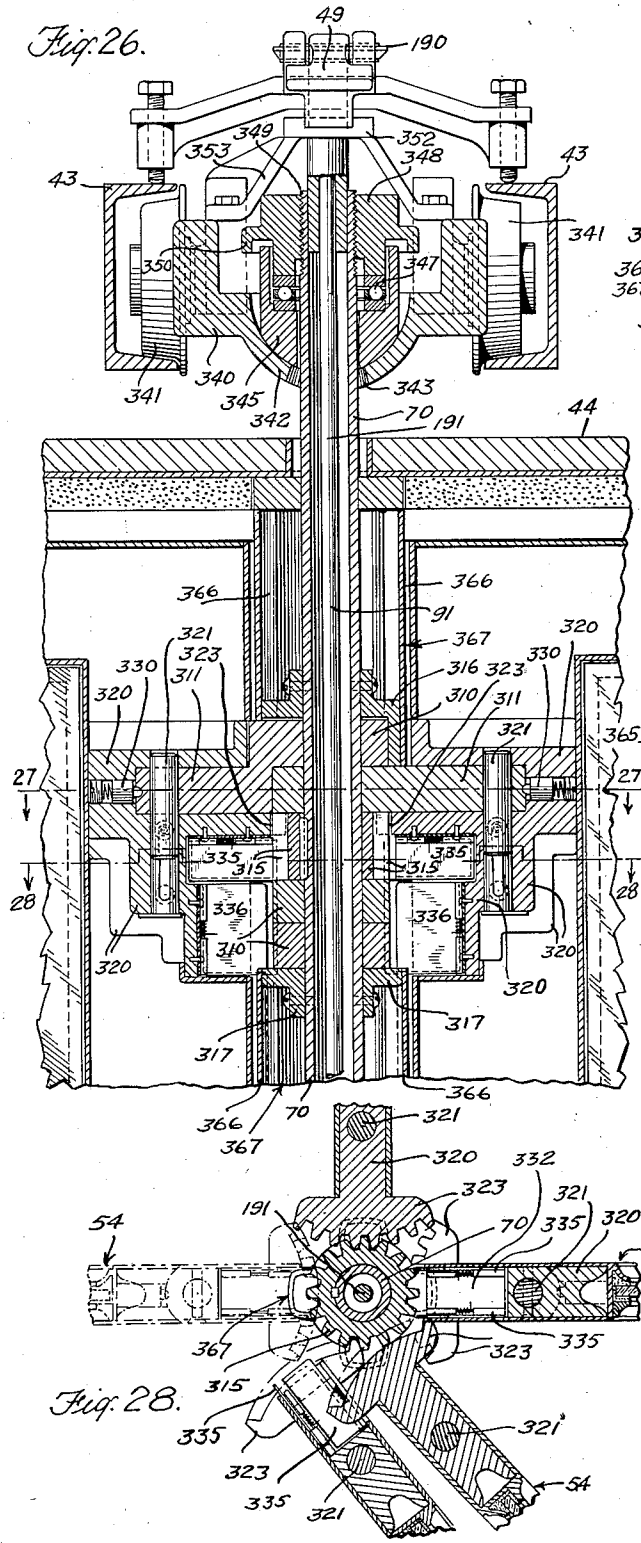


Fig. 27.

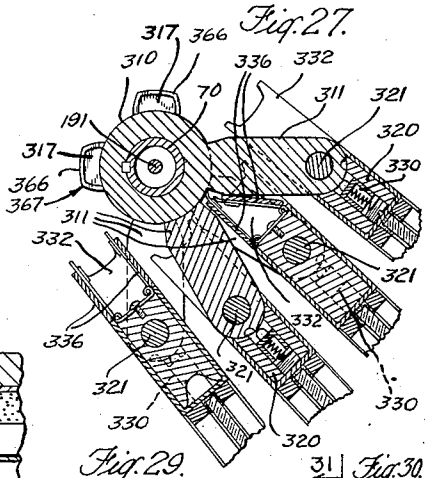


Fig. 29.

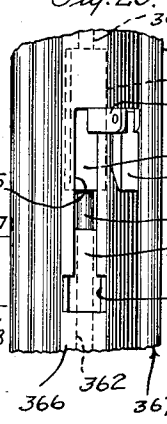


Fig. 30.

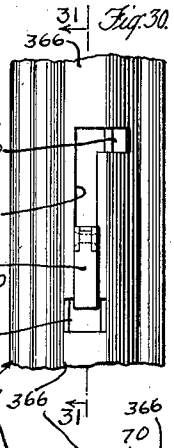
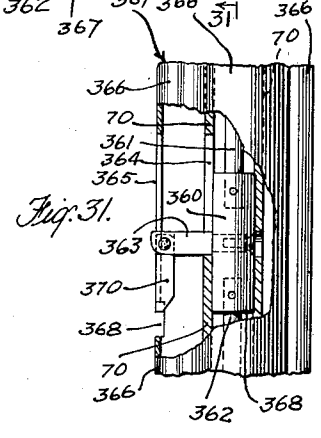


Fig. 31.



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Patented Aug. 13, 1935 2,010,825

UNITED STATES PATENT OFFICE

2,010,825

REVOLVING DOOR

Edmund Peremi, Manhasset, and Charles Kish, Elmhurst, N. Y., assignors to General Bronze Corporation, Long Island City, N. Y., a corporation of New York

Application May 26, 1932, Serial No. 613,602

14 Claims. (Cl. 20—18)

This invention relates to revolving doors. It has for its object the provision of improved constructions for mounting the leaves of the door upon the central column in such manner that the leaves may be readily folded either to permit the door to be moved to one side of its enclosure when not being used, or to permit the leaves to fold or collapse in case of emergency. It is a particular object of the invention to mount leaves in such a way that they will not sag or get out of alignment, either when in radially operative position or when collapsed. Owing to the positive and firm pivotal support of the door leaves, and to the fact that sagging and twisting of the door leaves are prevented when they are being folded, the pivoting of the door leaves is easily accomplished without danger of the leaves becoming jammed. It is also possible to make the door with close clearances between the parts, particularly between the inner vertical edges of the leaves and the door column, without danger of binding between the surfaces at those points. In this way a weather tight door is secured.

Other objects of the invention are to provide improved weather stripping means for the door, to provide an improved trolley construction for supporting the door, and to provide improved operating devices for the central door pivot and trolley latch operating head.

Other objects and advantages of the invention will appear from the description of certain preferred embodiments thereof, chosen to illustrate the principles of the invention.

In the accompanying drawings which illustrate such preferred embodiments:

Figure 1 is a front elevation of a door, showing the door enclosure in section;

Figure 2 is a plan view of the door with the ceiling and parts above omitted, and showing the door enclosure in horizontal section;

Figure 3 is a view partly in elevation and partly in central vertical section illustrating one preferred form of the invention and showing the lower part of the door column, leaves, and lower hinge connections of the leaves to the door column, and showing the bottom pivot of the door and socket for receiving the same.

Figure 4 is a vertical sectional view on line 4—4 of Figure 3 showing the construction of one of the door leaves;

Figure 5 is a horizontal section taken substantially on line 5—5 of Fig. 3 showing two of the door leaves folded;

Figure 6 is a perspective view of one of the leaf supporting blocks illustrated in Figures 3 and 5;

Figure 7 is a view partly in elevation and partly in central vertical section of a modified construction of door, parts being broken away;

Figure 8 is a horizontal sectional view taken substantially on line 8—8 of Figure 7, showing two of the door leaves folded;

Figure 9 is a section on line 9—9 of Figure 7;

Figure 10 is a view partly in elevation and partly in central vertical section of the upper part of another form of door;

Figure 11 is a similar view showing the lower part of the same door;

Figure 12 is a fragmentary view partly in section showing the central part of the same door;

Figure 13 is a vertical sectional view of the central part of the door column shown in Figure 12, the section being at right angles to the section shown in Figure 12;

Figure 14 is a fragmentary view in elevation of the portion of the door column shown in Figures 12 and 13;

Figure 15 is a horizontal sectional view taken on line 15—15 of Figure 11, looking upward, showing two of the door leaves folded;

Figures 16 and 17 are vertical sectional views taken on lines 16—16 and 17—17 respectively of Figure 11;

Figure 18 is a vertical sectional view taken on line 18—18 of Figure 10, on a larger scale;

Figure 19 is a horizontal sectional view of the side portion of a door leaf showing a construction of weather stripping;

Figure 20 is a similar view showing a modified form of weather stripping;

Figure 21 is a view partly in elevation and partly in central vertical section showing the lower part of another modified form of revolving door;

Figure 22 is a horizontal section taken substantially on line 22—22 of Figure 21, looking upward;

Figure 23 is a horizontal sectional view on line 23—23 of Figure 21;

Figure 24 is a view similar to Figure 21 showing another modified construction of door;

Figure 25 is a horizontal sectional view taken substantially on line 25—25 of Figure 24, looking upward, showing two of the door leaves folded;

Figure 26 is a central vertical sectional view showing the upper hinge construction of another modified form of revolving door, the ceiling of the door enclosure being also shown in the sec-

tion and said figure also showing in vertical section a construction of supporting trolley for the door;

Figure 27 is a horizontal sectional view on line 27—27 of Figure 26, showing all the door leaves folded;

Figure 28 is a horizontal sectional view on line 28—28 of Figure 26 showing two of the door leaves folded;

Figures 29 and 30 are fragmentary views in elevation, and Figure 31 is a fragmentary view partly in elevation and partly in vertical section, showing a construction of latch for operating the pivot slide of the door, the sectional part of Figure 31 being a section taken on line 31—31 of Figure 30.

Referring to the drawings in detail, particularly to Figures 1 and 2, revolving doors of the character involved in the present invention comprise a central column 40 which is mounted to rotate about a vertical axis and which is suspended in a suitable manner in the door enclosure 41, and which carries a plurality of door leaves 54. Preferably the column 40 is suspended from a trolley 42 which is mounted to travel on a horizontal track 43 extending across the top of the door enclosure and above the ceiling 44 thereof. The latter is provided with a slot 45 through which the door column passes. At the bottom of the door column is a retractable pivot bolt 46 which is received in a socket 47 located at the center of the floor of the door enclosure, a second socket 48 being preferably provided near the side of the door enclosure to receive the pivot when the door is collapsed and moved to one side. Latches 49 and 50 may advantageously be provided upon the track 43 to secure the trolley at one or the other limit of its movement. Mounted on the column 40 are the door leaves 54, usually four in number, these leaves being attached to the column by suitable hinge mechanisms, preferably located near the upper and lower ends of the leaves, as indicated at 55. While four leaves are illustrated and four leaves are usually used in these doors, a different number of leaves may be utilized if the layout of the building requires. For instance three leaves are sometimes employed, which leaves would be mounted in a manner similar to that described. These hinge mechanisms permit the door leaves to be folded so that the door may be collapsed and moved to one side of the door enclosure as indicated in dotted lines in Figure 2. As will be understood, one or more of the door leaves may be folded, and in some instances the door leaves may be folded two and two, so as to extend in diametrically opposite positions from the central column, in a well understood manner. Suitable means are provided with retaining the door leaves in spaced radial position during operation, such for instance as the chains 60. These chains are preferably releasably secured to the leaves in any suitable manner, for instance in one of the manners shown in our applications for patent, Serial No. 585,270, and Serial No. 592,004. By the use of suitable releasable connections between the door leaves, the latter may either be released manually when it is desired to collapse the door and move it to one side, or such releasable connections will give way upon the application of excessive pressure to opposite leaves of the door, such as may occur in the case of a panic, and thereby permit free passage through both sides of the door.

Referring particularly to the form of door shown in Figures 3 to 6 inclusive, the central column of the door comprises a strong supporting tube 70 which has two pairs of discs 71 and 72 mounted and keyed thereon, the lower pair only being shown in Figure 3. It will be understood that a similar hinge construction to that shown in Figure 3 is mounted near the top of the door. The disc 71 is provided with gear teeth 73 preferably extending part way only across its face. The disc 72 is spaced from the disc 71 by a flange 75 and has in its face nearest to the disc 71 an annular groove or track 76. A plurality of supporting blocks 80 are mounted in the space between the discs 71 and 72, each block having a curved lug 81 thereon, which slides in the groove 76. Each block has a portion projecting beyond the discs in which is a hole 82. A pair of blocks is provided for each leaf of the door, one block being located between the discs of the top hinge 55 of the door and one block being located between the pair of discs of the bottom hinge 55. Each door leaf is provided with hinge fittings 90 which are slotted to receive the blocks 80, and each hinge fitting is pivoted to its block by means of a pivot pin 91. Each hinge fitting is also provided with a gear segment 92, the teeth of which mesh with the gear teeth 73.

Figure 3 shows the bottom hinge fittings, it being understood that the leaves are provided at the top with similar hinge fittings also having gear segments meshing with the teeth on the upper disc similar to 71. Where door leaves of metal construction are utilized, each leaf preferably has near its top and bottom a pair of horizontal frame bars such as the channels 95 and 95 located just far enough apart to receive the hinge fittings between them. This provides a very strong and rigid support for the hinge fittings.

Surrounding the supporting tube 70 of the central column, between the upper and lower hinges, is a sleeve 100, and this sleeve and the adjacent edges of the door leaves are suitably shaped to provide weather proof joints when the leaves are in radial position. As shown, the sleeve is provided with four shallow, concave depressions 101, and the edges of the door leaves are made slightly convex as shown at 102. Owing to the manner of supporting and pivoting the leaves, by which sagging and twisting thereof are prevented, the clearances between the bottoms of the depressions 101 and the edges of the door leaves may be made close without danger of binding. To assist in locating the door leaves in their radial positions, when the leaves are unfolded from collapsed position, each block 80 carries a bullet catch 105 and in the bottom of the groove 76 in the disc 72 four sockets are formed, spaced 90° apart, to receive such catches.

When the leaves are moved from their radial positions to folded positions, as indicated by two of the leaves in Figure 5, it will be seen that the lugs 81 of the blocks 80 slide in the grooves 76 and that the gear segments 92 roll around the teeth in the disc 71. During this operation the leaves pivot about the pins 91. As each leaf has a gear segment near each end, it is constrained to move in a definite path, both ends of the leaf necessarily turning at the same speed so that twisting or tilting of the leaf is not possible, and perfect alignment is secured at all times. Lugs 81 travelling in the grooves 76 form very firm supports for the leaves and they can be folded and unfolded without danger of sagging. The

lugs 81 are preferably made of such length that when the leaves are folded into parallelism the ends of the lugs supporting the two inner leaves will contact, thereby stopping these leaves in parallel positions and assisting in forming a firm support for these leaves when folded.

The general principle of gear segments meshing with gear teeth has been utilized in revolving door construction for many years. As commonly employed, however, the gear segments have been of comparatively large radius with reference to the gears or pinions carried by the central column. One result of this has been that when the four door leaves were folded, the ends of the segments on some of the leaves projected beyond the planes of the adjacent leaves, and it was necessary to cut away portions of the leaves to clear such segments. As a consequence either the doors were not wind proof, or it was necessary to use spring flaps or other expedients for temporarily closing these openings. We have discovered, however, that by using substantially larger gears on the central column, and by making the radius of each segment correspondingly small, it is possible to fold the leaves into parallelism without having the ends of the segments on one leaf reach the plane of an adjacent leaf. In this way no recesses or spring flaps are required in the leaves. If the proportion between the radii of the gears and segments is properly chosen, the outer folded leaves, as represented by the lower left hand leaf in Figure 5, clear both the periphery of the toothed discs 72 and the segments on the adjacent leaves, so that a perfectly plane surfaced, unrecessed leaf can be utilized. To accomplish the desired result, the ratio between the radius of the toothed disc and the radius of each segment should not be less than two to one, and in the construction shown this ratio is three to one, and this ratio most satisfactorily accomplishes the desired result. It will be noted that with a leaf fully folded, the center of the pivot 91 of the folded leaf does not quite reach the diameter of the toothed disc at 45° from the initial position of the leaf, but this does not prevent the leaf from folding into a position parallel to the other folded leaves because the ratio of the gear radii is such that the surface of the leaf will clear the periphery of the toothed disc. The elimination of recesses and spring flaps in the leaves is a valuable feature, as it permits the leaves to present a smoothly finished appearance, avoids the weakening of the leaves with cutouts, avoids moving parts which may get out of order, and reduces cost.

In Figures 7, 8 and 9, a modified construction of door is shown in which the door leaves are pivoted to supporting blocks somewhat similar to the supporting blocks shown in the form of door described above, but in which a pin and slot construction is utilized for controlling the movement of the leaves and keeping them in alignment, in place of the segment and gear construction described. Referring to these figures, 70 is the supporting tube of the door column and to this are fixed discs 110, 111 near the top of the door, and discs 112, 113 near the bottom of the door. Each of the discs has an annular groove or track 114 therein. Mounted to slide in circular paths between the discs are the supporting blocks 115, each of which is provided with a pair of guide lugs 116 which slide in the grooves or tracks 114 in the pairs of discs. The leaves are pivoted to the projecting arm portions of corresponding pairs of supporting blocks by means of pivot pins 117 which are carried in hinge fittings 118 mounted in the leaves. Mounted near the upper and lower ends of the supporting tube 70 are the cross-members 120 and 121, each of which is provided with four radial guide slots 122. Each of the leaves is provided with guide pins 123 arranged to slide in these guide slots and thereby compel the leaves to fold in determinate paths when pivoted about the pivots 117. The pin and slot construction also maintains the top and bottom of each leaf in alignment. The hinge fittings of the leaves are preferably provided with bullet catches 125 which are adapted to engage in the guide slots when the leaves are in radial position. The lugs 116 and the inner ends of the supporting blocks 115 are so shaped that when the leaves are folded into parallel position, the adjacent faces of the blocks and lugs of the inner pair of leaves will come into contact, thereby stopping these leaves in parallel position and assisting in preventing them from sagging or getting out of alignment. In order to permit the leaves to be closely folded, as shown in the lower left hand side of Figure 8, the leaves are recessed as indicated at 130 to receive the ends of the arms of the cross-members. Spring flaps 131 are provided at each side of these recesses and hinged on fittings 118 so as to close the recesses 130 when the leaves are in radial position, and thereby prevent the passage of drafts. The supporting tube 70 is preferably enclosed within a sleeve 140 which is suitably formed to make weather tight joints with the edges of the leaves. As shown in Figure 9, sleeve 140 is provided with the concave recesses 141 which receive the convex edges 142 of the leaves.

In Figures 10 to 17, inclusive, another modified construction of door is shown. 70 is the supporting tube which has fixed near its upper and lower ends discs 151. Each of these discs has in its lower face a circumferential guide groove or track 152, which preferably is of polygonal form with rounded corners. Also formed in the lower face of each disc are four radial guide grooves 155 which intersect the circumferential guide grooves 152. Each of the leaves 54 is provided with upper and lower hinge fittings 156 and 157 respectively and each of these fittings carries two pins 158 and 159. Each of the pins 158 has pivoted on its end a pivot slide or supporting block 160, the outer face 161 of which is curved preferably to a radius equal to the radius of the outer wall of the round cornered portions of the circumferential guide groove or track. The inner face 162 of each block is preferably flat so that the blocks are narrower at the ends than in the center. The blocks are of such form that they will travel around the round cornered polygonal grooves, as clearly shown in Figure 15. When the door leaves are in radial position, the faces of these blocks will seat firmly against the outer walls of the round cornered portions of the circumferential grooves, spanning the grooves 155, as shown at the right hand side of Figure 15. The blocks 160 and pivots 158 thus provide means for supporting the leaves firmly and preventing sagging. Each of the pins 159 carries at its end a guide block 165 which slides in one of the radial guide grooves 155. These blocks 165, sliding in the radial grooves, serve to constrain the leaves to move in definite paths when being closed or opened, and prevent the tops and bottoms of the leaves from getting out of alignment. Blocks 160 are preferably made of such length that the adjacent ends of the blocks on the two inner leaves will come

into contact when the leaves are folded into parallelism, thereby stopping and assisting in supporting these leaves in such parallel position. To permit the leaves to be closely folded, as shown at the left hand side of Figure 15, each of the leaves is provided with recesses 170 to receive the projecting portions of the corresponding discs. Suitable flap means mounted in the hinge fittings are provided for closing these recesses when the door leaves are in radial position, so as to prevent the passage of drafts. As shown in Figures 10, 11, 15, 16 and 17, a single flap member 171 is provided centrally in each recess, such flap member being hinged along its lower edge, as shown at 172, and having at one end a projecting lug 173 which is engaged by the flat head 174 of a plunger 175 mounted in a recess in the hinge fitting, and urged upwardly by a spring 176. When the flap is pushed to one side or the other, by engagement with the edge of the disc 151, as shown in Figure 15, the projection 173 will force down the plunger 175 and upon release of the pressure on the flap, the spring 176 will raise the plunger and return the flap to vertical position.

In the construction above described, the supporting tube 70 of the central door column is enclosed within a sleeve 180 extending between the upper and lower discs 151, the sleeve 180 being of smaller diameter than the column sleeves shown in the modifications described above, and having concave recessed portions 181 depressed therein, the inner surfaces of the bottoms of which contact with the surface of the supporting tube 70, thereby giving added strength and assisting in preventing accidental deformation of the sleeve.

In Figures 12, 13, and 14, a construction for locking the operating device for the central door pivot and for the trolley latches is illustrated, this locking device being applicable to any of the door constructions shown or other similar door constructions. As will be understood, the door has a central pivot 46 at the bottom of the column and a latch operating head 190 at the top of the column (see Fig. 1). These two members are connected by rods 191 with a slide 192 located at a convenient point in the door column. The slide 192 has a hole 193 therein adapted to receive a suitable key or tool 194 (Fig. 13), which may be inserted into the hole through a slot 195 in the sleeve 180 and a slot 196 in the supporting tube 70. A sliding shield 197 is preferably provided for closing all but the lowest part of the slot 195, the shield being mounted to slide between the tube 70 and the sleeve 180 and being limited in its movement by the engagement of a flange 198 on the back of the shield with the head of a screw 199 inserted in the tube 70. Attached to the side of the tube 70 opposite to the slot 196 is a block 200 having two recesses therein, in which are mounted respectively locking pins 201 and 202, each of which is normally urged inwardly by a spring 203. When the slide 192 is in its lower position, as shown in Figure 13, the locking pin 201 will enter the hole 193 and prevent the slide 192 from moving upwardly, thereby positively locking the bottom pivot of the door in its socket. When it is desired to collapse and shift the door to the side of its enclosure, the key 194 is inserted in the hole 193 and pushed against the end of the pin 201, thereby pushing said pin out of the hole 193, and permitting the slide 192 to be moved upwardly by means of the key. When the slide has been moved to its upper position with the pivot and trolley latch disengaged, the hole 193 is opposite to the locking pin 202 and upon the withdrawal of the key 194 this pin will snap into the hole and retain the slide in raised position until the key is again inserted.

Figures 16 to 20 inclusive show a suitable construction of weather strip which may be used with any of the revolving doors shown, or with other revolving door constructions. Figures 16 and 17 show the bottom strip for the door, comprising a flexible strip 210 of felt, rubber or the like mounted in the bottom channel of a door leaf by means of the clamping strips 211 which may be of wood, metal, or other suitable material. Figure 18 shows a construction of weather strip at the top of the door leaf, comprising a strip 215 of felt, rubber or other suitable flexible material clamped between a pair of serrated jaws 216 and 217. The jaw 216 is formed on the channel member 218, fixed to the top rail of the door leaf, while the jaw 217 is formed on a curved strip member 220 which is removably attached to the opposite flange of the channel member 218 from that which carries the fixed jaw 216. The removable jaw strip 220 has a rib 221 on its inner edge which bears in a groove 222 in the side of the channel member 218, and clamping screws 223 are provided by which the strip 220 may be drawn towards the flange of the channel member 218 and thereby firmly clamp the weather strip between the serrated jaws. This construction holds the weather strip very firmly and at the same time permits its adjustment in case of wear or replacement. Figure 19 shows a similar construction applied to the weather strip at the side of the door leaf which engages the inner surface of the door enclosure 41. The weather strip at the side of the door leaf preferably comprises a tapered rubber strip 225 which has attached to its edge a wear strip 226 of felt, composition rubber or the like.

Figure 20 shows a modified construction of weather strip at the side of the door leaf in which a tapered composition rubber, felt or the like, weather strip 230 is employed which carries a wear strip 226 and which has an enlarged base 231 which is received in a groove 232 formed in the edge of the door leaf. One wall 233 of the groove is made removable so as to permit insertion and removal of the weather strip.

In Figures 21, 22 and 23 another form of hinge construction for securing the door leaves to the central door column is illustrated. As shown in these figures, the supporting tube 70 of the door column has fixed to its lower end a disc 240, it being understood that a similar disc, not shown, is secured to the upper end of the tube. The disc 240 is of somewhat polygonal outline and has at each of the corners a vertical notch 241. In the top face of the disc 240 is an annular groove or track 242 and in the lower face of the disc are cut four radial grooves 243, the walls of which merge into the diverging curved surfaces 244, as shown in Figure 22, so as to form what may be described as flaring mouths for the grooves. Mounted below the disc 242 and fixed thereto is a cross-member 250 having four short arms, in the end of each of which is a notch 251. The door leaves 54 are each provided with a lower hinge fitting 255 and with a similar upper hinge fitting not shown. Mounted in each hinge fitting is a pin 256 which carries a guide roller 257 travelling in the annular guide groove or track 242. Each hinge fitting also carries a pin 260 which is adapted to travel in one of the radial grooves 243 and which follows one of the diverging curved surfaces 244 when the door leaf is folded, as shown at the left hand side of

Figure 22. The hinge fittings are also provided with lugs 263 adapted to engage with the proper notches 251 when the leaves are fully collapsed, so as to support the leaves against sagging in that position. The adjacent lugs 263 on the hinge fittings of the inner pair of leaves are adapted to contact when the leaves are folded into parallel position so as to stop the leaves in that position. Each leaf is firmly supported and caused to move in a constrained path, by the engagement of rollers 257 on the pins 256 at the top and bottom of each leaf, in the corresponding annular grooves in the discs and by the engagement of the pins 260 in the radial grooves 243. When the leaves are fully folded one of the lugs 263 on each of the outer leaves, the pins 260 of which have left the radial grooves 243, will engage with one of the notches 251 and thereby firmly support such leaves against sagging. As in the forms of door described above, the supporting tube 70 of the door is enclosed within a suitable sleeve 270, as shown in Figure 23. In order to enable the leaves to fold closely they are slotted as indicated at 275, so as to receive the edges of the discs 240. To close the outer part of such slots when the leaves are in radial position, spring flaps 276 are provided which are pivoted on vertical pivots 277. When the leaves are in radial position, the ends of these flaps extend into the grooves 241.

Another form of door hinge construction is shown in Figures 24 and 25 which is similar in many respects to the construction shown in Figures 21 to 23. In this construction upper and lower discs are fixed to the supporting tube 70, the lower disc only being shown at 290. Each of these discs has a guide groove or track 291 in its upper face, the groove being formed of four arc shaped sections as indicated in Figure 25, adjacent sections joining in the cusp-like intersections 292.

In the lower face of the disc are formed radial grooves 293, the walls of which merge into outwardly diverging walls 294 so as to form flaring mouths for the grooves. Fixed in the lower face of the disc are four bearing pins 295. The door leaves are provided with hinge fittings 296 which carry pins 297 on the ends of which are mounted rollers 298 which travel in the circumferential guide grooves 291. The hinge fittings also carry pins 300 which travel in the radial grooves 293, and which, when the door leaves are completely folded as shown at the lower left side of Figure 25, travel on the curved surfaces 294. The hinge fittings 296 are also provided with lugs 303 adapted to engage with the proper pins 295 when the door leaves are fully collapsed so as to support the leaves against sagging when in that position. The adjacent lugs 303 on the inner pair of leaves are adapted to contact when the leaves are folded into parallelism, and thereby stop the leaves in that position. To prevent leakage through the slots in the leaves which are formed to clear the edges of the discs 290, spring flaps 305 are provided.

Referring to Figures 26 to 28 inclusive, these show another modified form of revolving door in which the supporting tube 70 has rotatably mounted upon it near its upper end, a set of four hinge arms, one of which is pivoted to each door leaf. A similar set of hinge arms (not shown) is mounted on the lower part of the tube 70. These hinge arms comprise body rings 310 and arm portions 311 and are arranged in pairs, one arm portion of each said pairs being offset from its body ring so as to lie in the same plane as the arm projecting from the body ring in the other member of the pair. The two pairs of arms are spaced from one another and between them is fixed to the tube 70 a pinion 315. The body rings on the arms are retained against longitudinal movement in any suitable manner as by collars 316 and 317 fixed to the tube 70, which collars also securely hold in position the sleeve sections 307. The door leaves are provided with hinge fittings at 320 which carry pivot pins 321 passing through holes in the ends of their respective hinge arms. Each of the hinge fittings 320 is also provided with a gear segment 323, the segments on two opposite leaves being located in one plane and the segments on the two leaves at right angles thereto being located in a different plane, but all of said segments being constantly in mesh with the pinion 315. For locating the leaves in alinement with the hinge arm when opening the door, that is, moving its leaves into radial position, bullet catches 330 may be provided in each hinge fitting, adapted to engage in notches in the ends of corresponding hinge arms. The hinge fittings have recesses 332 therein to permit the leaves to fold and clear the hinge arms of adjacent leaves, as shown in Figure 27, and also to clear the ends of the segments 323, as shown in Figure 28. Spring flaps are provided for normally closing the openings to these recesses, two pairs of flaps being shown for each recess. These two pairs comprise horizontal flaps 335 which are adapted to be moved out of the way by engagement with the ends of segments 323, while vertically hinged flaps 336 are engaged and moved out of the way by the pivot arms.

In Figure 26 an improved trolley construction is illustrated which is applicable to any of the forms of revolving door described or other similar doors. This construction comprises a trolley body 340 mounted on wheels 341 which run on the tracks 43. In the center of the trolley body is a spherical cup 342 with an opening 343 in the bottom, through which the supporting tube 70 projects. Mounted to slide in the spherical cup is a bearing block 345 having a spherical bottom surface fitting the spherical cup and having a recess at the top thereof which receives an antifriction bearing 347. Mounted on the upper end of the tube 70 is a block 348 which is preferably adjustably secured to the tube 70 by suitable means such as the screw thread 349. The block 348 preferably has a skirt 350, which projects over the upper edge of the block 345 so as to prevent dust from getting into the bearing. A latch strike plate 352 is mounted on the trolley by means of supporting brackets 353 and engages with one or the other of the pivoted latching devices 49 or 50 shown in Figure 1. The construction of these latches is more fully described and claimed in our application, Serial No. 585,270, filed January 7, 1932.

Figures 29, 30 and 31 illustrate an improved bolt construction which may be utilized for operating the slide 360 to which are connected the rods 361 and 362 which operate the latch releasing head and bottom pivot for the door. The slide operating devices comprise a pin 363 fixed in the slide 360 and passing through a slot 364 in the tube 70, and a slot 365 in the outer face of one of the vertical ribs 366 of the sleeve 367 which encloses the tube 70. At the bottom of the slot 365 is an enlargement 368 forming a finger recess. Pivoted to the end of the pin 363 is an arm 370. When the inner edge of the door leaf which is adapted to engage with the rib 366, is

moved to its radial position, it will seat against this rib and close and conceal the slot 365 and the folded down slide operating arm 370. When this door leaf is swung to one side, however, the arm may be moved outwardly, whereupon it may be utilized to lift the slide and the operating rods connected thereto. At the upper end of the slot 365 is an offset portion 380 and the slide may be rotated slightly so that the pin 363 will engage with such offset portion and thereby hold the slide raised.

While we have illustrated and described in detail certain preferred forms 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 constructions 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 supporting column, a plurality of door leaves, a disc mounted on the column and having a circumferential track therein, supporting members for the leaves including blocks having sliding non-rotative engagement in said track, and outwardly extending arms rigid with said blocks and having pivotal connections with the respective leaves outside said track, and means for constraining said leaves to move in predetermined paths when folded.

2. In a revolving door, a central supporting column, a plurality of door leaves, discs mounted on the column and having circumferential tracks therein, supporting members for said leaves including elongated block portions shaped to slide without rotating in said tracks, pivots connecting said leaves with said supporting members outside the circumferences of said tracks, and means on the central support disposed wholly within the paths of said pivots for constraining the leaves to move in predetermined paths when moved about said pivots.

3. In a revolving door, a central supporting column, a plurality of door leaves, discs mounted on said column having circumferential tracks therein, supporting arms for the leaves having block portions sliding in said tracks and arm portions projecting radially outward beyond said tracks, and pivots connecting said leaves with said projecting arm portions at points outside of said tracks.

4. In a revolving door, a central supporting column, a plurality of door leaves, discs mounted on said column having circumferential tracks therein, supporting arms for the leaves having block portions sliding in said tracks and arm portions projecting radially outward beyond the peripheries of said discs, and pivots connecting said leaves with said projecting arm portions at points outside of the peripheries of said discs.

5. In a revolving door, a central supporting column, a plurality of door leaves, upper and lower pairs of discs mounted on said column, leaf supporting arms mounted between each pair of discs and projecting beyond the peripheries thereof, at least one disc of each pair having a circumferential track in that face thereof nearest to the companion disc, each of said supporting arms having a portion sliding in said track, and pivots connecting the projecting portions of said supporting arms with the respective leaves.

6. In a revolving door, a central supporting column, a plurality of door leaves, upper and lower pairs of discs mounted on said column, leaf supporting arms mounted between each pair of discs and projecting beyond the peripheries thereof, at least one disc of each pair having a circumferential track in that face thereof nearest to the companion disc, each of said supporting arms having a portion sliding in said track, and pivots connecting the projecting portions of said supporting arms with the respective leaves, at least one of each of said pairs of discs having gear teeth thereon, and gear segments on each leaf meshing with said gear teeth.

7. In a revolving door, a central supporting column, a plurality of door leaves, upper and lower pairs of discs mounted on said column, leaf supporting arms mounted between each pair of discs and projecting beyond the peripheries thereof, at least one disc of each pair having a circumferential track in that face thereof nearest to the companion disc, each of said supporting arms having a portion sliding in said track, pivots connecting the projecting portions of said supporting arms with the respective leaves, at least one of each of said pairs of discs having gear teeth thereon, and gear segments on each leaf meshing with said gear teeth, the radii of the toothed portions of said discs being not less than twice the radii of the gear segments of the leaves.

8. In a revolving door, a central supporting column, a plurality of door leaves, upper and lower pairs of discs mounted on said column, leaf supporting arms mounted between each pair of discs and projecting beyond the peripheres thereof, at least one disc of each pair having a circumferential track in that face thereof nearest to the companion disc, each of said supporting arms having a portion sliding in said track, pivots connecting the projecting portions of said supporting arms with the respective leaves, at least one of each of said pairs of discs having gear teeth thereon, and gear segments on each leaf meshing with said gear teeth, the ratio of the radii of the toothed portions of said discs to the radii of said gear segments being such that the leaves may be folded into parallelism without contact between the inner faces of the two outer door leaves and the ends of the teeth on either the discs or gear segments of the adjacent door leaves, and without interference between the gear segments on the inner adjacent leaves.

9. In a revolving door, a central supporting column, a plurality of door leaves, means for pivotally supporting each leaf so that it may have pivotal movement about an axis lying between the side planes of the leaf and parallel to the column axis and so that it may also have pivotal movement about the axis of said central column, and cooperating means controlling the relations of the movements of the leaves about said axes, comprising a toothed disc fixed to said column and common to all the leaves, and a gear segment fixed on each leaf concentric with the outer pivot thereof and outside said toothed disc for meshing with said toothed disc, the radius of said toothed disc being not less than twice the radius of one of said segments.

10. In a revolving door, a central supporting column, a plurality of door leaves, means for pivotally supporting each leaf so that it may have pivotal movement about an axis lying between the side planes of the leaf and parallel to the column axis and so that it may also have pivotal movement about the axis of said central column, and cooperating means controlling the relations of the movements of the leaves about said axes,

comprising a toothed disc fixed to said column and common to all the leaves, and a gear segment fixed on each leaf and meshing with said toothed disc, the radius of said toothed disc being substantially three times the radius of one of said segments.

11. In a revolving door, a central supporting column, a plurality of door leaves, toothed discs mounted on said column, supporting arms movably supported from said column so as to have limited rotative movement about said column, pivots connecting said leaves to said supporting arms, and gear segments carried by said leaves and meshing with said toothed discs, the axes of said gear segments coinciding with the axis of the pivots of the respective leaves and the pitch diameters of the segments being greater than the thickness of the leaves the ratio of the radii of said toothed discs to the radii of said gear segments being such that when the leaves are folded into substantial parallelism the inner planes of the two outer leaves will clear the ends of the teeth on the toothed discs and on the segments on the adjacent door leaves, whereby no recessing of the leaves is required to clear such teeth when the leaves are folded.

12. In revolving door construction, a central supporting column, a plurality of leaves, hinge members for all of the leaves carried by said column in a common plane perpendicular to the column, each leaf being pivotally connected with one of the hinge members, and opposed guide members fixed on the central support and providing opposed, parallel faces at opposite sides of the plane of the hinge members for supporting and guiding the hinge members in said plane, one of said guide members being recessed to interfit with portions of all the hinge members to control movements of the latter in said plane.

13. In a revolving door, a central supporting column, a plurality of door leaves, upper and lower pairs of discs mounted on said column, leaf supporting arms mounted between each pair of discs and projecting beyond the peripheries thereof, at least one disc of each pair having a circumferential track in that face thereof nearest to the companion disc, each of said supporting arms having a portion sliding in one of said tracks, pivots connecting the projecting portions of said supporting arms with the respective leaves at points spaced from the inner edges of said leaves, cross-arm members fixed to said supporting column, said members having radial guide slots therein, and guide pins carried by said leaves near the inner edges thereof and arranged to slide in said radial slots.

14. In a revolving door, a central supporting column, a plurality of door leaves, discs mounted on the column having circumferential tracks therein, supporting members for said leaves including block portions shaped to slide without rotating in said tracks, the block portions attached to a pair of adjacent leaves being adapted to contact when said leaves are folded in parallelism, pivots connecting said leaves with said supporting members, and means for constraining the leaves to move in predetermined paths when moved about said pivots.

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