

April 2, 1935.

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1,996,310

MOUNTING FOR DOORS AND THE LIKE

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2 Sheets-Sheet 1

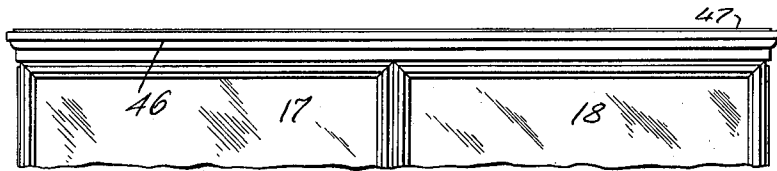


Fig. 1.

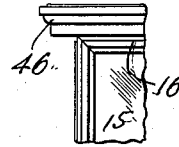


Fig. 2.

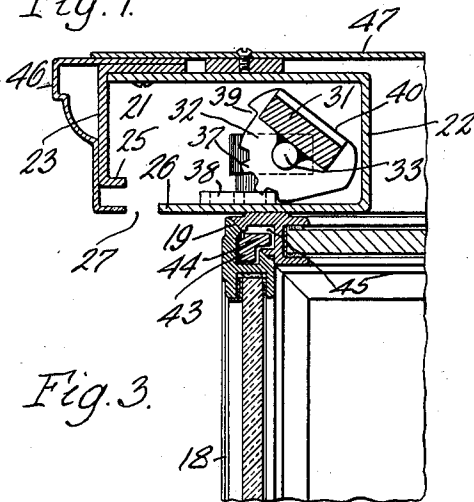


Fig. 3.

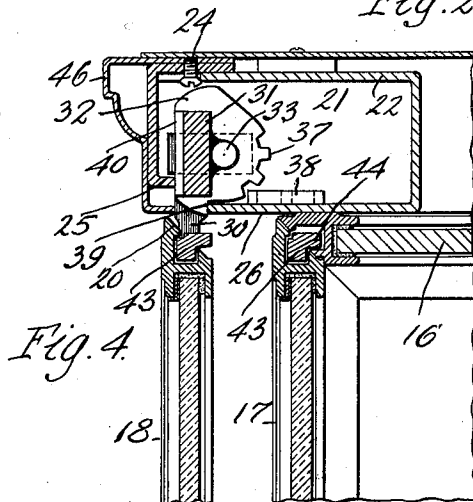


Fig. 4.

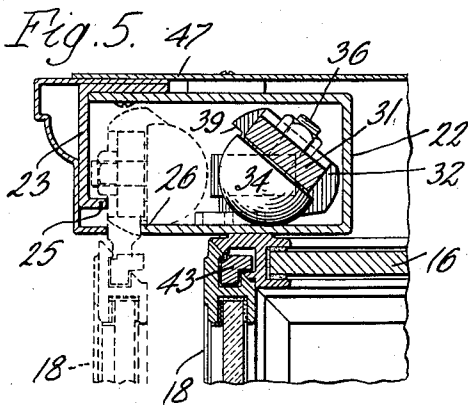


Fig. 5.

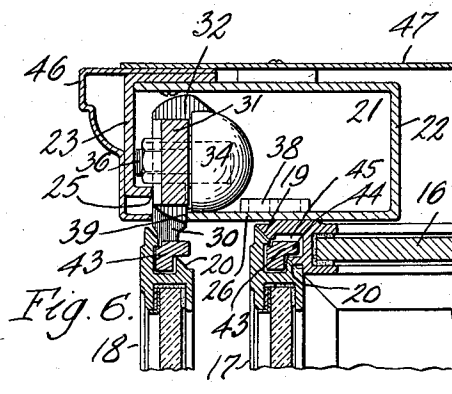


Fig. 6.

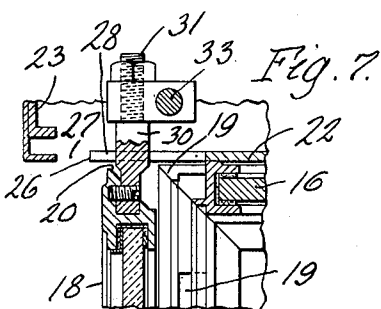


Fig. 7.

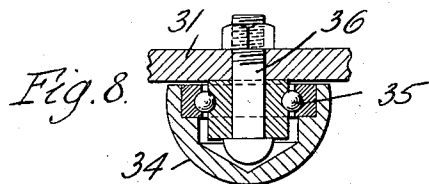


Fig. 8.

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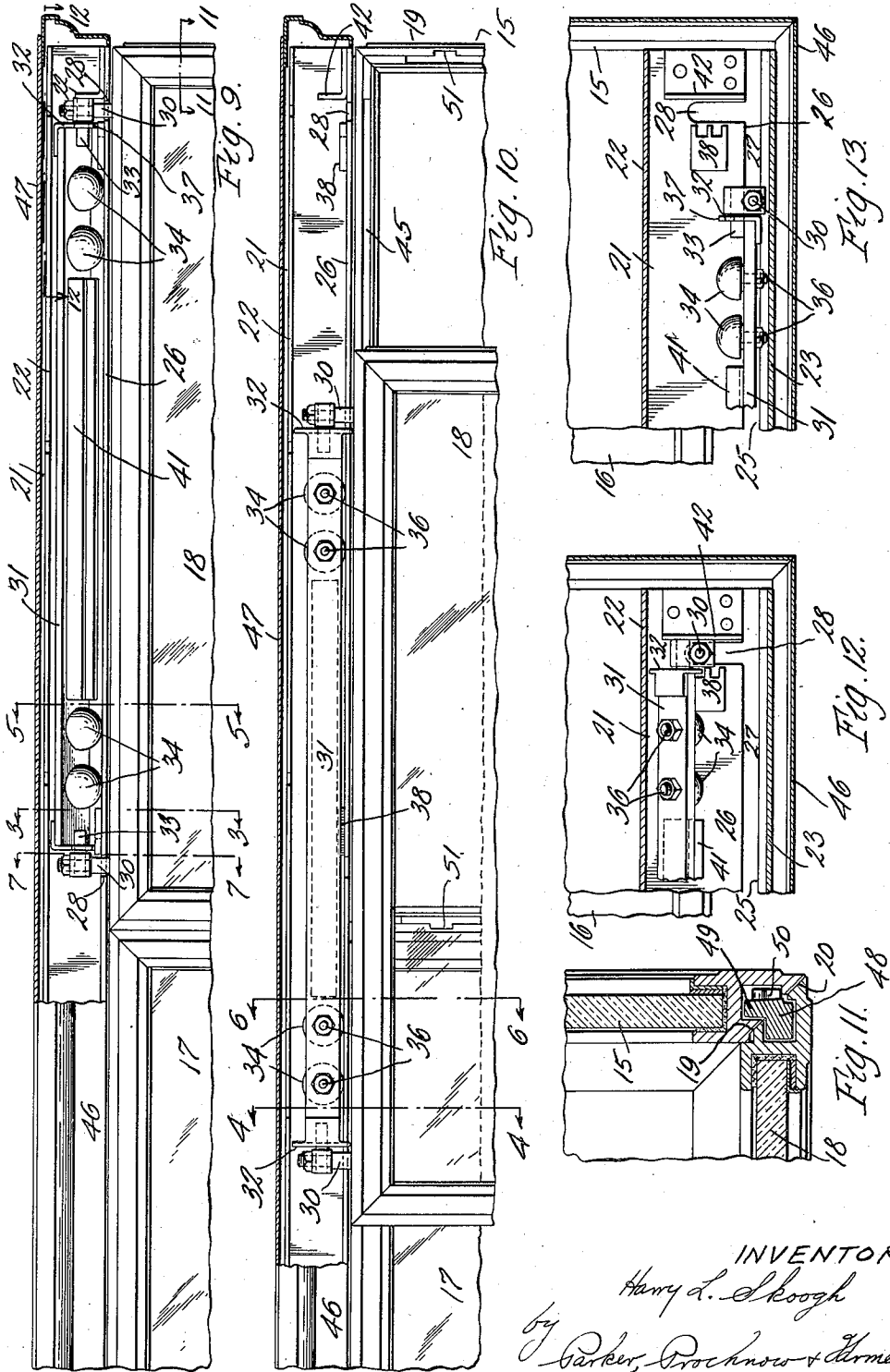
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MOUNTING FOR DOORS AND THE LIKE

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2 Sheets-Sheet 2



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# UNITED STATES PATENT OFFICE

1,996,310

## MOUNTING FOR DOORS AND THE LIKE

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13 Claims. (Cl. 20—19)

This invention relates to door or closure mountings or supporting means, and more particularly to means for mounting a door to move into and out of engagement with the door frame and also laterally to and from a position in front of the door opening. Such means are desirable, for instance, in museum cabinets and other cases where a plurality of doors or panels are provided which, when closed, occupy positions edge to edge or in a common plane, and one or each of which is movable from its closed position outwardly to a plane adapting it to slide parallel with itself in front of another door or panel so that one or another of the doors can be moved along in front of another door to afford access through one or another door opening.

A primary object of my invention is to provide a door mounting of this character which enables a door or analogous member, which may be heavy, to be opened and tightly closed with the maximum ease and with the minimum noise.

Other objects of the invention are to provide a simple but strong and durable mechanism which operates smoothly and easily, whereby a door or analogous member may be moved inwardly and outwardly toward and from the door frame, and also parallel with the plane of the door to and from a position in front of the door opening or frame; also to provide a suspension mechanism for doors of the sort mentioned which, while strong and durable and adapted to sustain a door of heavy weight, nevertheless is of compact construction and occupies the minimum space; also to provide a door mounting having the other features of advantage and improvement hereinafter described and set forth in the claims.

In the accompanying drawings, the invention is illustrated in connection with glass doors for a glass paneled cabinet such as used in museums for housing and protecting specimens, but it will be understood that the invention is not restricted to the particular construction shown in the drawings nor to doors for this particular purpose.

In said drawings:

Figs. 1 and 2 are respectively a front and fragmentary end elevation of the upper portion of a cabinet provided with a door mounting embodying my invention.

Fig. 3 is a transverse sectional elevation, full size, thereof, on line 3—3, Fig. 9, showing the position of the parts when the door is closed.

Fig. 4 is a similar view on line 4—4, Fig. 10, showing the position of the parts when the door

has been moved out and laterally in front of the adjacent door or panel.

Figs. 5 and 6 are similar views on lines 5—5, Fig. 9, and 6—6, Fig. 10 respectively.

Fig. 7 is a transverse sectional elevation on line 7—7, Fig. 9, but showing the door moved outwardly partway from its closed to its laterally sliding position.

Fig. 8 is a sectional elevation showing one of the suspension rollers for the door.

Fig. 9 is a fragmentary, front elevation of the upper portion of the cabinet, partly in section, to show the door suspension means, and showing the position of the parts when the door is closed.

Fig. 10 is a similar view but showing the position of the parts when the door is partially opened.

Fig. 11 is a sectional plan view of the door and door frame on line 11—11, Fig. 9.

Figs. 12 and 13 are sectional plan views on line 12—12, Fig. 9, but showing respectively the positions of the suspension means when the door is closed and opened.

The cabinet illustrated in the drawings has top, end and back walls formed by framed glass plates or panels, and the front of the cabinet is formed by similar framed glass panels, one of which, however, is movably mounted and forms a door or movable closure for the front of the cabinet. As shown, there are two like front panels and one of them is movably mounted for use as a door, but both can, if desired, be so mounted that either one can constitute a door movable relatively to the other panel.

15 represents one of the glass paneled end walls, 16 the paneled top wall and 17 and 18 the front glass panels or doors. The frame bars of these end and top walls of the cabinet have bevelled front faces 19 and the frame bars of the doors have bevelled rear faces 20 adapted to fit tightly against the bevelled faces of the top and end wall frames and against similar bevelled faces on a vertical frame bar at the middle front portion of the cabinet between the adjacent edges of the two doors.

The cabinet is provided, preferably along its front, above the door openings, with a horizontal housing 21 for a travelling door suspension or supporting carriage or mechanism, said housing forming a guide or track on which said carriage is adapted to travel both in and out transversely of the plane of the door and also parallel with such plane for closing and opening the door. This guide housing may be stationarily mounted in any suitable way, being, in its preferred construction,

formed by a forwardly opening channel member **22** fixed on the top panel frame **16** of the cabinet, and a reversed channel bar **23** removably secured in front of the fixed channel **22**, as by screws **24**, **5** Fig. 4, connecting the top flanges of the channels. The front channel bar **23** can be released and removed from in front of the member **22** for assembling the suspension means and removing it when it may be desired to dismount and remove **10** the door. The rear edge of the bottom flange **25** of the removable channel **23** is spaced from the front edge of the bottom flange **26** of the fixed channel, thereby leaving a longitudinal slot **27**, see Fig. 3, between these edges extending parallel **15** with the front of the cabinet for the passage and lateral travel of door supporting hangers or parts. The bottom of channel **22** is also provided with transverse slots **28** leading rearwardly from the slot **26**.

**20** In the construction shown, the door **18** has attached to its upper edge, as by screws, (see Fig. 7) two hangers **30** which pass through the slot **27** into the guide housing **21** and are attached at their upper ends to a supporting carriage arranged **25** within the housing to travel both transversely and longitudinally on the bottom **26** of the housing as a track. This carriage, as shown, comprises a horizontal bar **31** which extends lengthwise in the housing, and at its opposite ends is fixed to **30** or formed with vertical end pieces **32** which are pivotally connected to the hangers **30**; for instance, by pivot studs **33** projecting from rearwardly extending blocks secured on the hangers and entering holes in the end pieces **32** so that **35** the carriage is adapted to rock transversely about these pivots. The carriage is provided with supporting rollers **34**, of which there are preferably two adjacent each end of the carriage. Preferably these rollers are of semi-spherical shape and are mounted by suitable ball bearings **35** on studs **40** **36** fixed to the carriage bar **31**. Each roller is adapted to roll on the track **26** lengthwise thereof, revolving on its ball bearing in so doing, and the semi-spherical tread of the roller is also adapted **45** to rock or roll transversely on the track **26** in a plane perpendicular to the plane of revolution of the roller on its bearing.

**50** In the closed position of the door shown in Figs. 3 and 5, the carriage occupies the inclined position in the rear of the housing **21**, shown in said figures, and the rollers provide spherical bearings on which the carriage is adapted to rock on the track **26** from this position to the position shown in Fig. 6. In this rocking motion of the carriage, **55** it turns about the aligned centers of the pivots **33** and of the rollers. When the door is closed against the door frame, the hangers **30** are located in the transverse slots **28** in the bottom of the housing, which slots are placed so as to register with the two hangers of the door when the door is directly in front of its door opening. By **60** pulling the door forwardly from its closed position, the carriage is thus rocked forwardly and thereby the door hangers are moved out of the transverse slots **28** into the longitudinal slots **27** **65** in the housing. In this forward movement of the carriage, the rollers roll or rock on their spherical treads until the axes of their ball bearings extend horizontally, as shown in Fig. 6. The rollers can then revolve in a vertical plane about their then horizontal axes or bearings, whereby the carriage is adapted to roll longitudinally in the housing parallel with the front of the cabinet for moving the door laterally away from a position **70** in front of its door opening to a position in

front of the adjacent door or panel, and for returning the door. Thus, the door is supported and rolls freely and easily on ball bearing rollers when being moved parallel with its plane. When the door is returned to the position in front of its opening or frame, the door hangers will register with the transverse slots **28**. The hangers can then enter these slots, thus permitting the door to be moved inwardly against the door frame, and in this inward movement of the door, the rollers **34** will rock or roll transversely of the housing on their spherical treads, thus providing a rolling support for the door in its in and out movements. The rollers having tread surfaces which are circular both in the planes of the axes of their bearings and also in planes perpendicular thereto permit a free, easy and quiet rolling motion of the door supporting carriage both for moving the door in a plane parallel with the plane of the door and also to move the door against **20** and away from the door frame.

Preferably the end pieces **32** of the carriage are formed with toothed segments **37** adapted to mesh with fixed toothed racks **38**, see Figs. 12 and 13, on the bottom of the housing. These **25** intermeshing segments and racks at the opposite ends of the carriage equalize the forward and rearward movements of the opposite ends of the carriage and door and prevent the door from being accidentally shifted out of parallelism with the door frame. The carriage end pieces are also provided with stop projections or shoulders **39** and edges **40**, see Figs. 3 to 6, which are adapted to engage the front and rear edges of the longitudinal slot **27** to limit the forward **35** rocking of the carriage beyond the position shown in Fig. 4. The engagement of these parts **39** and **40** with the edges of the slot **27** prevents the weight of the door from rocking the carriage beyond the position in which the axes of the roller bearings are horizontal, and also assists in guiding the door in its movements parallel with the front of the cabinet and in preventing possible misregister of the segment and rack teeth. Furthermore, the edges of the end pieces **32**, **45** when the door is moved out from the door frame, lie so close to the top of the housing as to prevent the possibility of the door being lifted sufficiently to disengage the toothed segments from their racks and allow the carriage to rock out of **50** its intended position. The carriage bar **31** is preferably stiffened by a reinforcing bar **41** rigidly fixed thereto between the rollers at opposite ends of the carriage.

A vertical stop **42** extends transversely in the **55** housing adjacent each end of the housing. This guide is conveniently formed by the vertical flange of an angle plate riveted or otherwise suitable secured in the housing. When the door is moved from its open position parallel with the front of the cabinet for closing the door, the pivot block on the leading door hanger will strike one of the stops **42** and arrest the door with its hangers **30** registering with the transverse slots **28** in the bottom of the housing and cooperate **65** with the slots in guiding the door to proper engagement with the door frame. The opposite stop **42** acts similarly to limit the longitudinal movement of the door in the opposite direction.

By the use of the semi-spherical rollers journalled on the rocking carriage, as described, they provide circular treads of large diameter for the rolling of the door carriage, but nevertheless the described construction of the carriage makes possible the use of a housing **21** which is but slight- **75**

ly deeper than the diameter of the rollers. Thus, large rollers having large, durable ball bearings can be employed in a housing or space of substantially less depth than would be required for housing a carriage with spherical balls of equal size and strength. This construction, therefore, provides a strong, durable suspension for a heavy door which occupies the minimum vertical space at the top of the cabinet and does not necessitate a top construction for the cabinet of cumbersome or unattractive proportions or appearance. Both of the front panels or doors 17 and 18 can be movably mounted by suspension means of the described construction, to enable either panel to open and close, since when either door is closed the other one can be moved out and longitudinally in front of the closed door. The full and broken line positions of the suspension means in Fig. 5 shows that when one door is open, its suspension means can pass that of the closed door without interference. Some cabinets are made with one movable front door or panel and one or more fixed panels, while other cabinets have two or more movable doors, but it is considered unnecessary to a clear understanding of the invention to show more than one door movably mounted by the suspension means.

As before explained, the abutting edges of the door and door frame are bevelled but preferably a strip 43 secured in a groove in the top edge of the door provides a longitudinal tongue 44 which projects from the door into a groove 45 in the top bar of the door frame across the bevel joint between the door and door frame. This tongue breaks the bevel joint and thereby insures a better closure or sealing of the door opening. Also, by engagement with the bottom of its groove in the door frame, the tongue will prevent downward sagging or displacement of the door, and thus cooperates with the suspension means in supporting the weight of the door.

46 is an ornamental cornice strip which covers the front of the suspension housing to furnish a desired ornamental finish for the upper front portion of the cabinet and 47 is a top plate which closes the chamber at the top of the cabinet in which the suspension housing is located. This cornice strip and top plate may be removably secured in place in any suitable manner adapting them to be removed for permitting the assembling and disassembling of the door suspension means.

Any suitable locking means for forcing the door tightly against the door frame and securing the door in its closed position may be employed. Means for this purpose, shown in Fig. 11, comprise a vertical locking strip 48 which is movable vertically in a groove in each vertical edge of the door and has a rearwardly projecting tongue or flange 49 which extends into a groove in the adjacent vertical edge of the door frame and is provided with a lateral cam projection 50 adapted to pass through a notch 51, Fig. 10, in the inwardly projecting lip at the front face of the door frame strip, and cooperate with this lip by vertical movement of the locking bar, to force the bevelled edge of the door tightly against the bevelled edge of the door frame. More detailed description of this means, which is not claimed herein, is unnecessary.

I claim as my invention:

1. The combination with a frame having a door opening, of a door movable into and out of said opening, a travelling supporting carriage for the door, a track extending parallel with the plane

of the door, and rollers journaled to revolve on said carriage and roll on said track lengthwise thereof for carrying the door to and from a position opposite said door opening, and said rollers having treads which are convexly curved transversely to their plane of revolution and concentrically with their centers of revolution, whereby said rollers are also adapted to rock transversely on said track for moving the door horizontally transversely of its plane into and out of said door opening.

2. The combination with a door frame, of a door, a travelling supporting carriage for the door, a track extending parallel with the plane of the door, and segmental spherical rollers journaled to revolve on said carriage and roll along said track for horizontal travel of said carriage along said track parallel with the plane of said door, and said rollers being also mounted to rock transversely on said track transversely thereof and concentrically with their spherical centers for moving said door horizontally toward and from the door frame.

3. The combination with a door frame, of a door, a stationary track extending parallel with the plane of the door, a supporting carriage for the door to which the door is pivotally connected to permit said carriage to rock in a direction transversely of the length of the track, and segmental spherical carriage supporting rollers journaled to revolve on said carriage and roll on said track lengthwise thereof and rock thereon transversely of track and concentrically with the pivotal axis of the carriage for moving the door parallel with the plane of the door and also transversely thereof toward and from the door frame.

4. The combination with a door frame, of a door, an overhead track extending parallel with the plane of the door, supports projecting upwardly from the door, a carriage pivoted to said supports to rock in a plane perpendicular to the plane of the door, and segmental spherical carriage supporting rollers journaled to revolve on said carriage and bearing and adapted to roll on said track lengthwise thereof and rock thereon transversely thereof and concentrically with the pivotal axis of the carriage.

5. The combination with a door frame, of a door, a track extending parallel with the plane of the door, a carriage which supports the door and is pivotally connected thereto to rock in a plane perpendicular to the plane of the door, segmental spherical carriage supporting rollers journaled to revolve on said carriage and bearing and adapted to roll on said track lengthwise thereof and rock thereon transversely thereof and concentrically with the pivotal axis of the carriage, and equalizing mechanism for equalizing the movement of opposite ends of the carriage in the movement thereof transversely of the track.

6. The combination with a door frame, of a door, a track extending parallel with the plane of the door, supports projecting from the door, a carriage pivoted to said supports to rock in a plane perpendicular to the plane of the door, segmental spherical rollers journaled on said carriage and bearing and adapted to roll on said track lengthwise thereof and rock thereon transversely thereof, and toothed segments at the opposite ends of the carriage meshing with stationary toothed racks for equalizing the movement of the opposite ends of the carriage in the movement of the carriage transversely of said track.

7. The combination with a door frame, of a

door, a track extending parallel with the plane of the door, supports projecting from the door, a carriage pivoted to said supports to rock in a plane perpendicular to the plane of the door, segmental spherical rollers journalled on said carriage and bearing and adapted to roll on said track lengthwise thereof and rock thereon transversely thereof and concentrically with the pivotal axis of the carriage, and means for arresting the rocking motion of the carriage in one direction when the axes of the roller journals are horizontal.

8. The combination with a door frame, of a door, a housing above the door frame extending parallel with the plane of the door and having a bottom provided with connecting longitudinal and transverse slots, hangers projecting from said door through said longitudinal slots and arranged to enter said transverse slots when the door is opposite said door frame, a carriage within said housing pivoted to said hangers to rock in a plane transverse to the plane of the door, and segmental-spherical rollers journalled on said carriage and adapted to bear and roll on the bottom of said housing as a track lengthwise thereof and rock thereon transversely of the track for moving said door parallel with its plane and also transversely thereof toward and from the door frame.

9. The combination with a door frame, of a door, a housing above the door frame extending parallel with the plane of the door and having a bottom provided with connecting longitudinal and transverse slots, hangers projecting from said door through said longitudinal slots and arranged to enter said transverse slots when the door is opposite said door frame, a carriage within said housing pivoted to said hanger to rock in a plane transverse to the plane of the door, segmental spherical rollers journalled on said carriage and adapted to bear and roll on the bottom of said housing as a track lengthwise thereof and rock thereon transversely of the track for moving said door parallel with its plane and also transversely thereof toward and from the door frame, and parts on said carriage adapted to engage the edges of said longitudinal slot for limiting the rocking movement of said carriage in one direction.

10. The combination with a door frame, of a door, a track extending parallel with the plane of the door, supports projecting from the door, a carriage pivoted to said supports to rock in a plane perpendicular to the plane of the door, and segmental-spherical rollers journalled on said carriage and bearing and adapted to roll on said track lengthwise thereof and rock thereon

transversely thereof, said door and door frame having abutting bevelled edges and a longitudinal tongue projecting from one of said edges and adapted to enter a groove in the other edge.

11. The combination with a door frame, of a door, a track extending parallel with the plane of the door, supports projecting from the door, a carriage pivoted to said supports to rock in a plane perpendicular to the plane of the door, and segmental spherical rollers journalled on said carriage and bearing and adapted to roll on said track lengthwise thereof and rock thereon transversely thereof, said door and door frame having abutting bevelled edges and a longitudinal tongue projecting from the bevelled edge of the door and adapted to enter a longitudinal groove in the edge of the door frame.

12. The combination with a door frame, of a door, a housing extending parallel with the plane of the door and consisting of a stationary channel opening forwardly and a front channel, one flange of which is separated from the adjacent flange of the stationary channel forming a longitudinal slot, said stationary channel also having transverse slots extending therein from said longitudinal slot, supports projecting from said door through said longitudinal slot and arranged to enter said transverse slots when said door is opposite said door frame, a carriage within said housing pivoted to said supports and adapted to rock in a direction perpendicular to the plane of said door, and segmental spherical rollers journalled on said carriage and bearing and adapted to roll on the bottom of said housing as a track for moving the door parallel with the plane thereof and also adapted to rock on said track for moving the door transversely of said plane toward and from said frame.

13. The combination with a door frame, of a door, a housing extending parallel with the plane of the door and having a horizontal wall provided with connecting longitudinal and transverse slots, supports projecting from said door through said longitudinal slots and arranged to enter said transverse slots when the door is opposite said door frame, a carriage within said housing pivoted to said supports to rock in a plane transverse to the plane of the door, and segmental-spherical rollers journalled on said carriage and adapted to bear and roll on the bottom of said housing as a track lengthwise thereof and rock thereon transversely of the track for moving said door parallel with its plane and also transversely thereof toward and from the door frame.

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