Feb. 20, 1934. E. PEREMI ET AL 1,947,733

GOVERNOR FOR REVOLVING DOORS

Filed Sept. 17, 1932 4 Sheets-Sheet 1

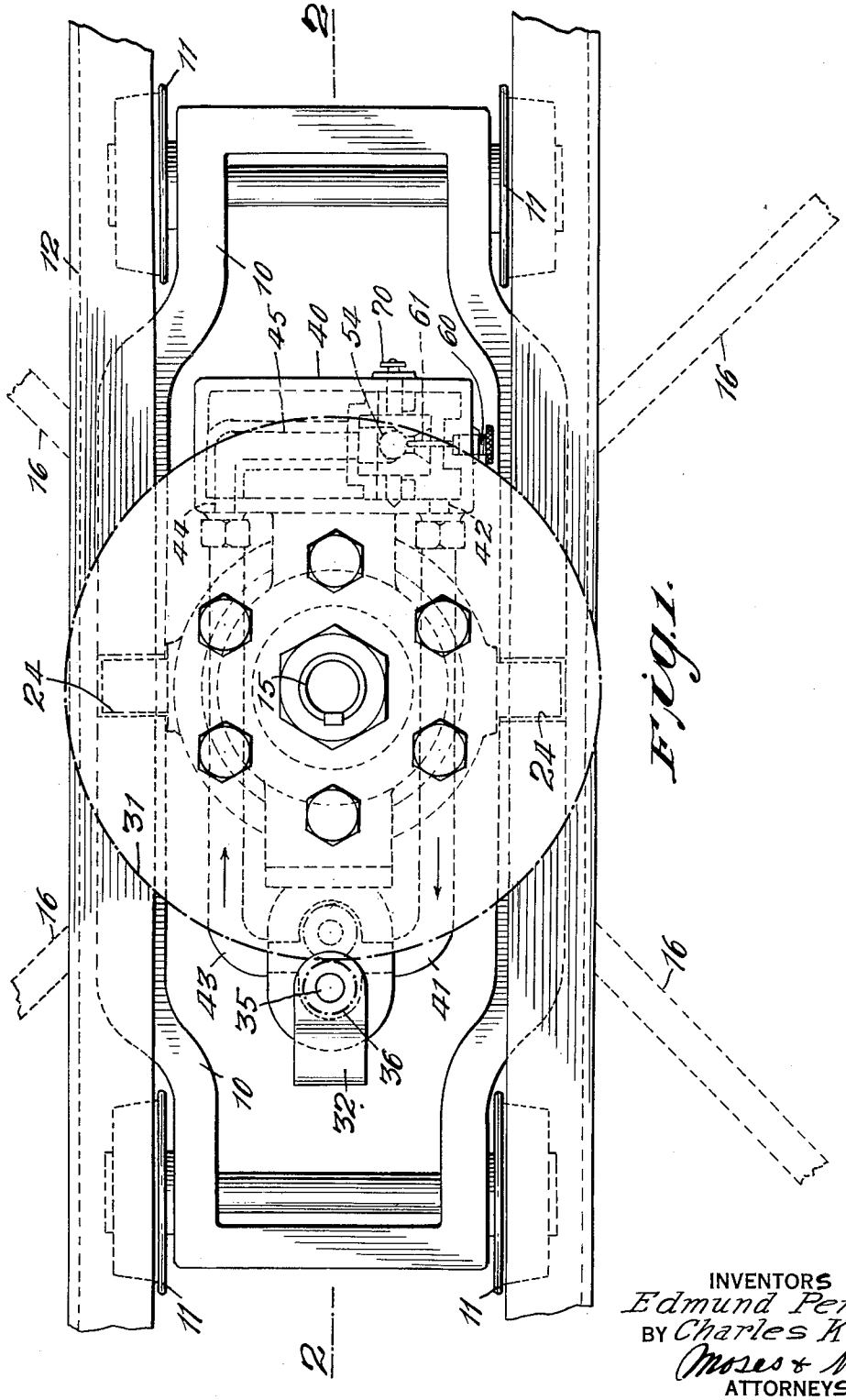



Fig. 1.

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Filed Sept. 17, 1932 4 Sheets-Sheet 2

Fig. 2.

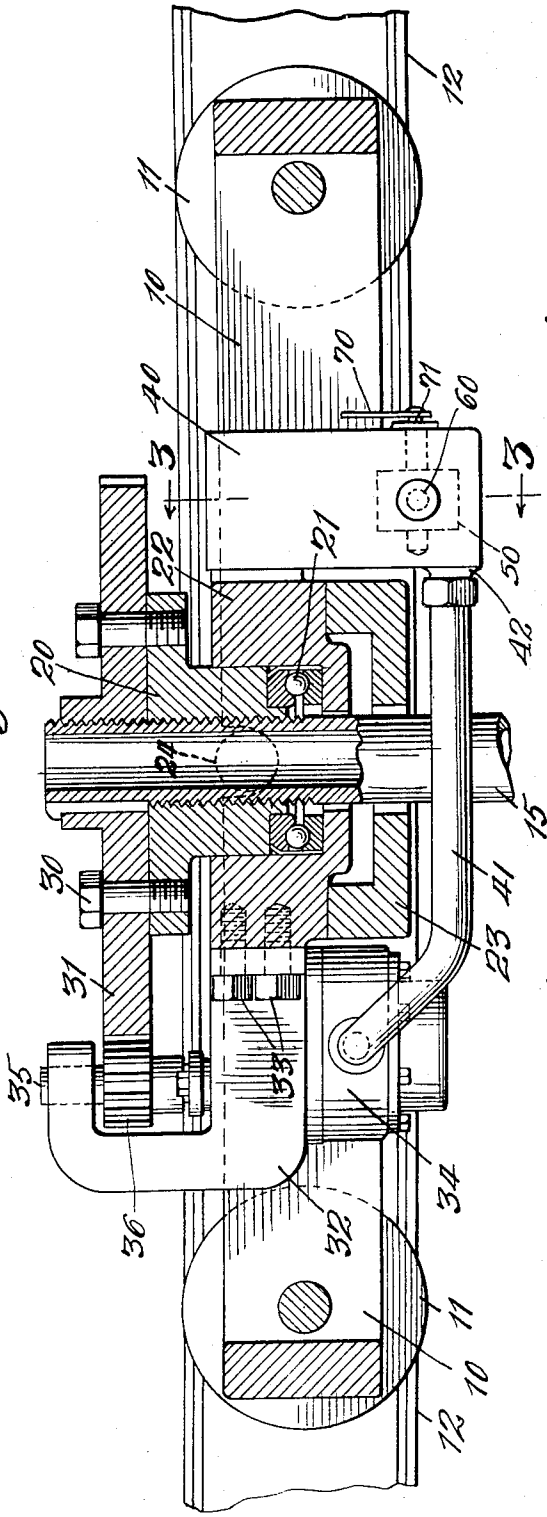



Fig. 4.

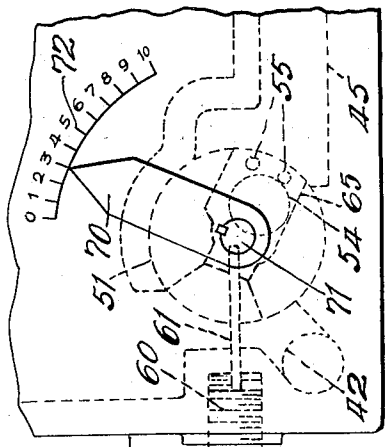
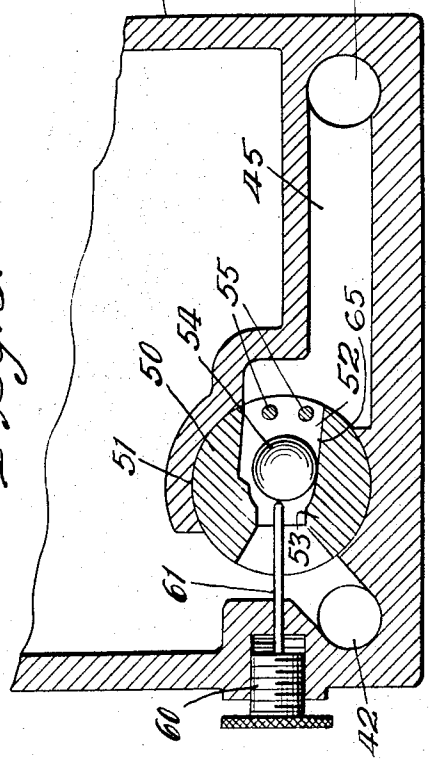



Fig. 3.




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GOVERNOR FOR REVOLVING DOORS

Filed Sept. 17, 1932 4 Sheets-Sheet 3

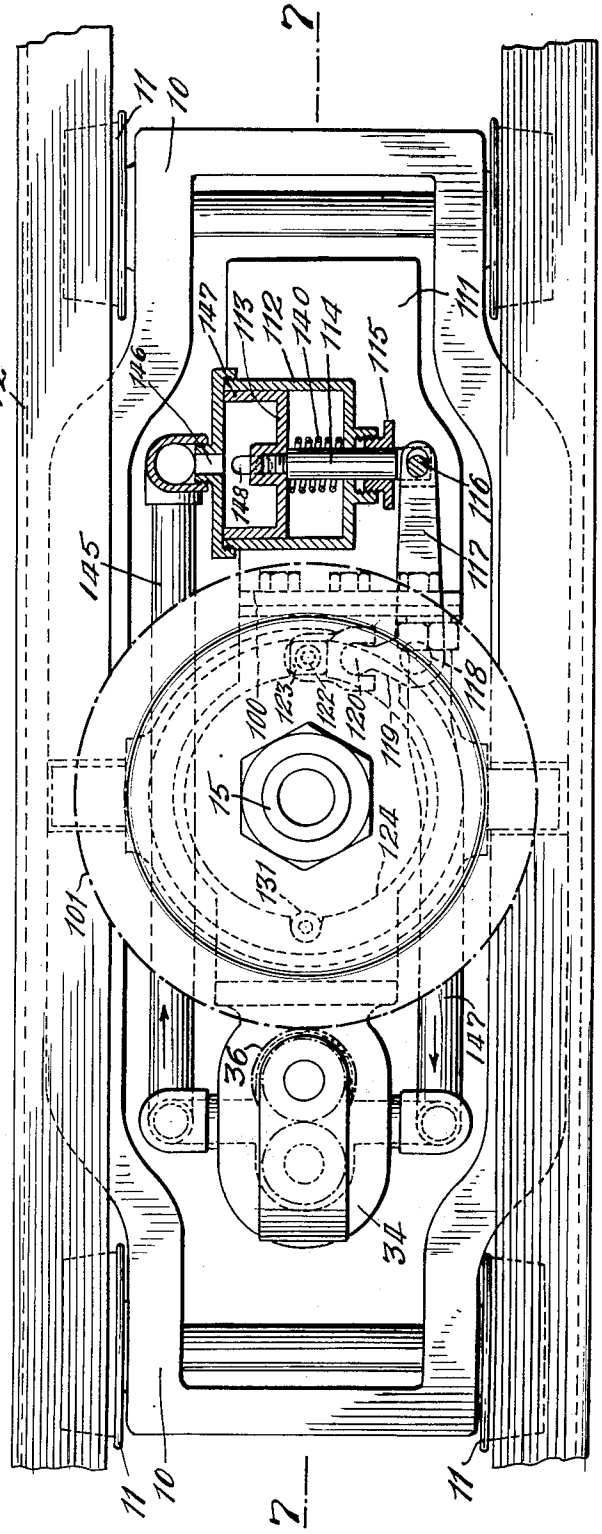



Fig. 5.

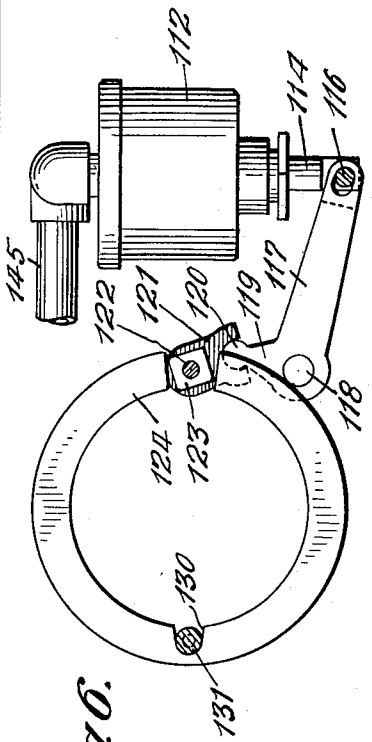



Fig. 6.

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Filed Sept. 17, 1932 4 Sheets-Sheet 4

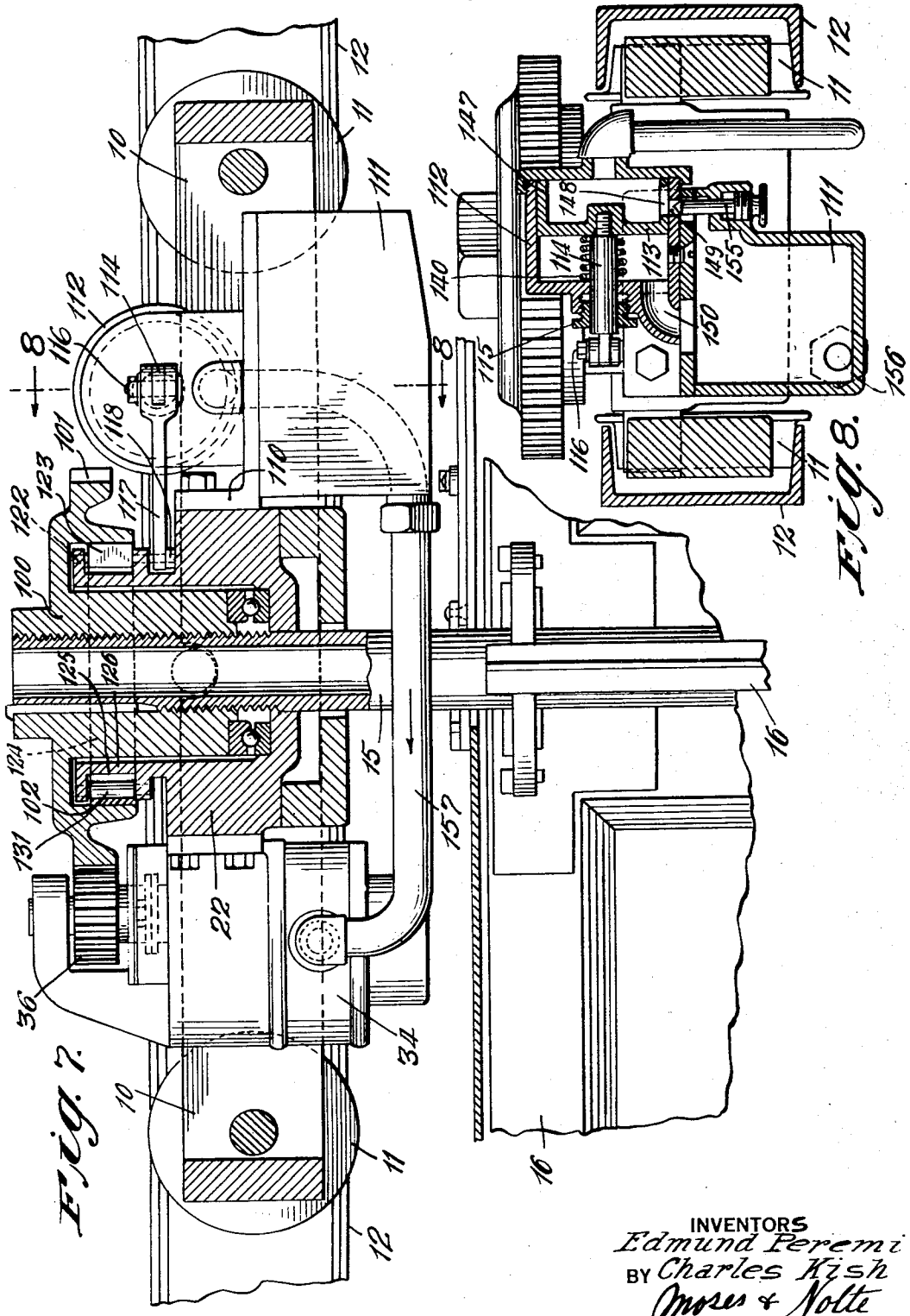



Fig. 7.

Fig. 8.

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# UNITED STATES PATENT OFFICE

1,947,733

## GOVERNOR FOR REVOLVING DOORS

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Serial No. 633,585

13 Claims. (Cl. 20—18)

This invention relates to revolving doors, and particularly to governors or speed controlling means therefor adapted to limit the speed with which the revolving door can be turned and to prevent spinning thereof. Means are provided by which the maximum permissible speed can be regulated to meet the conditions of use.

The object of the invention is to provide improved means of this character in which a fluid circulation set up by the revolution of the door is utilized as the controlling means either directly or through the application of a friction brake mechanism.

In the accompanying drawings, which show certain preferred embodiments of the invention as illustrative of the principle thereof:

Figure 1 is a plan view of a door trolley showing one form of the invention applied thereto;

Figure 2 is a view in vertical longitudinal section of the mechanism shown in Figure 1, taken on line 2—2 in said figure, parts being shown in side elevation;

Figure 3 is a detail vertical transverse section on line 3—3 of Figure 2, showing the lower part of the oil reservoir and the control valve;

Figure 4 is a fragmentary view in end elevation showing a part of the oil reservoir;

Figure 5 is a plan view of a door trolley illustrating a modified form of the invention applied thereto, parts being shown in horizontal section;

Figure 6 is a diagrammatic plan view showing the friction brake and connections for operating the same;

Figure 7 is a vertical longitudinal sectional view on line 7—7 of Figure 5, parts being shown in elevation; and

Figure 8 is a vertical transverse sectional view on line 8—8 of Figure 7.

Referring to the drawings in detail, and particularly to the form of the invention shown in Figures 1 to 4, 10 is the door trolley frame mounted on wheels 11 which run on tracks 12 mounted in the usual manner above the ceiling of the door enclosure (not shown). The door comprises a central column 15 which carries the door leaves 16 indicated in dotted lines in Figure 1. The door column 15 is suspended by means of a block 20 attached near its upper end which rests on an anti-friction bearing 21 mounted in a carrier member 22 which is pivotally mounted on a gimbal ring 23 supported by trunnions 24 in bearings in the trolley frame 10. The construction of these parts is well understood, and is therefore not illustrated in detail.

Mounted on the upper end of the column 15 and secured to the block 20 by bolts 30 is a governor driving gear 31. Mounted on a bracket 32 secured to the carrier member 22 by bolts 33 is an oil pump 34, which may be of any suitable type, preferably an ordinary form of gear pump. This pump has a driving shaft 35 on which is mounted a pinion 36 meshing with the gear 31, so that upon the rotation of the door column 15 the pump is actuated. Attached to the opposite end of the carrier 22 from the pump is a reservoir 40 for the oil or other operating liquid. A pipe 41 leads from the reservoir outlet 42 to the inlet side of the pump, and a pipe 43 leads from the discharge side of the pump to the reservoir inlet 44. By mounting the pump and reservoir at opposite ends of the carrier member and by locating the connecting ducts on either side of the door column, a very compact and symmetrical arrangement of parts is secured. The reservoir inlet 44 opens into a supplementary chamber or duct 45 in the lower part of the reservoir. The oil passes from this duct through a control valve mechanism into the reservoir from which it is withdrawn through the outlet 42 and pipe 41 into the pump.

The control valve mechanism shown particularly in Figures 3 and 4 comprises a cylindrical or tapered valve body 50 fitting closely in a valve chamber 51 and rotatable therein. Formed in the valve body 50 is a passage 52 in which is a constricted portion or valve seat 53 for a ball valve 54. The chamber 52 is of larger diameter than the ball, and the ball is loosely retained therein by cross pins 55. A screw plug 60 is mounted in the wall of the reservoir and carries a stop pin 61 for limiting the movement of the ball valve towards its seat. This pin may be adjusted by rotation of the screw plug to such a position that it will prevent the ball valve from closing tightly against its seat, a certain amount of leakage being preferably provided so that movement of the door will not be stopped altogether. Ordinarily the valve body 50 is adjusted to such a position that the lower wall 65 of the chamber 52 is inclined downwardly away from the valve seat. This will cause the ball valve 54 normally to roll down against the stop pins, as indicated in dotted lines in Figure 4. When the ball valve is in this positon, comparatively free passage for the operating liquid is permitted through the valve, so that the liquid may pass from the duct 45 into the reservoir without appreciable resistance. This is the condition when the door is stationary or rotating at low speeds.

As the speed of rotation of the door is increased,

more oil is pumped by the pump 34 through the pipe 43 and into the duct 45. When the critical speed is reached, the ball valve 54 will be picked up by the flowing oil and carried against the seat 53 or as close thereto as the stop pin 61 will permit it to be carried. Thereupon the flow of oil will be stopped or greatly retarded, and this retardation of the flow will react upon the pump 34 and prevent it from turning any faster, the pump in turn acting through the pinion 36 and gear 31 to limit the speed of rotation of the door. By adjusting the position of the valve body 50 so as to change the inclination of the wall 65, the critical speed can be changed. If the wall 65 is made nearly horizontal, a slight increase in speed of the door will roll the ball valve towards its seat, whereas if the valve body is adjusted so as to make the inclination greater, the ball valve has to be lifted more abruptly, and therefore will not come into action until a higher critical speed is reached. At all speeds of rotation of the door below the desired critical speed, the free flow of oil is unobstructed by the ball valve and no resistance to the free action of the door is interposed.

In order to provide for convenient adjustment of the position of the valve body, and consequently of the critical speed of the door, a pointer 70 is provided on the outside of the reservoir which is fixed to the end of the shaft 71 of the valve body, and by which the valve body may be rotated. A scale 72 may conveniently be provided on the side of reservoir by which the setting of the pointer may be determined. By adjusting the stop pin 61 the maximum resistance desired to the rotation of the door may be determined, and the adjustment of the stop pin, in combination with the adjustment of the valve body, provides for great flexibility of control of the door action. The rotation of the door may be checked at whatever critical speed is desired, and the control may be effected gradually or more or less abruptly to suit conditions. The stop pin also provides for adjustments depending upon the viscosity of the operating liquid.

Referring to Figures 5 to 8, in the construction here shown, the revolving door, its column 15 and the supporting trolley are the same as already described. Mounted on the upper end of the door column is a block 100 which also carries a governor driving gear 101. This gear is hollow and provided with a cylindrical surface 102 constituting a brake drum. Mounted on the carrier member 22 of the trolley is a gear pump 34 similar to that already described which is driven by a pinion 36 meshing with the gear 101. Mounted on the end of the carrier member 22 opposite to that on which the pump is mounted is a bracket 110 which carries a reservoir 111 for the oil or other operating fluid and which also carries a brake cylinder 112. Working in the brake cylinder is a piston 113 which is connected to a piston rod 114 passing through a stuffing box 115 and connected by means of a pin 116 with the longer arm 117 of a bell crank lever which is pivoted on a pivot 118. The shorter arm 119 of the bell crank lever is provided with a ball 120 which operates in the socket in the end of a lever 121 fixed to a shaft 122. Also fixed to the shaft 122 is a cam block 123 which is mounted between the ends of an expanding brake band 124. The brake band 124 is mounted in a recess 125 in an extension 126 on the carrier member 22 which extends up inside of the brake drum in the gear 101. The brake band 124 is notched at 130 to increase its flexibility, and is held in position by a pin 131 passing through this notch. The movement of the piston 113 in a direction to project the piston rod 114 through the stuffing box 115 will cause the cam block 123 to expand the brake band 124, as indicated in Figure 6, and thereby apply braking force to the brake drum on the gear 101 which will check the speed of rotation of the door column and door. A spring 140 is provided in the cylinder for moving the piston 113 in a direction to release the pressure on the brake band. The oil discharged by the pump 34 passes through the discharge pipe 145 to the inlet port 146 in the cylinder head. The piston 113 is provided with a flange 147 in which is an elongated port 148 which registers with a discharge port 149 in the cylinder wall (Figure 8). The oil passes through this discharge port into the reservoir 111. The portion of the cylinder 112 behind the piston 113 is vented into the top of the reservoir through a vent 150, so that there will be no resistance other than the force of the spring 140 opposing movement of the piston. The flow of oil through the discharge port 149 is regulated by suitable means, such as a needle valve 155. The oil is drawn through a port 156 in the reservoir from which it passes to the pump through a pipe 157. The needle valve 155 is so adjusted that when the door is at rest or operating below the desired critical speed, the oil delivered by the pump will flow through the port 149 without building up any pressure in the cylinder sufficient to move the piston 113. When the door reaches its critical speed, however, more oil will be delivered to the cylinder by the pump than can pass freely through the port 149, and therefore the piston 113 will be moved and will apply a braking force to check the speed of the door, as already described. As soon as the door slows down, the spring 140 will return the piston to its initial position, and the braking force will be removed. By adjusting the needle valve 155 the critical speed of the door may be varied.

The construction described is very effective as at normal speeds of rotation of the door no material resistance to such rotation is interposed, whereas when the critical speed is reached a very substantial braking force is instantly applied. At the same time such braking force being applied by a friction band is applied smoothly and in such a way as to reduce the speed of rotation of the door without abruptly stopping it.

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 forms its principle may be utilized.

We claim:

1. In a revolving door, a door supporting trolley, a carrier member movably mounted thereon, a door column suspended from said carrier member, and governor mechanism for said door comprising a fluid pump attached to said carrier member, driving connections between said door column and said fluid pump, a fluid reservoir, ducts connecting said pump and reservoir, and adjustable valve means for regulating the flow of fluid through said pump, ducts and reservoir, said valve means including a movable valve member mounted in the path of the flowing liquid and normally occupying a position at low door speeds that will permit a free flow of the fluid and adapt-

ed to be moved by an increased flow of the fluid to a position where it will substantially choke such flow.

2. In a revolving door, a rotatable door column, and governor mechanism for said door comprising a pump, driving connections between said door column and said pump, a liquid circulation system fed by said pump, and adjustable valve means for regulating the flow of liquid through said system, said valve means including a valve member located in the path of the flow of liquid, and normally held by gravity in a position where it does not substantially interfere with said flow, but being movable against the force of gravity by an increase of said flow into a portion of the system of restricted diameter where it will have a choking effect upon the flow of liquid.

3. In a revolving door, a rotatable door column, and governor mechanism for said door comprising a pump, driving connections between said door column and said pump, a liquid circulation system fed by said pump and adjustable valve means for regulating the flow of liquid through said circulation system, said valve mechanism including a valve body having a passage therethrough including a portion of large diameter and a portion of constricted diameter, and a valve ball movably mounted in said passageway and normally occupying a position in the portion thereof of large diameter, but being movable by the liquid towards the constricted portion of said passageway so as to close or partially close the same.

4. In a revolving door, a rotatable door column, and governor mechanism for said door comprising a pump, driving connections between said door column and said pump, a liquid circulation system fed by said pump and adjustable valve means for regulating flow through said system, said valve mechanism including a valve body rotatable about a horizontal axis and having a passageway therethrough including a portion of large diameter and a portion of constricted diameter, a valve ball mounted in said portion of the passageway of large diameter, and being movable towards and from the portion of said passageway of constricted diameter, and means for adjusting said valve body about its axis so as to change the inclination of said passageway.

5. In a revolving door, a rotatable door column, and governor mechanism for said door comprising a pump, driving connections between said door column and said pump, a liquid circulation system fed by said pump, and adjustable valve means for regulating the flow of liquid through said liquid circulation system, said valve means including a movable valve member mounted in the path of the flowing liquid and normally occupying a position at low door speeds that will permit a free flow of the liquid, and adapted to be moved by an increased flow of the liquid to a position where it will substantially choke such flow, and adjustable means for regulating the choking effect of said valve member.

6. In a revolving door, a rotatable door column, and governor mechanism for said door comprising a pump, driving connections between said door column and said pump, a liquid circulation system fed by said pump, adjustable valve means for regulating the flow of liquid through said system, said valve means including a valve member located in the path of the flow of liquid, and normally held by gravity in position where it does not substantially interfere with such flow, but being movable against the force of gravity by an increase of such flow into a portion of the system of restricted diameter where it will have a choking effect upon the flow of liquid, and adjustable means for limiting the movement of said valve member into said portion of restricted diameter.

7. In a revolving door, a rotatable door column, and governor mechanism for said door comprising a pump, driving connections between said door column in said pump, a liquid circulation system fed by said pump, and adjustable valve means regulating the flow of oil through said system, said valve mechanism including a valve body rotatable about a horizontal axis and having a passageway therethrough including a portion of larger diameter and a portion of restricted diameter, a valve ball mounted in said portion of the passageway of larger diameter and being movable towards and from the portion of said passageway of restricted diameter, means for adjusting said valve body about its axis so as to change the inclination of the bottom of said passageway, and an adjustable stop for limiting the movement of said valve ball towards the portion of said passage of restricted diameter.

8. In a revolving door, a rotatable door column, and governor mechanism for said door comprising a pump, driving connections between said door column and said pump, a reservoir, ducts connecting said pump and reservoir, and adjustable valve means for regulating the flow of fluid through said pump, ducts and reservoir, said valve mechanism including a valve body rotatable about a horizontal axis and having a passageway therethrough including a portion of larger diameter and a portion of restricted diameter, a valve ball mounted in said portion of the passageway of larger diameter and being movable towards and from the portion of said passageway of restricted diameter, means for adjusting said valve body about its axis so as to change the inclination of the bottom of said passageway, and a visible indicator for indicating the setting of said valve body.

9. In a revolving door, a door supporting trolley, a carrier member movably mounted thereon, a door column suspended from said carrier member, and governor mechanism for said door comprising a pump attached at one end of said carrier member, driving connections between said door column and said pump, a reservoir attached at the opposite end of said carrier member from that to which said pump is attached, ducts connecting said pump and reservoir, a pressure chamber mounted adjacent to said reservoir and communicating therewith, a duct leading from said pump discharging into said pressure chamber, a pressure responsive element in said pressure chamber, and friction brake mechanism for checking the speed of rotation of said door column actuated by said pressure responsive element.

10. In a revolving door, a rotatable door column, a pump, driving connections between said door column and said pump, a pressure chamber connected to said pump, a pressure responsive element in said chamber, a friction brake mechanism for checking the speed of rotation of said door column, and operative connections between said pressure responsive member and said friction brake mechanism.

11. In a revolving door, a rotatable door column, a pump, driving connections from said door column to said pump, a reservoir, a fluid pressure chamber, a passageway between said fluid pres-

sure chamber and said reservoir, adjustable valve means for controlling the flow of fluid through said passageway, a duct connecting said pump and said fluid pressure chamber, a duct connecting said reservoir and said pump, a pressure responsive member in said fluid pressure chamber, friction brake mechanism for checking the rotation of said door column, and operative connections between said pressure responsive member and said friction brake mechanism.

12. In a revolving door, a rotatable door column, a pump, driving connections from said door column to said pump, a reservoir, a fluid pressure chamber, a passageway between said fluid pressure chamber and said reservoir, adjustable valve means for controlling the flow of fluid through said passageway, a duct connecting said pump and said fluid pressure chamber, a duct connecting said reservoir and said pump, a pressure responsive member in said fluid pressure chamber, friction brake mechanism for checking the rotation of said door column, and operative connections between said pressure responsive member and said friction brake mechanism, said friction brake mechanism including an internal brake drum rotatable with said door column, a non-rotatable brake band inside of said drum, and means actuated by said pressure responsive member for expanding said band.

13. In a revolving door, a door trolley, a carrier member movably mounted thereon, a door column suspended from said carrier member, a rotatable brake drum attached to said door column, an expansible brake member carried by said carrier member inside of said brake drum, a pump carried by said carrier member, driving connections between said door column and said pump, a reservoir, a pressure cylinder, a passageway connecting said pressure cylinder and said reservoir, an adjustable valve in said passageway, a vent connecting said cylinder and said reservoir, a piston movable in said pressure cylinder, means for expanding said brake member, operative connections between said piston and said expanding means, a duct connecting said pressure cylinder with the discharge side of said pump, and a duct connecting said reservoir with the inlet side of said pump.

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