

April 26, 1966

J. C. CATLETT

3,247,617

TWO WAY AUTOMATIC DOOR

Filed Nov. 3, 1961

3 Sheets-Sheet 1

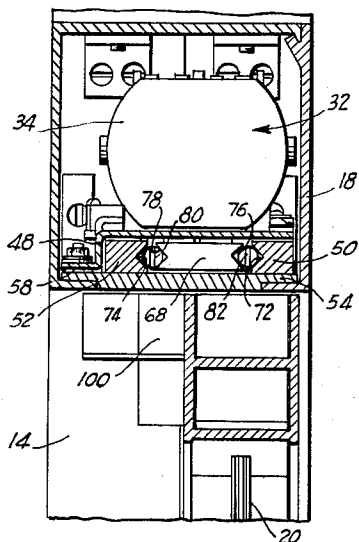


Fig. 4

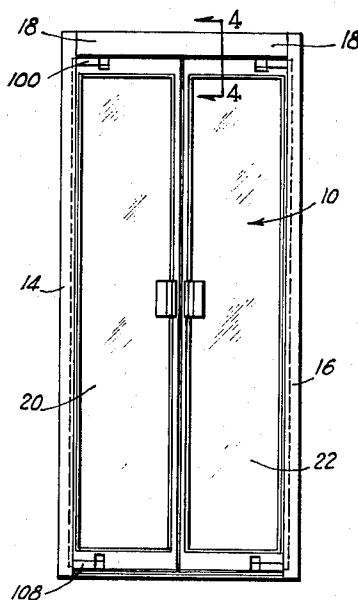


Fig. 2

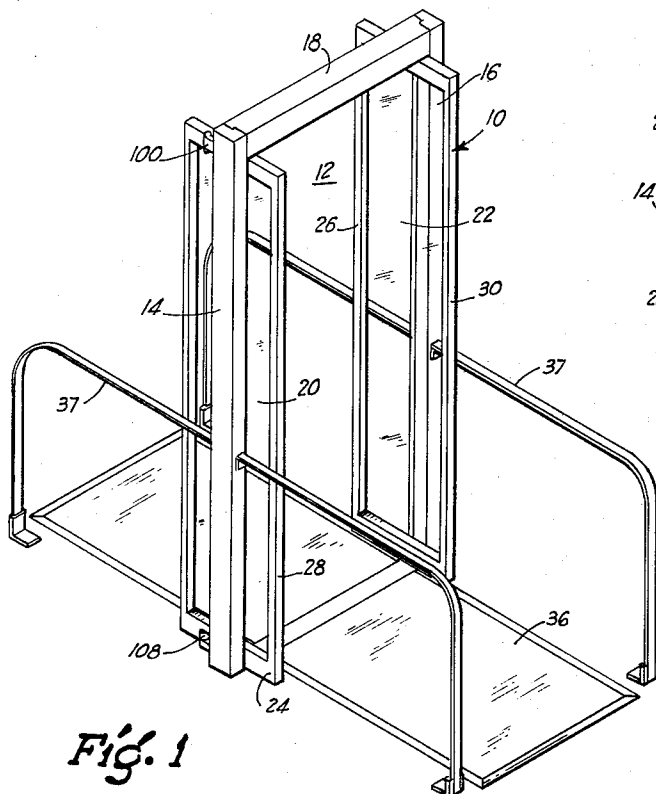


Fig. 1

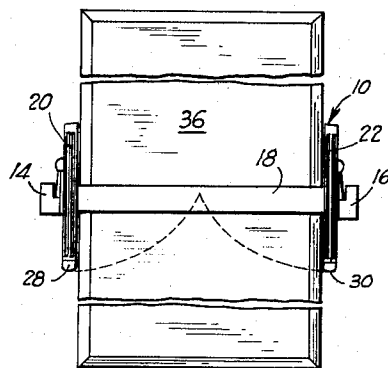


Fig. 3

INVENTOR.

John C. Cattlett

BY

William S. Dorman

ATTORNEY

April 26, 1966

J. C. CATLETT

3,247,617

TWO WAY AUTOMATIC DOOR

Filed Nov. 3, 1961

3 Sheets-Sheet 2

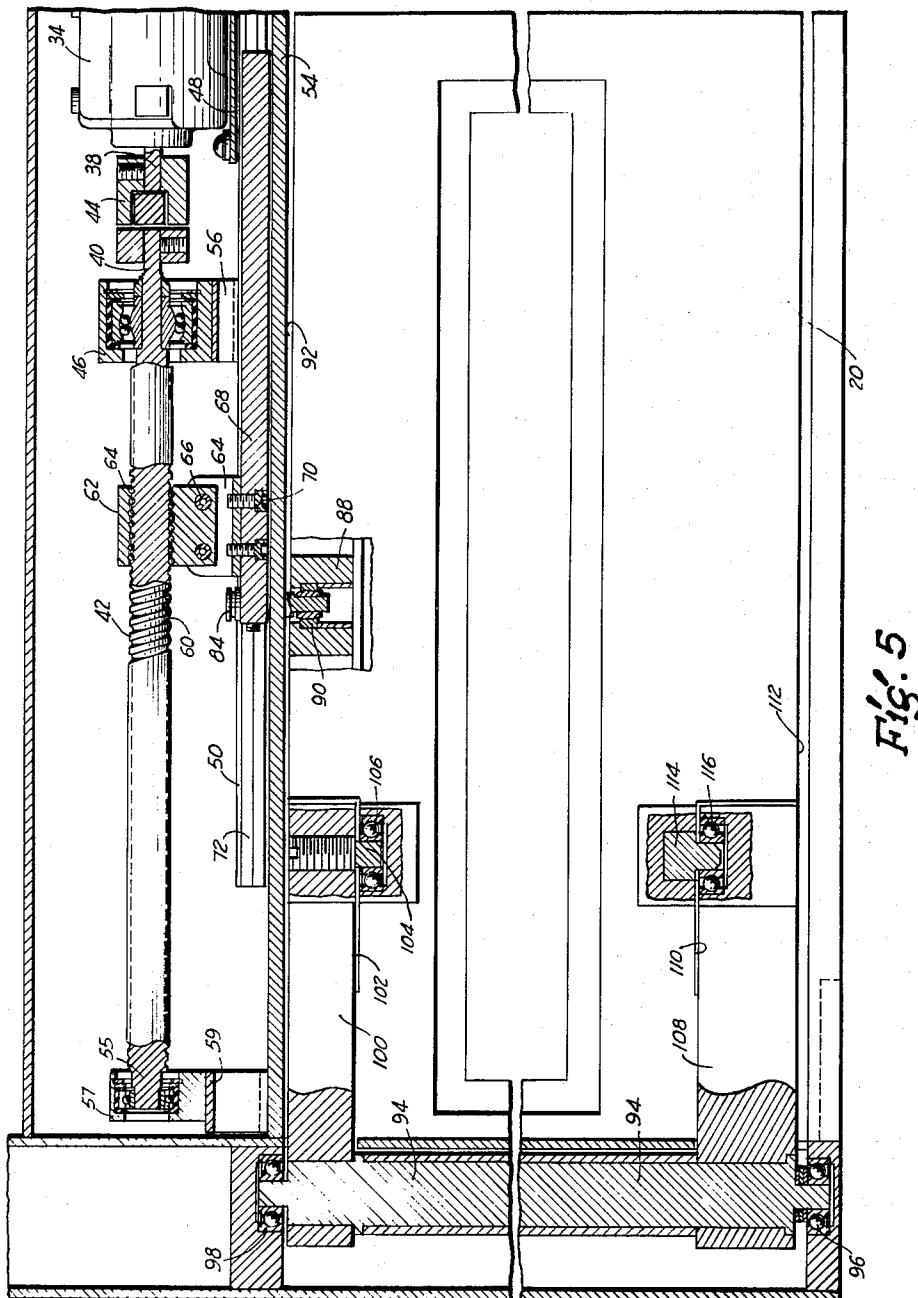


Fig. 5

INVENTOR.

John C. Cattlett

BY

William S. Dorman

ATTORNEY

April 26, 1966

J. C. CATLETT

3,247,617

TWO WAY AUTOMATIC DOOR

Filed Nov. 3, 1961

3 Sheets-Sheet 3

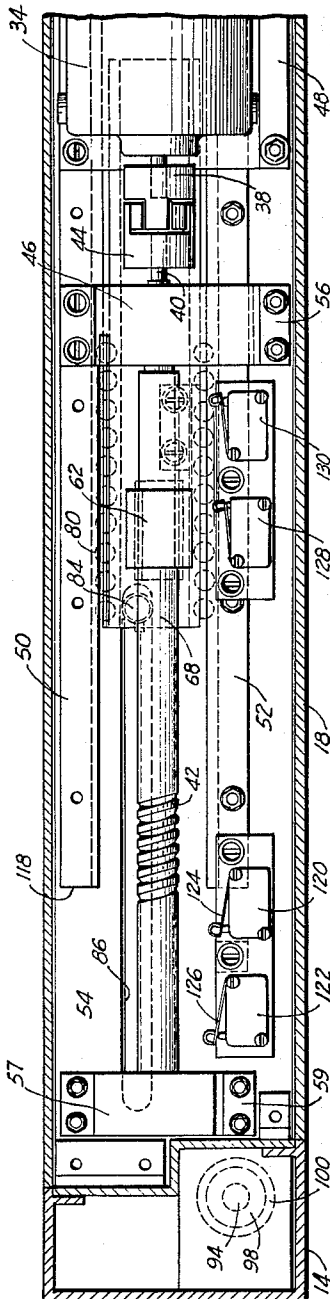


Fig. 6

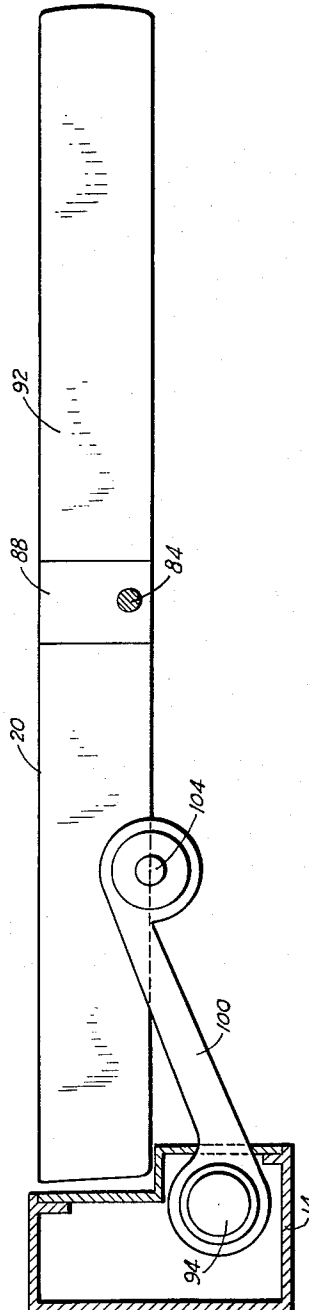


Fig. 7

INVENTOR.

John C. Cattlett

BY

William S. Jorman

ATTORNEY

1

3,247,617

TWO WAY AUTOMATIC DOOR

John C. Catlett, Oklahoma City, Okla., assignor to Roto-Swing Door Co., Inc., Oklahoma City, Okla., a corporation of Oklahoma

Filed Nov. 3, 1961, Ser. No. 149,917

7 Claims. (Cl. 49—107)

This invention relates to improvements in balanced door structures and more particularly, but not by way of limitation, to a two way automatic balanced door for the usual single door opening.

The use of automatic opening doors is widespread today, and doors of this type are in great demand. These doors are normally actuated by means of an electric eye, an electronic wave impulse, or by switch type mats which initiate the opening of the door upon being interrupted or activated by the person approaching the door. Most of the above doors are employed in combinations of two or more where one door will open inwardly for entering traffic and another door will open outwardly for outgoing traffic.

Of course, it is also desirable to provide for two way traffic flow through a single door in order that people may move into and out of the building or establishment wherein a single door opening exists. As a result, attempts have been made to provide a two-way swinging door in a single door opening wherein the door will respond to signals from certain actuating devices for opening the door outwardly or inwardly depending upon the direction of traffic flow. This type of structure has proven to be inefficient, impractical and dangerous for many reasons. For example, when two people approach such a door from the opposite sides thereof, the person first arriving in the vicinity of the respective actuating device causes the device to initiate the opening of the door in the swinging direction away from himself. Thus, the opening door may strike the second person who is approaching the door from the opposite direction, and may do bodily harm to the second individual.

As a result of the above noted inconveniences, the usual practice today (as briefly set forth above) is to provide a double door opening, or two separate door openings in a slightly spaced relationship wherein two completely separate doors and door operator mechanisms may be installed. Each of the doors is provided with a door actuator device wherein one door is particularly designed for opening in an inward direction to permit traffic to move into the building, and the other of said doors is designed for opening in an outward direction to permit passage of traffic out of the building. In fact, the usual practice is to provide a safety feature for these doors whereby not only will the door not open when approached from the wrong direction, but cannot be opened when a person is standing in the vicinity of the wrong side of the door.

While the double or two door arrangement satisfactorily solves the problem of permitting two way flow of pedestrian traffic to and from a building, there are many establishments wherein a two door installation is not practical or possible. There are many relatively small businesses, such as jewelry stores, or candy stores, or the like, wherein it is desirable to provide an automatic door for the entrance thereto, but where the physical limitations of space simply do not permit the use of two separate doors. In many of these instances, there is only space for a single door opening, and as a result, there is no practical door structure available to provide an automatic opening door for the establishment.

The present invention contemplates a novel two way automatic door for a single door opening thus permitting a two way traffic flow through the door, with the door designed and constructed for automatic opening to serve

2

the traffic moving in both directions. The novel two way door is of a balanced construction for facilitating the opening thereof under extreme pressure conditions, such as high winds, or pressure differentials in large buildings resulting from the heating of the building during the cold or winter seasons and cooling of the building during summer seasons. To accomplish this balanced construction feature, the single door opening is filled with two door leaves of substantially half the width of the usual single door leaf. Each of the half-doors, or half-sized door leaves are simultaneously pivoted in opposite directions and moved transversely in the doorway opening in opposite directions to a position adjacent each respective door jamb to provide a substantially full opening of the doorway for permitting passage therethrough from either side of the door.

Each of the door leaves is provided with an offset arm assembly for supporting each leaf and connecting each leaf with a guide pivot mechanism whereby each door leaf is rotated about a vertical axis extending substantially centrally therethrough. Thus, each door leaf or section can be considered as having two equal vertical parts or halves during the opening or closing thereof whereby pressure applied against one half of the door leaf is opposed by the pressure against the other half thereof, as is well known in balanced door construction. As one portion or half section of the door leaf swings inwardly and the other half portion thereof swings outwardly, the load requirements for either manual or automatic operation of the door are greatly reduced. Furthermore, the substantially central disposition of the vertical pivot axis for the door leaves, combined with the sliding action thereof provided by the offset arm mechanism opens each half section or door leaf against the respective door jamb in such a manner that approximately one half of each door leaf extends inwardly from the respective door jamb and the opposite half of the door leaf extends outwardly therefrom. In this manner, the projection of the door to either the outside or inside of the door opening is maintained at a minimum, and the door may be opened and moved to an out-of-the-way position quickly, thus assuring no interference to the person approaching the door from either direction.

Of course, any suitable type of door operator mechanism may be utilized for automatically opening the door upon the approach of a person. For example, an electric eye may be provided on both sides of the door for actuation by a person approaching the door in either direction. Upon actuation of the electric eye device, the door operator mechanism may be energized for opening the door and permitting movement through the doorway. The particular embodiment depicted herein utilizes a switch mat extending on both sides of the door whereby the door operator will be energized for opening of the door when a person steps on the switch mat exposed on either side of the door. Thus, no locking devices are required for precluding the opening of the door from the wrong side, since there is no wrong side. The switch mat and door operator are so designed and constructed as to hold the door leaves in the open position during the entire time interval that a person is standing on or treading on any portion of the mat, thus assuring that the door will not accidentally close before the person or persons moving through the doorway have cleared the switch mat. The door operator may be of any suitable type, such as hydraulic, pneumatic, electrical, mechanical, or the like. It is preferable to provide a free wheeling type door operator mechanism for facilitating the opening and closing of the door leaves, but it is to be understood that any type of actuation or motivating power may be utilized for the opening and closing of the door leaves.

It is an important object of this invention to provide

a novel two way automatic door for a single door opening for handling traffic moving through the door opening in both the incoming and outgoing directions.

It is another object of this invention to provide a novel two way door for a single door opening and a door operator therefor wherein the door may be automatically opened by a person approaching the door from either direction.

Another object of this invention is to provide a novel two way automatic door for a single door opening wherein the pressures acting on the two way door are balanced for facilitating the opening and closing of the door.

Still another object of this invention is to provide a novel two way automatic door for a single door opening particularly designed and constructed for swinging quickly toward an open position for substantially precluding accidental bodily harm to persons moving through the door opening.

A further object of this invention is to provide a novel two way automatic door constructed in a manner to provide a full ninety degree opening for each door leaf, thereby providing a maximum open area for passage of traffic through the door.

A still further object of this invention is to provide a two way automatic door for a single door opening which is simple and efficient in operation and economical and durable in construction.

Other objects and advantages of the invention will be evident from the following detailed description, read in conjunction with the accompanying drawings, which illustrate my invention.

In the drawings:

FIGURE 1 is a perspective view of a two way door embodying the invention and depicting the door in an open position.

FIGURE 2 is a front elevational view of a two way door embodying the invention and depicting the door in a closed position.

FIGURE 3 is a plan view of a two way door embodying the invention depicting the door in an open position with dotted lines indicating the travel of the outermost ends of the door leaves.

FIGURE 4 is a sectional view taken on line 4-4 of FIGURE 2.

FIGURE 5 is a broken sectional elevational view of the combined door structure and door operator, depicting one door leaf and the associated half section of the door operator.

FIGURE 6 is a plan view of one half of the door operator mechanism with portions shown in dotted lines for purposes of illustration, and with the lintel and one door jamb of the door frame depicted in section.

FIGURE 7 is a plan view of one door leaf and the offset arm assembly therewith.

Referring to the drawings in detail, and particularly FIGURES 1, 2 and 3, reference character 10 generally indicates a two way door adapted to be disposed in the usual doorway 12 having vertical door jambs 14 and 16 and an upper door frame or lintel 18. The door 10 comprises two vertically disposed half-sections of door leaves 20 and 22 of any suitable door construction. As depicted herein, the leaves 20 and 22 are each provided with a peripheral frame 24 and 26 supporting transparent center portions made of glass, or the like. It is to be understood that each door leaf 20 and 22 may be of a slab structure, or any other suitable door construction, and is not in any manner limited to the decorative design depicted herein. Furthermore, it should be apparent from the drawings that each door leaf constitutes a single rigid panel. The door leaves 20 and 22 are preferably each substantially half the width of the doorway 12, and in the closed position thereof, as shown in FIGURE 2, fill the doorway.

Each leaf 20 and 22 is suspended from the upper frame 18 in a manner as will be hereinafter set forth whereby

the leaves rotate and slide along the frame 18 simultaneously but in opposite directions. For example, one leaf, such as the leaf 20, pivots in a clockwise direction upon opening thereof and simultaneously slides along the door frame 18 in a direction toward the jamb 14. The door leaf 22 simultaneously pivots in a counterclockwise direction upon opening thereof and slides along the frame 18 in a direction toward the jamb 16. Upon closing of the door 10, the leaf 20 pivots in a reverse direction, or counterclockwise direction, whereas the leaf 22 rotates in a clockwise direction, and both leaves 20 and 22 slide along the frame 18 in a direction toward each other. Thus, during the opening and closing operation, the corresponding outer ends 28 and 30 of the door leaves 20 and 22 move through the elliptical path indicated by the dotted lines in FIGURE 3.

It will be apparent that the combined pivoting and sliding action of the door sections 20 and 22 results in a disposition of each section adjacent the respective door jamb 14 and 16 in such a manner that substantially half of each door section extends on each side of the door jambs. In addition, the path of travel of the outer ends of the door sections 20 and 22 is reduced to a minimum distance from the doorway 12, thus decreasing the distance through which the door must travel during the opening thereof. In this manner, the door 10 may be fully opened and moved to an out-of-the-way position before a person approaching the door has proceeded or traveled through a sufficient distance toward the door to encounter the opening door sections. Furthermore, the door sections 20 and 22 open to a full ninety degree position against the door jambs 14 and 16 to provide a maximum spacing therebetween in the open position of the door 10 for facilitating the passage of traffic therethrough from either direction.

A door operator unit, generally indicated at 32 (FIGURES 4, 5 and 6), is disposed in the upper door frame 18 above the door leaves 20 and 22 for opening and closing thereof as will be hereinafter set forth. The frame 18 may be suitably constructed to provide accessibility for the operator unit 32 for facilitating insulation thereof, as is well known. The door operator unit 32 extends substantially throughout the entire length of the frame 18, and comprises two substantially identical half-sections, with one section thereof being of a reversed operation from the second section. The half-section of the unit 32 in association with the door leaf 20 is depicted herein, it being understood that the second half-section is identical thereto but reversed therefrom, as will be hereinafter set forth in detail.

The unit 32 comprises a motor 34 suitably electrically connected to a switch mat 36 in any well known manner (not shown) for actuation thereby. Of course, suitable hand rails 37 may be provided on the opposed sides of the doorway 12, as is well known, and an electric eye device (not shown), or the like, may be utilized for actuation of the motor 34 in lieu of the mat 36, if desired. The switch mat 36 is activated when a person steps on any portion thereof, regardless of the direction or side of the doorway 12, and the motor 34 is actuated thereby for rotating a motor drive shaft 38. The drive shaft 38 may be connected with a reduced neck portion 40 of a ball screw 42 by a coupling device 44, which may be of any suitable type for transmitting rotation to the ball screw 42. The reduced neck portion 40 of the screw 42 is supported by a self-aligning type of bearing 46 in order to compensate for any mis-alignment in the disposition of the screw 42 and to provide a free rotation for the screw 42.

The motor 34 may be mounted on a bracket 48 which spans the distance between a pair of longitudinally extending spaced rail members 50 and 52. The rail members 50 and 52 are supported on or secured to a bottom plate member 54 which may be carried by or a part of the door frame 18, and extend therealong for a purpose as will be hereinafter set forth. The bearing 46 may be

mounted on a similar bracket 56 which also spans the distance between the rails 50 and 52. It is preferable that both the motor 34 and the bearing 46 be mounted on suitable shock absorbers, or the like, such as the rubber pads 58, to provide a smooth and quiet operation for the unit 32.

As hereinbefore set forth, only a half-section of the door operator unit 32 is depicted in FIGURES 5 and 6, and the motor 34 is preferably centrally disposed in the frame 18 substantially above the juncture between the door leaves 20 and 22. It is to be understood that a second drive shaft (not shown) similar to the drive shaft 38 extends outwardly from the motor 34 in an opposite direction and is similarly coupled with a second ball screw (not shown). Of course, the drive shaft 38 may extend through the motor 34 and project outwardly from the opposite sides thereof to provide the two drive ends or shafts for the motor, if desired. The opposed drive shafts are rotated simultaneously upon actuation of the motor for transmitting simultaneous rotation to the respective ball screws. It is to be noted that the two ball screws are preferably substantially identical with one of the screws being a left hand screw, whereas the other thereof is a right hand screw. This arrangement provides the motive power for opening the door leaves 20 and 22 in opposite directions in a manner as will be hereinafter set forth. The half-section of the operator 32 depicted herein is duplicated in reverse in the other half-section.

The free end or outer extremity of the ball screw 42 is provided with a reduced stem member 55 which is supported in a suitable self-aligning bearing 57 carried by a bracket 59 secured to the bottom plate member 54. The bearing 57 is preferably shock mounted or rubber mounted and cooperates with the bearing 46 for supporting the screw 42 and for compensating for any mis-alignment in the installation of the ball screw. Thus, the rotation of the ball screw 42 will be free and smooth during operation of the unit 32.

The ball screw 42 is provided with a continuous spiral groove 60 extending longitudinally along the outer periphery thereof, as is well known, for receiving a ball nut 62 thereon. A plurality of balls 64 contained within the ball nut 62 ride in the groove 60 to provide a substantially frictionless or free wheeling rotational movement between the screw 42 and nut 62. The nut 62 is rigidly secured to a flange bracket member 64 in any suitable manner, such as by a plurality of screws or pins 66, and the flanged bracket 64 is rigidly secured to a slidable bar 68 by a plurality of screws 70. The bar 68 is disposed between two spaced rails 50 and 52 and is thus held against lateral or transverse movement. Thus, the nut 62 is held against rotational movement and rotation of the screw 42 causes the nut 62 to move longitudinally therealong. It will be apparent that rotation of the screw 42 in one direction causes the nut 62 to move in a left hand direction, as viewed in FIGURES 5 and 6, whereas rotation of the screw 42 in an opposite direction causes the nut 62 to travel in a reverse or right hand direction therealong. The reciprocation of the nut 62 along the screw 42 is transmitted to the slide bar 68 through the connection therebetween provided by bracket 64.

As clearly shown in FIGURE 4, the rails 50 and 52 are each provided with a longitudinally extending V-shaped groove 72 and 74, respectively, on the inner edge portions thereof. The slide bar 68 is provided with complementary V-shaped grooves 76 and 78 extending longitudinally along the opposed side edges thereof, and in substantial alignment with the grooves 72 and 74, respectively. The complementary grooves provide longitudinally extending passageways between the bar 68 and each of the rails 50 and 52 for receiving a plurality of balls 80 therein. The balls 80 may be retained within the passageways or in the grooves 76 and 78 by suitable retaining pins 82, or the like, secured to the slide bar 68 and

disposed at the outer extremities of the grooves 76 and 78. Upon assembly of the slide bar 68 between the rails 50 and 52 the complementary pairs of grooves 72-76 and 74-78 support the balls 80 and the pins 82 preclude loss of the balls at the open ends of the grooves 76 and 78. Thus, the balls are securely retained in the complementary grooves between the slide bar and the rails at all times. The balls 80 roll in the complementary V-shaped grooves as the bar 68 reciprocates between the rails, thus providing a free wheeling or substantially frictionless movement therebetween for facilitating the smooth and easy operation of the operator unit 32.

A pin member 84 (FIGURE 5) is carried by the bar 68 and extends downwardly therefrom through a longitudinal groove 86 (FIGURE 6) provided in the bottom plate 54. The pin 84 extends downwardly through the groove 86 and into a door guide pivot member 88. The pin 84 is supported in the guide pivot 88 by a suitable swivel type ball aligning bearing 90 whereby any abnormal twisting or weight loads can be compensated for, as well as elimination of any possible binding or friction which may result in mis-alignment. The door guide pivot 88 is suitably installed in the upper edge 92 of the door leaf 20, and is preferably disposed substantially in the lateral center of the leaf 20 whereby rotation of the leaf will be about a centrally disposed vertical axis. Lateral movement of the vertical pivot axis, therefore, is confined to a rectilinear path by virtue of the groove 86.

A vertical hinge pin or shaft 94 (FIGURE 5) is disposed in the door jamb 14 in any well known manner, and is preferably mounted in a pair of spaced ball bearing support member 96 and 98 for free rotation therein. An upper hinge arm 100 is secured to the upper end of the hinge shaft 94 and extends radially outwardly therefrom into a recess 102 provided in the upper end 92 of the door section 20. A pivot pin 104 is threadably secured to the outer extremity of the hinge arm 100 and extends downwardly therefrom into a suitable bearing support member 106 disposed in the recess 102. A lower hinge arm 108 is secured to the lower end of the hinge shaft 94 and extends radially therefrom into a groove or recess 110 provided at the lower end 112 of the door leaf 20. A pivot pin 114 is suitably secured in the recess 110 in substantial axial alignment with the upper pivot pin 104 and extends downwardly into a suitable ball bearing member 116 carried in the lower hinge arm 108. The lower pivot pin 114 cooperates with the upper pivot pin 104 for connecting the hinge arms 100 and 108 between the hinge shaft 94 and door leaf 20 for supporting the door leaf and providing an offset pivot axis for the hinge arms 100 and 108.

As shown in FIGURE 6, the rails 50 and 52 terminate at 118 slightly spaced from the left hand end of the door frame 18. A pair of suitable switches 120 and 122 are secured to the bottom plate 54 slightly spaced from the ends 118 of the rails 50 and 52. As the slide bar 68 moves in a left hand direction as viewed in the drawings, the bar is moved into sequential contact with the actuating members 124 and 126 of the switches 120 and 122, respectively, for activating the switches in sequence. The switch 120 is arranged electrically with respect to the motor 34 to reduce the operating speed thereof upon contact by the bar 68, thus reducing the speed of travel of the bar. The switch 122 is so arranged electrically with respect to the motor 34 to stop the activation thereof upon contact by the bar 68, thus stopping the movement of the bar. As is well known, a series of suitable relays (not shown) are provided for holding the motor 34 in this position, and thus retain the bar 68 in the stopped position as long as the switching mat 36 is engaged. When the switching mat 36 is released or disengaged, the direction of operation of the motor 34 is automatically reversed through the relays for reversing the direction of rotation of the drive shaft 38 and moving the bar 68 in a reverse direction and out of contact with the switches

120 and 122. This switching arrangement controls the opening of the door leaf 20.

A pair of similar control switches 128 and 130 are provided on the rail 52 and spaced slightly from the bearing member 46. The bar 68 strikes the actuating members 132 and 134 of the switches 128 and 130, respectively, in sequence for activation of the switches. The switch 128 is connected with the motor 34 for slowing the speed thereof upon contact by the bar, and the switch 130 is suitably connected with the motor 34 for stopping the actuation thereof upon contact by the bar 68, thus controlling the closing of the door leaf 20.

As hereinbefore set forth, the two half-sections of the door operator unit 32 are substantially identical but reverse in operation. Thus, actuation of the motor 34 in one direction causes the door leaf 20 to rotate in a clockwise direction toward an open position while the door leaf 22 simultaneously rotates in a counter-clockwise direction toward an open position. The reciprocal movement of the slide bar 68, and the counter-part thereof (not shown) in the second half-section of the unit 32, move the door leaves 20 and 22 laterally in the doorway 12 to a position adjacent the respective door jambs 14 and 16. Activation of the motor 34 in a reverse direction causes the door leaf 20 to rotate in a counter-clockwise direction toward a closed position while the door leaf 22 simultaneously rotates in a clockwise direction toward a closed position, and the reciprocating slide bars move the door leaves in a direction toward each other.

The electrical relays (not shown) and controls (not shown) are of any suitable type and electrically connected in any well known manner for automatically reversing the operation of the motor 34 in the event the door leaves 20 and 22 are closing and a pedestrian approaching the door 10 treads on the mat 36. In this event, the energization of the switching mat 36 by the pedestrian causes the motor 34 to automatically reverse in its operation to stop the closing movement of the door leaves and initiate the opening movement thereof. This assures that the door leaves will not accidentally close on the pedestrian traffic being served by the two way automatic door 10.

Operation

When it is desired to provide a two way automatic door for a single door opening, or single doorway, the door unit 10 may be installed in the single doorway 12 whereby the doorway opening is filled with the two vertically disposed door leaves 20 and 22. The door sections or leaves 20 and 22 are so arranged with respect to the upper door frame 18 and door jambs 14 and 16 as to pivot about a centrally disposed vertical axis and simultaneously move laterally in the doorway. The door leaves simultaneously rotate and move laterally in opposite directions. In the opening operation, the door leaves move in a combined rotational and lateral movement toward the opposed door jambs 14 and 16 to provide a full opening thereof against the respective jambs. In the closing operation, the door leaves move in a combined rotational and lateral movement toward each other to fill the doorway 12 and provide a closed position for the door 10.

Any suitable type remote control switching apparatus may be provided for energizing the door operator unit 32, and the particular switching apparatus depicted herein is the switching mat 36. Furthermore, any suitable type of door operator unit may be utilized to provide the power for opening and closing the door leaves 20 and 22. Hydraulic means, pneumatic means, mechanical means including drum and cable means, rack and gear means, or the like, may be utilized in lieu of the particular operator arrangement depicted herein. The important feature is the combined rotational and lateral movement of the door sections in a manner to provide a minimum path of travel for the door ends and to maintain the least interference with the pedestrian traffic passing through the door 10.

As depicted herein, the motor 34 is activated when the

switch mat 36 is energized by a person approaching the door 10 and stepping or treading on the mat. The energization of the motor 34, with the door leaves 20 and 22 in the closed position, causes the ball screw 42 to rotate in a direction for moving the ball nut 62 toward the door jamb 14. This movement of the nut 62 moves the slide bar 68 in a left hand direction, as viewed in the drawings, and simultaneously pulls the pivot pin 84 in the slot 86 in a direction toward the door jamb 14. This action causes the door leaf 20 to start to move in a lateral direction, which in turn causes the offset hinge arms to pivot about the offset pivot axis determined by the pivot pins 104 and 114. This pivot action of the offset hinge arms causes the door leaf 20 to rotate about the pivot pin 84 whereby the leaf 20 is free to move laterally toward the door jamb. The leaf 20 continues to pivot and move laterally in the doorway 12 until the slide bar 68 has moved a sufficient distance to contact the activating element 124 of the switch 120.

When the switch 120 is energized by the contact of the bar 68, the speed of the motor 34 is reduced to simultaneously reduce the speed of rotation of the screw 42. The reduction of rotational speed of the screw slows the speed of the sliding movement of the bar 68 for reducing the over-all speed of the door leaf 20. When the bar 68 has moved further along the rails 50 and 52, and contacts the activating member 126 of the switch 122, the operation of the motor 34 is stopped, and the relays (not shown) are utilized for holding the door leaf 20 in the opened position against the jamb 14 until such a time as the person walking through the door on the mat 36 has completely disengaged the mat. When the mat is disengaged, or released, the operation of the motor 34 is reversed.

The reverse operation of the motor reverses the direction of rotation of the screw 42, which in turn reverses the direction of travel of the bar 68, thus moving the pin 84 in the slot 86 in a reverse direction, or toward the center of the doorway 12. This reverses the action of the offset hinge arms 100 and 108, whereby the leaf 20 rotates and moves laterally in the doorway in a reverse direction and toward the closed position. It will be apparent that the door leaf 22 is simultaneously operated in a reverse manner with respect to the leaf 20. The leaf 22 simultaneously opens against the door jamb 16 upon opening of the leaf 20, and simultaneously moves to the closed position with the closing of the leaf 20.

The ball screw 42 and cooperating ball nut 62 in combination with the balls 80 interposed between the sliding bar 68 and rails 50 and 52 provide a substantially frictionless or free wheeling drive for the opening and closing of the door leaves. Thus, in the event the motor 34, or the switching mat 36 are inoperative for any reason, such as upon an electrical power failure, the door leaves 20 and 22 may be readily opened and closed manually with relatively little force or effort, which greatly improves the over-all efficiency and desirability of the door unit 10.

From the foregoing, it will be apparent that the present invention provides a novel two way automatic door for a single door opening whereby traffic moving through the doorway in both directions may be served equally efficiently. The novel door is provided with two vertically disposed door leaves in the single door opening, each adapted to open and close through a combined rotational and lateral movement. The door leaves are of a balanced type construction for equalizing the forces acting thereon to facilitate the opening and closing thereof regardless of pressure conditions. The door operator may be actuated by a person approaching the door from either direction for automatically opening the door without danger of bodily harm to a person approaching the door from the opposite direction. The particular door operator depicted herein is provided with a substantially frictionless drive mechanism for facilitating the smooth and quiet door operation, and providing for ease of manual operation in

the event of an electrical power failure, or the like. The novel two way automatic door is simple and efficient in operation and economical and durable in construction.

Changes may be made in the combination and arrangement of parts as heretofore set forth in the specification and shown in the drawings, it being understood that any modification in the precise embodiment of the invention may be made within the scope of the following claims without departing from the spirit of the invention.

I claim:

1. In a two way automatic balanced door, a door frame, a pair of leaves mounted in said door frame, each door leaf constituting a single rigid panel and being provided with an upper offset hinge arm and a lower offset hinge arm, means pivotally mounting one end of each arm to said door frame, means pivotally mounting the other end of each arm to its associated door leaf in offset relation therewith, each door leaf having a centrally disposed vertical pivot axis, guide means in said door frame for confining the movement of each pivot axis to a rectilinear movement, a motor, free wheeling means for each door leaf actuated by the motor for translating rotational movement to reciprocal movement, substantially frictionless means reciprocated by each free wheeling means and connected with the pivot axes of the door leaves for providing alternate opened and closed positions therefor.

2. In a two way automatic balanced door, a door frame, a pair of leaves mounted in said door frame, each door leaf constituting a single rigid panel and being provided with an upper offset hinge arm and a lower offset hinge arm, means pivotally mounting one end of each arm to said door frame, means pivotally mounting the other end of each arm to its associated door leaf in offset relation therewith, each door leaf having a centrally disposed vertical pivot axis, guide means in said door frame for confining the movement of each pivot axis to a rectilinear movement, a motor, free wheeling means for each door leaf actuated by the motor for translating rotational movement to reciprocal movement, substantially frictionless means reciprocated by each free wheeling means and connected with the pivot axes of the door leaves for reciprocation thereof in opposite directions, said offset hinge arm means supporting each door leaf and cooperating with the frictionless means to provide a combined rotational and lateral movement for the door leaves for alternate opening and closing of the door.

3. In a two way automatic balanced door, a door frame, a door constituting a single rigid panel mounted in said door frame, offset hinge arm means pivotally connected at one end to said frame and at the other end to said door, said door having a centrally disposed vertical pivot axis, guide means in said door frame for confining the movement of said pivot axis to a rectilinear movement, a door operator comprising a motor, ball bearing screw means rotated by the motor, ball nut means carried by the ball screw and held against rotation whereby the ball nut means moves reciprocally upon rotation of the screw means, ball bearing slide bar means secured to the ball nut means for reciprocation thereby, means for connecting the pivot axis of the door with the ball bearing slide bar means for alternate opening and closing of the door upon reciprocation of the slide bar means.

4. In a two way automatic balanced door, a door frame, a pair of leaves mounted in said door frame, each door leaf constituting a single rigid panel and being provided with an upper offset hinge arm and a lower offset hinge arm, means pivotally mounting one end of each arm to said door frame, means pivotally mounting the other end of each arm to its associated door leaf in offset relation therewith, each door leaf having a centrally disposed vertical pivot axis, guide means in said door frame for confining the movement of each pivot axis to a rectilinear movement, a door operator comprising a motor, ball bearing screw means for each door leaf rotated by the

motor, ball nut means carried by each ball screw and held against rotation whereby each ball nut means moves reciprocally upon rotation of its associated screw means, ball bearing slide bar means secured to each ball nut means for reciprocation thereby, means for connecting the pivot axis each door leaf with its associated slide bar means for reciprocation thereby in alternate directions for opening and closing of the door.

5. In a two way automatic balanced door, a door frame, a pair of leaves mounted in said door frame, each door leaf constituting a single rigid panel and being provided with an upper offset hinge arm and a lower offset hinge arm, means pivotally mounting one end of each arm to said door frame, means pivotally mounting the other end of each arm to its associated door leaf in offset relation therewith, each door leaf having a centrally disposed vertical pivot axis, guide means in said door frame for confining the movement of each pivot axis to a rectilinear movement, a door operator comprising a motor, ball bearing screw means for each door leaf rotated by the motor, ball nut means carried by each screw means and held against rotation for reciprocation thereby, ball bearing slide bar means secured to each ball nut means for reciprocation thereby, means for connecting the pivot axis of each door leaf with its associated slide bar means for cooperation with the offset hinge means to provide a combined rotational and lateral movement of the leaves in opposite directions for opening and closing of the door.

6. In a two way automatic balanced door, a door frame, a pair of leaves mounted in said door frame, each door leaf constituting a single rigid panel and being provided with an upper offset hinge arm and a lower offset hinge arm, means pivotally mounting one end of each arm to said door frame, means pivotally mounting the other end of each arm to its associated door leaf in offset relation therewith, each door leaf having a centrally disposed vertical pivot axis, guide means in said door frame for confining the movement of each pivot axis to a rectilinear movement, free wheeling means for each door leaf actuated by the motor for translating rotational movement into reciprocal movement, substantially frictionless means reciprocated by each free wheeling means, means connecting the pivot axis of each door leaf with its associated frictionless means for cooperating with the offset hinge arm means in one direction of reciprocation to provide a combined rotational and lateral movement for each door leaf in opposite directions for opening of the door, said frictionless means and offset hinge arm means cooperating upon an opposite direction of reciprocation for the frictionless means to provide opposite combined rotational and lateral movements for each door leaf for closing of the door.

7. In a two way automatic balanced door, a door frame, a pair of leaves mounted in said door frame, each door leaf constituting a single rigid panel and being provided with an upper offset hinge arm and a lower offset hinge arm, means pivotally mounting one end of each arm to said door frame, means pivotally mounting the other end of each arm to its associated door leaf in offset relation therewith, each door leaf having a centrally disposed vertical pivot axis, guide means in said door frame for confining the movement of each pivot axis to a rectilinear movement, a motor, ball screw means for each door leaf actuated by the motor, ball nut means carried by each screw means and held against rotation for translating rotational movement into reciprocal movement, ball bearing slide bar means secured to each ball nut means and reciprocated thereby, means connecting each slide bar means with the respective central pivot axis of each door leaf for cooperation with the offset hinge arm means in one direction of reciprocation to provide opposite combined rotational and lateral movements for the door leaves to open the door, said slide bar means and offset hinge means cooperating upon reciprocation of the slide bar means in an opposite direction to provide op-

11

posite combined rotational and lateral movement for the
door leaves to close the door.

References Cited by the Examiner

UNITED STATES PATENTS

1,469,165	9/1923	Marsh	268—31
1,822,042	9/1931	Kohl et al.	268—33
2,019,528	11/1935	Ellison	20—16

5

12

2,242,706	5/1941	Hanson	268—63
2,298,158	10/1942	Piron	268—62
2,366,048	12/1944	Opelek	268—63
2,581,783	1/1952	Bates	20—16
2,661,945	12/1953	Hamilton	268—63

HARRISON R. MOSELEY, *Primary Examiner.*JEROME SCHNALL, *Examiner.*