United States Patent

Catlett

[15] **3,675,370**

[45] **July 11, 1972**

[54] AUTOMATIC BALANCED DOOR WITH CONCEALED DRIVE

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[73] Assignees: **James R. Gilson**, Memphis, Tenn.; **Sam Horwitz**, Chicago, Ill. ; part interest to each

[22] Filed: **June 1, 1970**

[21] Appl. No.: **41,850**

[52] **U.S. Cl.** **49/253**, 49/141, 49/280, 49/340

[51] **Int. Cl.** **E05d 15/28**, E05f 15/12

[58] **Field of Search** 49/141, 253, 334, 340, 264, 49/280, 137

[56] **References Cited**

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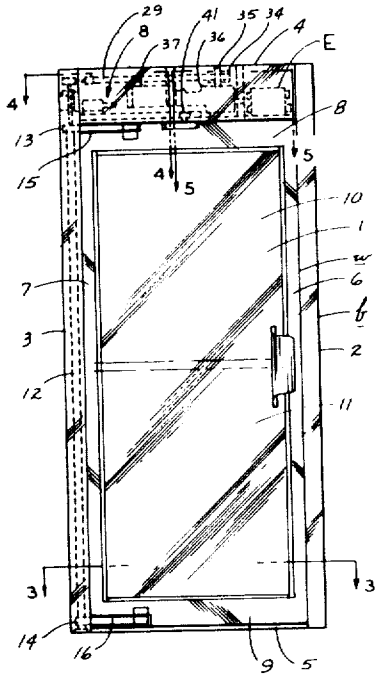
Primary Examiner—J. Karl Bell

Attorney—Ralph W. Kalish

[57] **ABSTRACT**

An automatic balanced door comprising in combination a door frame having a header, a door having a balanced hinge arrangement provided within said frame and including a main hinge shaft and a power operator provided within said header. Motion transmitting means located within said header connecting said power operator and said main hinge shaft. A latch assembly operable responsive to movement of the customary guide roller; said latch assembly being connected to the motor unit and being disposed within said header. A block demountably disposed upon said door leaf and carrying said guide roller for displacement from said door when the latter is caused to swing in a direction opposite from that intended.

10 Claims, 17 Drawing Figures



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SHEET 1 OF 9

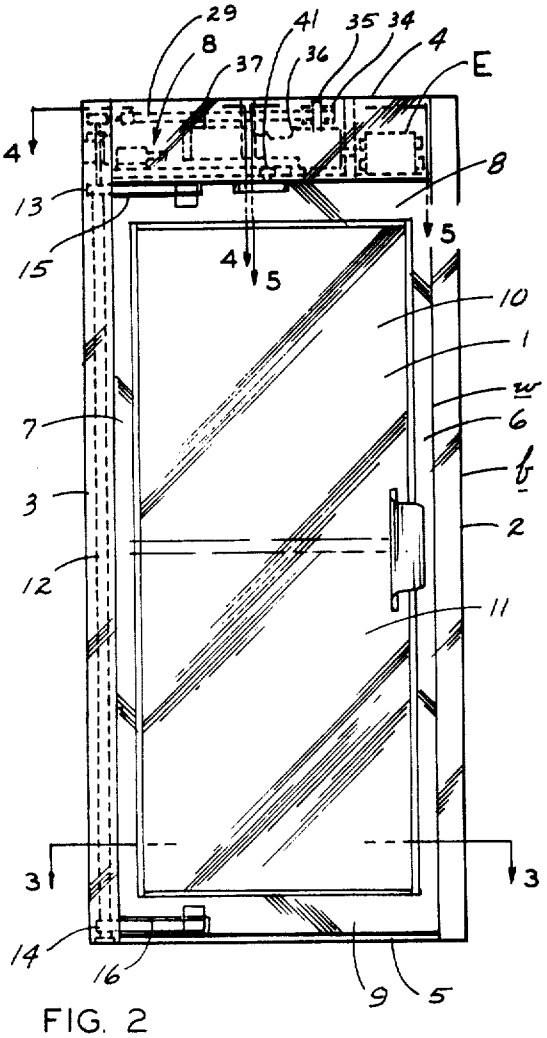


FIG. 2

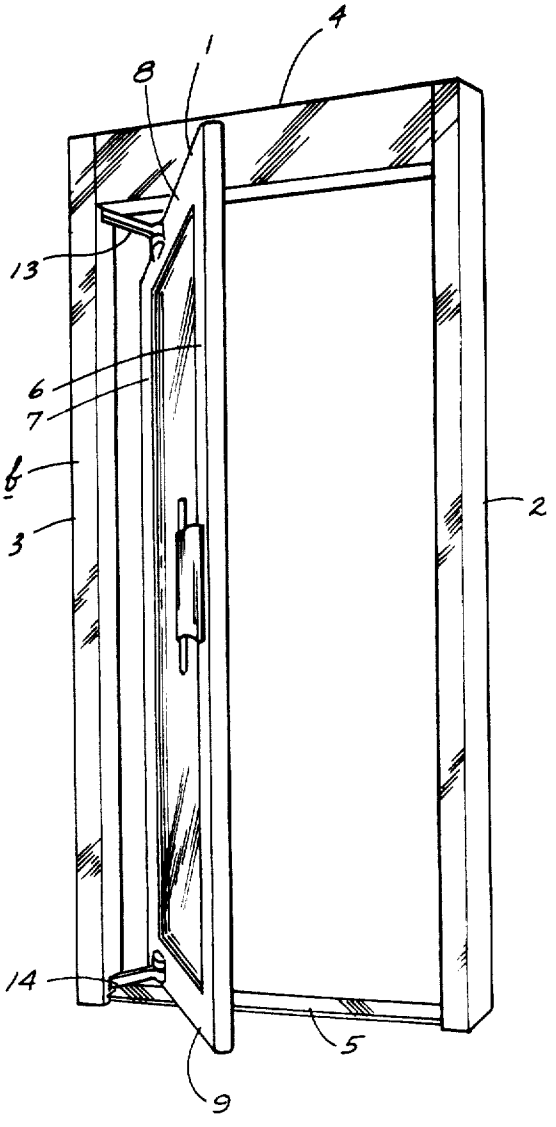


FIG. 1

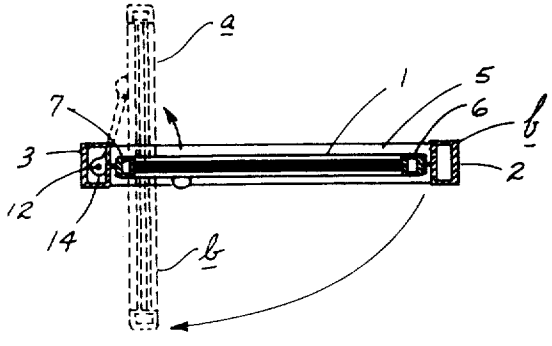


FIG. 3

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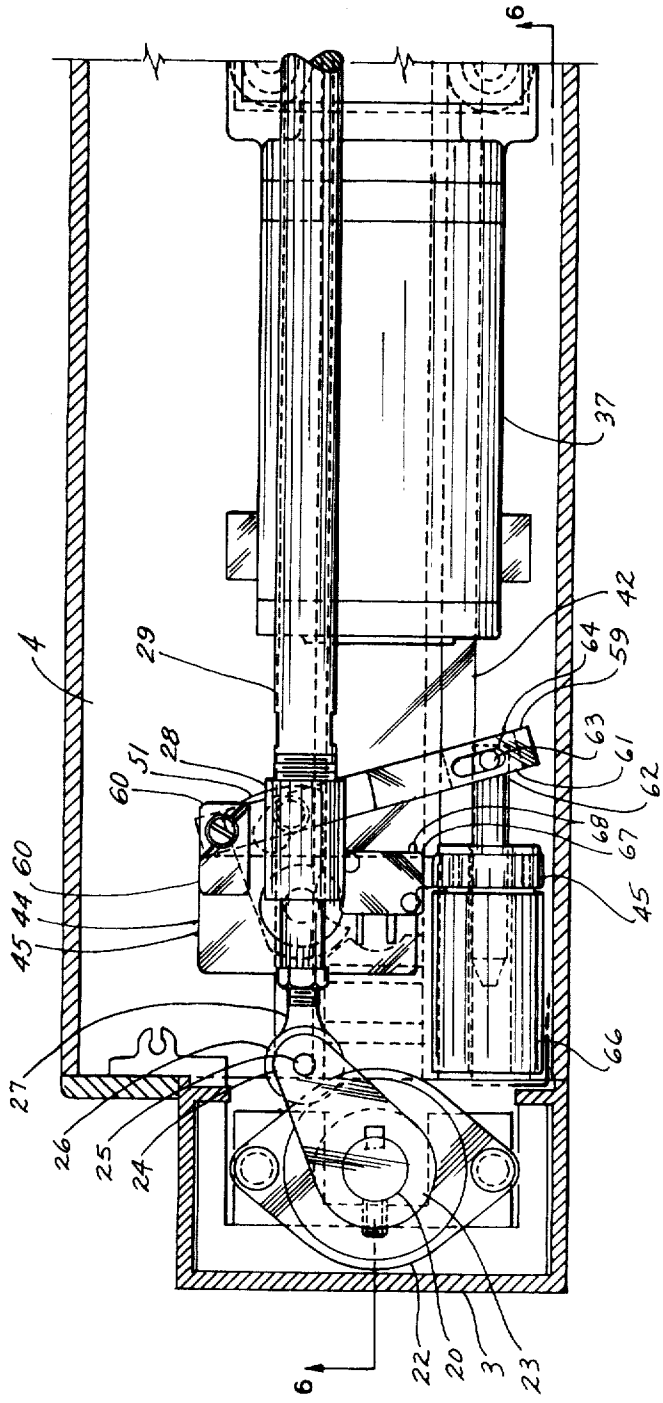


FIG. 4

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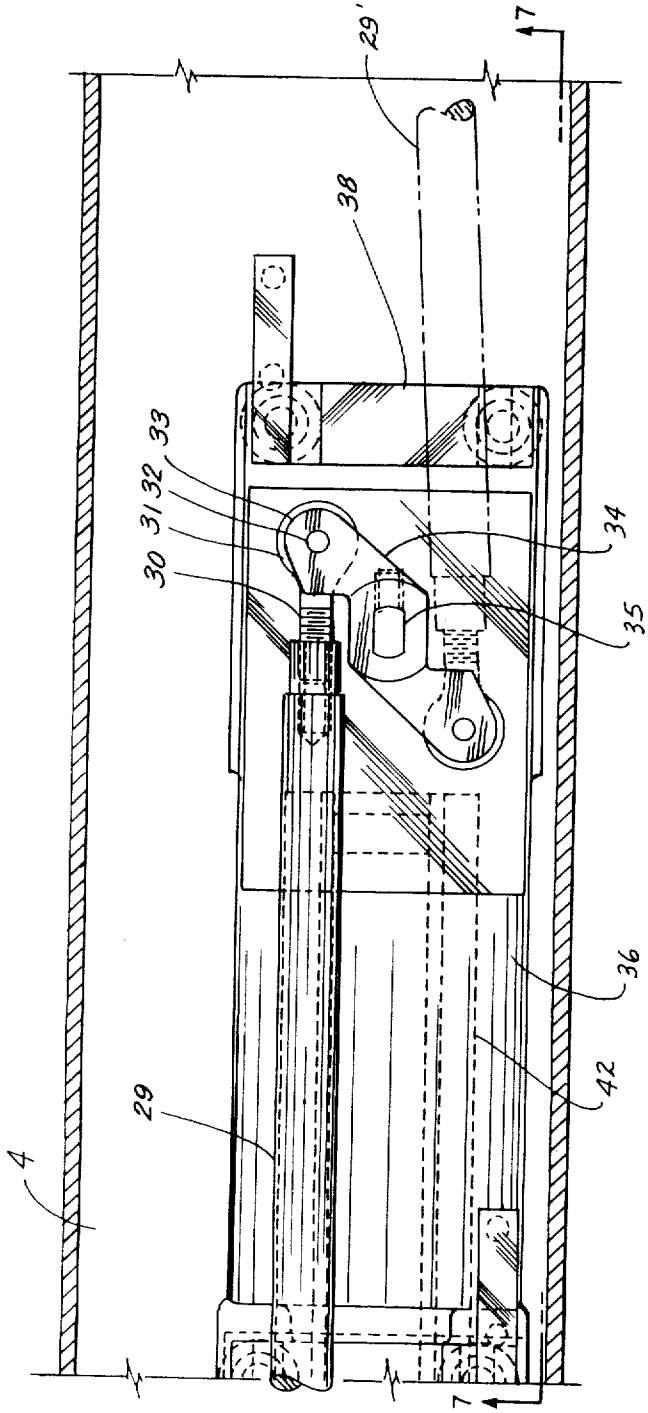


FIG. 5

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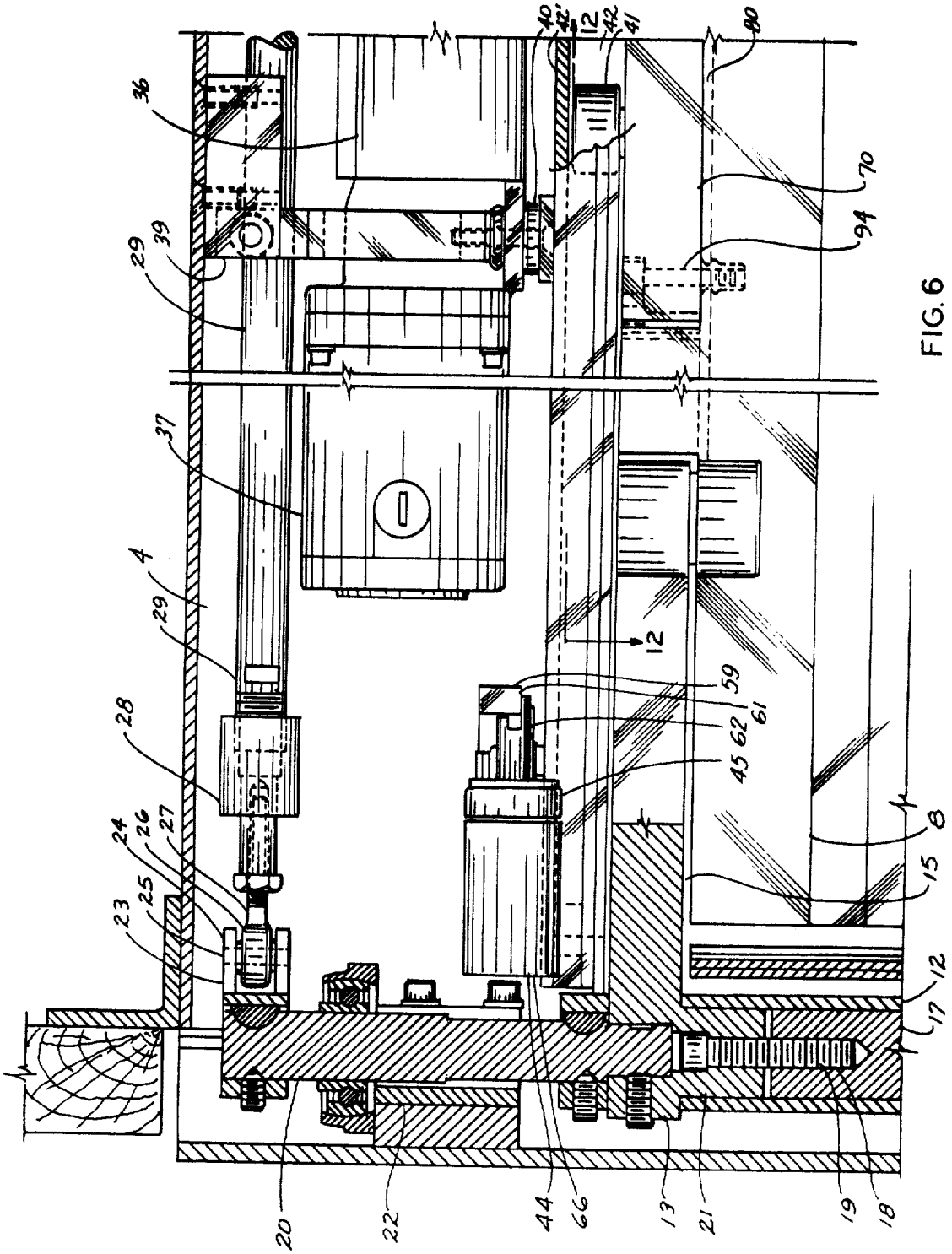


FIG. 6

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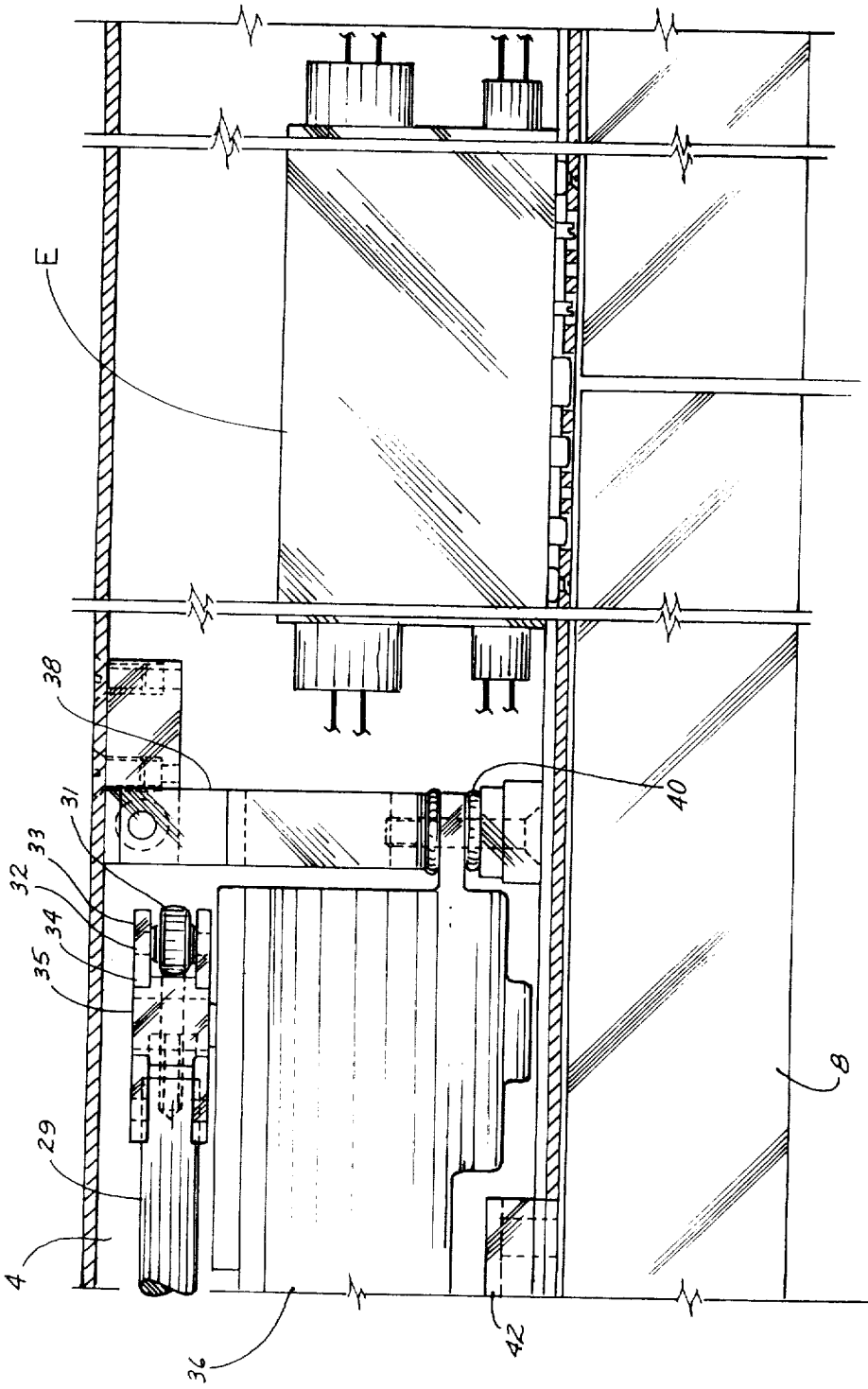


FIG. 7

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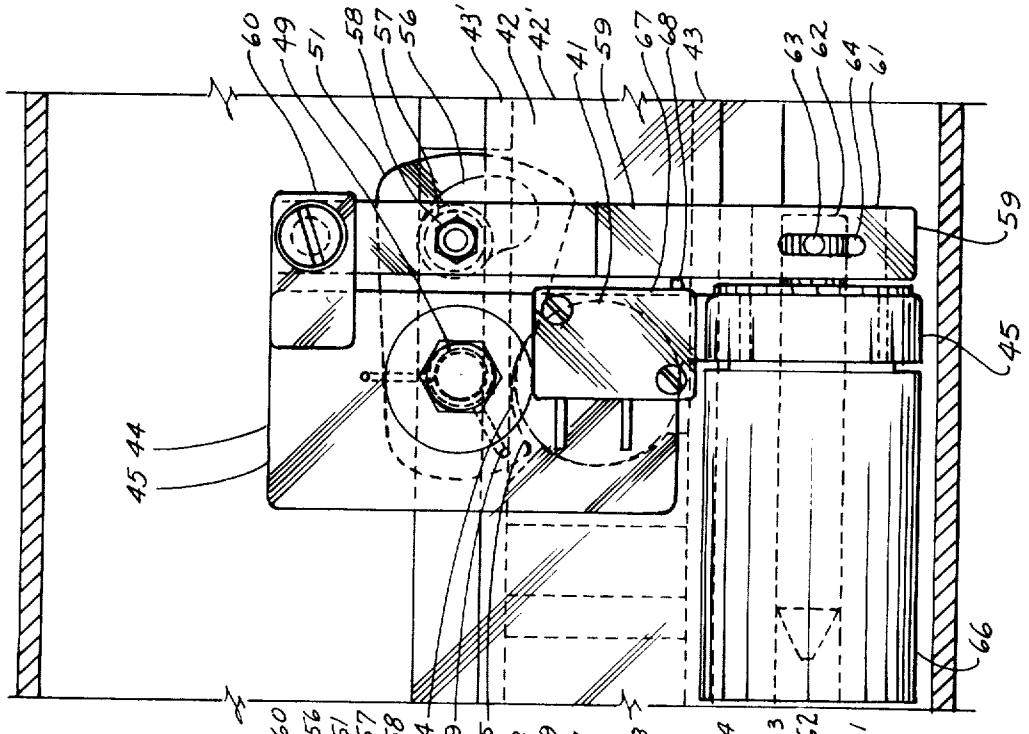


FIG. 9

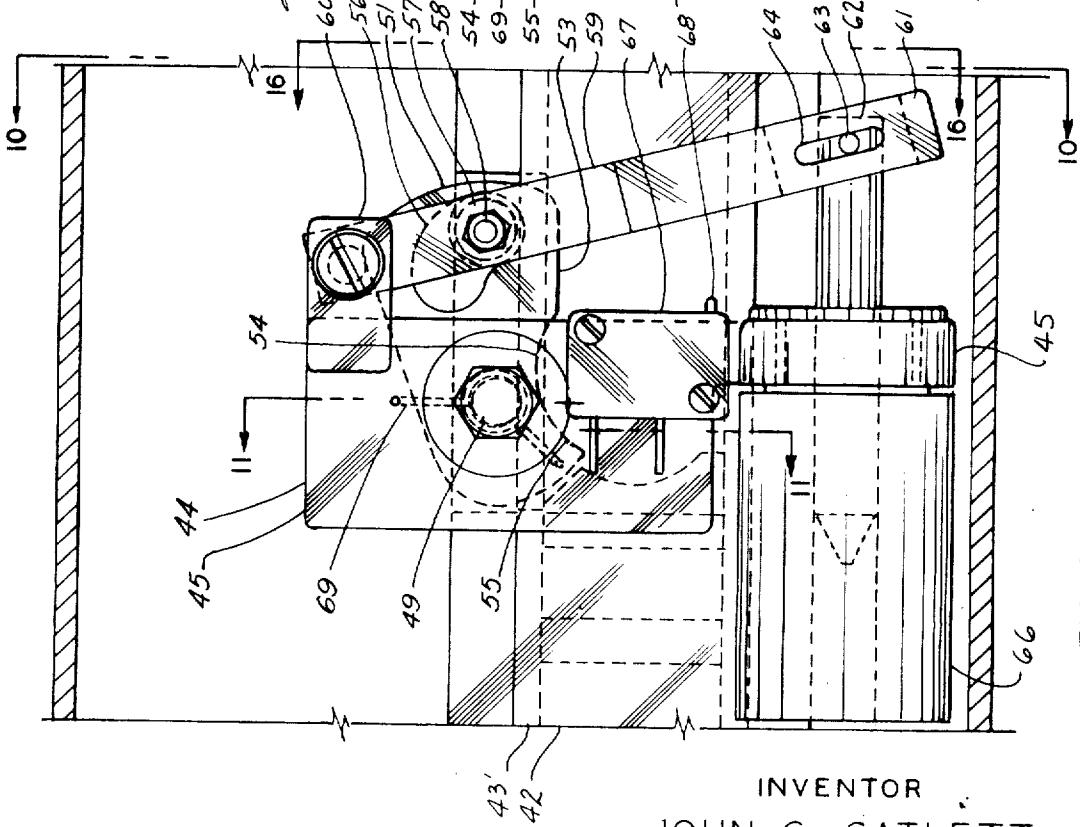


FIG. 8

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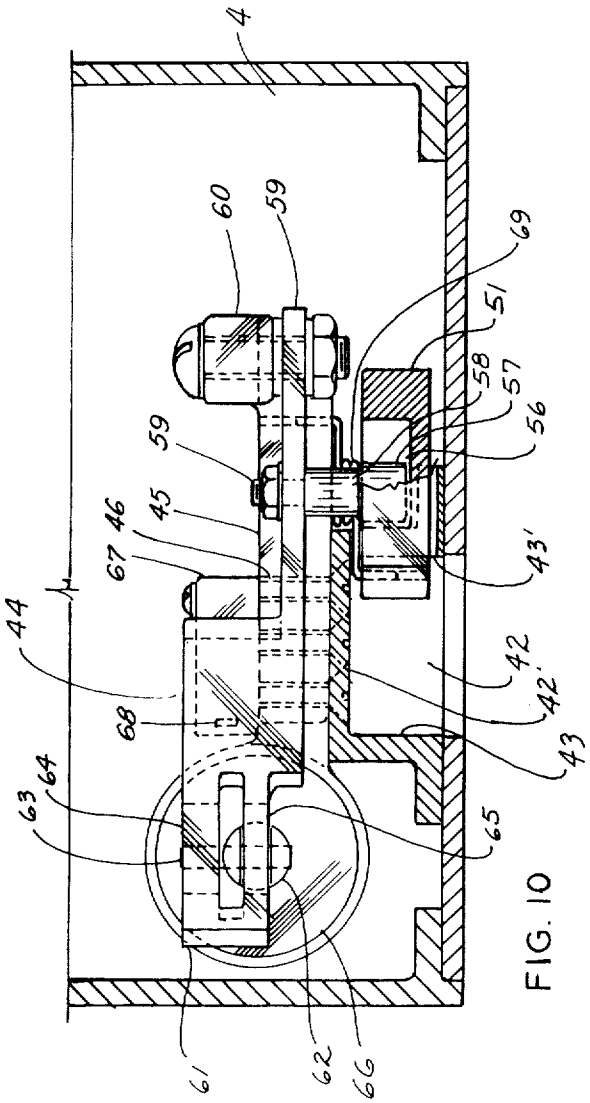


FIG. 10

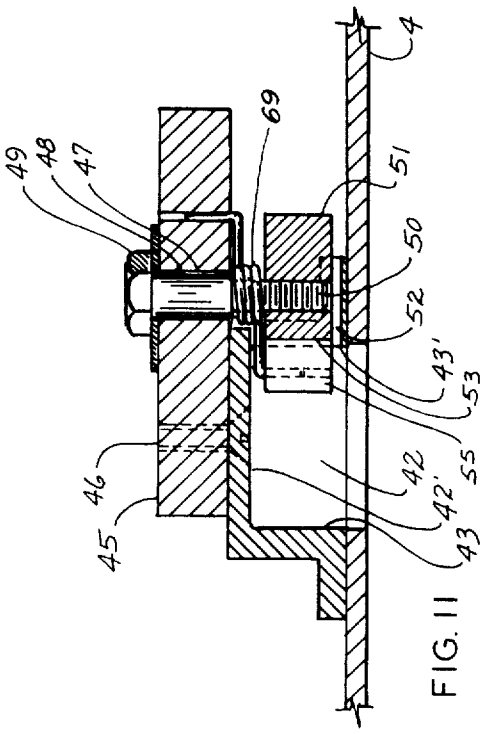


FIG. 11

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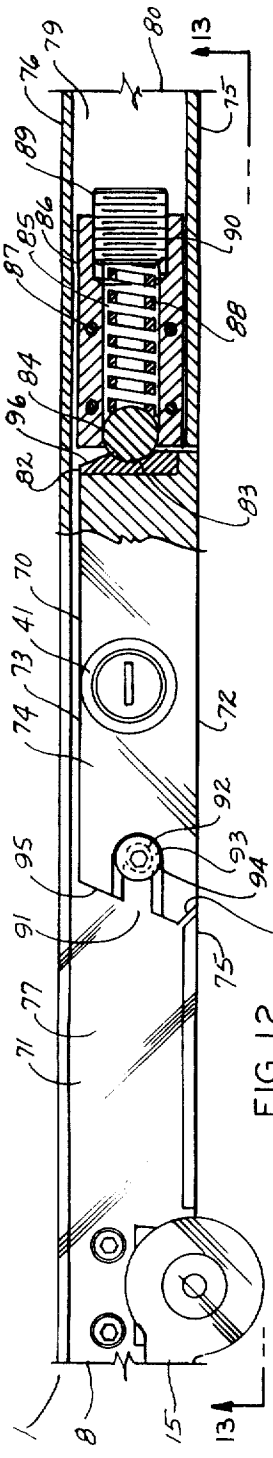


FIG. 12

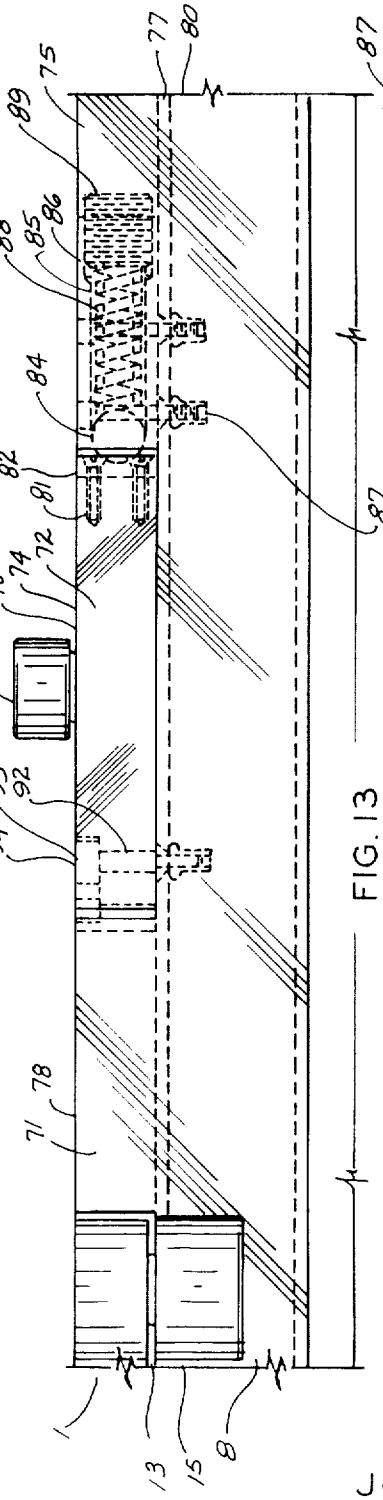


FIG. 13

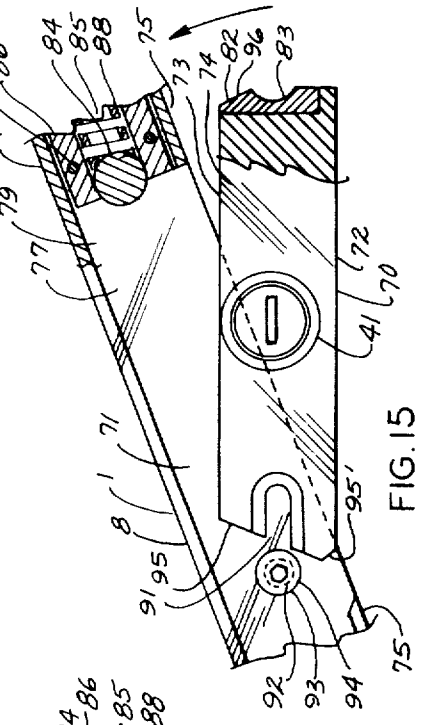


FIG. 15

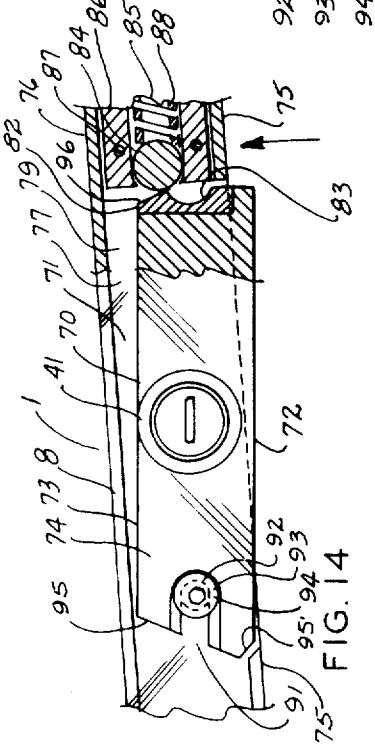


FIG. 14

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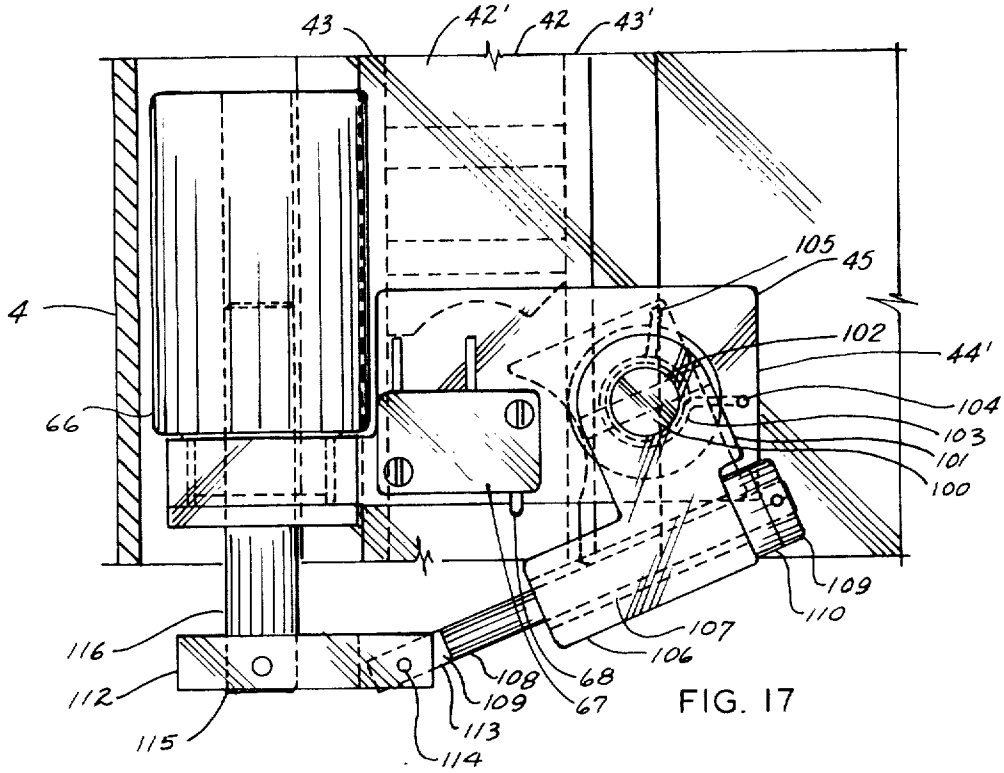


FIG. 17

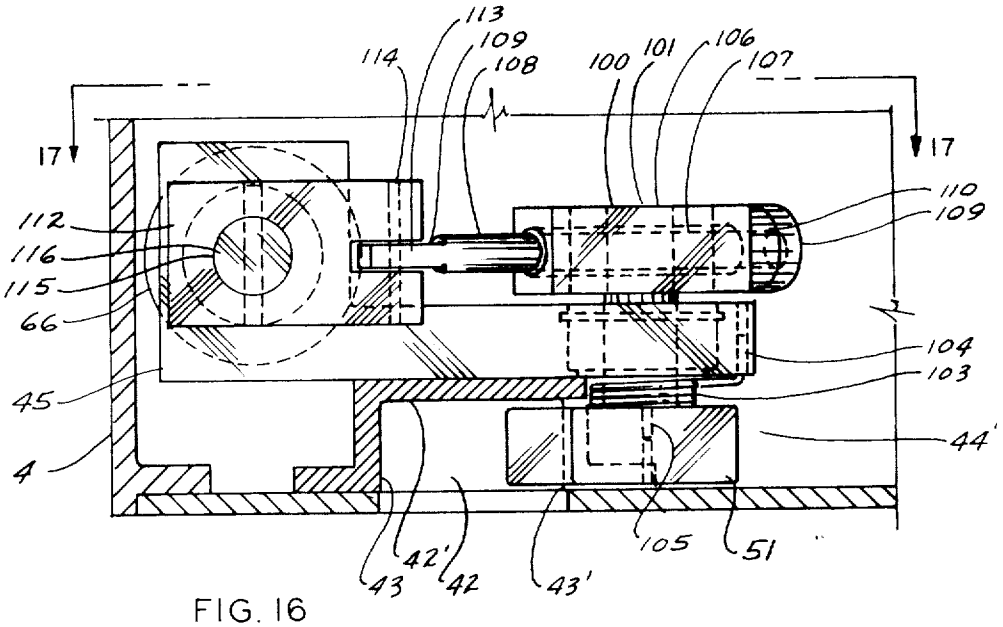


FIG. 16

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AUTOMATIC BALANCED DOOR WITH CONCEALED DRIVE

BACKGROUND OF THE INVENTION

Heretofore, automatic balanced doors have been normally operated by power units located within the header of the door frame and connected to the door through a two-piece drive arm located outwardly of the frame to one side of the door. For effecting proper disposition of the drive arm, the frame necessarily had to be of the so-called "offset" type so that problems in mounting doors of this character has been continuously encountered. Additionally, the exposure of the drive arm has proved objectionable from an aesthetic, architectural standpoint.

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide an automatic balanced door for disposition within a frame with means located within the header of said frame for effecting operation of the door and thereby obviating the need to incorporate drive components presented outwardly of the frame.

It is another object of the present invention to provide an automatic balanced door which incorporates novel motion transmitting means for effecting rotation of the main shaft of the door through operation of a power unit located concealedly within the header.

It is a further object of the present invention to provide an automatic balanced door incorporating a latch assembly within the door header for controlling door closing operation consequent to travel of a guide member.

It is a still further object of the present invention to provide an automatic balanced door incorporating a member supporting a guide component and being demountably carried by the door so that under emergency conditions displacement of the guide component may be caused to allow swinging of the door in the normally reverse direction without damage thereto.

It is another object of the present invention to provide an automatic balanced door of the character stated, which is most compact; which is durable and efficient in usage; which is aesthetically appealing in that the operating parts are located enclosingly within the header; and which is adapted for use as an emergency exit, obviating necessity of constructing an independent door for such prupose.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view of a balanced door constructed in accordance with and embodying the present invention, illustrating the door in partially open condition.

FIG. 2 is a front view illustrating the door in closed condition.

FIG. 3 is a horizontal transverse sectional view taken on the line 3—3 of FIG. 2 and indicating the path of movement of the door between open and closed conditions.

FIG. 4 is a horizontal transverse sectional view taken on the line 4—4 of FIG. 2.

FIG. 5 is a horizontal transverse sectional view taken on the line 5—5 of FIG. 2 and being continuous with FIG. 4.

FIG. 6 is a vertical transverse sectional view taken on the line 6—6 of FIG. 4.

FIG. 7 is a vertical transverse sectional view taken on the line 7—7 of FIG. 5 and being continuous with FIG. 6.

FIG. 8 is an enlarged top plan view taken from the point indicated in FIG. 2 and illustrating the latch assembly in open condition.

FIG. 9 is a top plan view taken from the same point as FIG. 8, but illustrating the latch unit in closed condition.

FIG. 10 is a vertical transverse sectional view taken on the line 10—10 of FIG. 8.

FIG. 11 is a vertical transverse sectional view taken on the line 11—11 of FIG. 8.

FIG. 12 is a horizontal transverse sectional view taken on the line 12—12 of FIG. 6.

FIG. 13 is a fragmentary front elevational view taken on the line 13—13 of FIG. 12.

FIG. 14 is a fragmentary top plan view taken substantially on the line 12—12 of FIG. 6, but illustrating the emergency release device during its initial operation.

FIG. 15 is a fragmentary view taken substantially on the line 12—12 of FIG. 6 and illustrating the emergency release device in full open condition.

FIG. 16 is a vertical transverse sectional view taken substantially on the line 10—10 of FIG. 8, illustrating another form of latch assembly constructed in accordance with and embodying the present invention.

FIG. 17 is a top plan view taken on the line 17—17 of FIG. 16.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now by reference characters to the drawings which disclose the preferred embodiment of the present invention, 1 generally designates a door for disposition within a doorway *w* defined by a frame *f* comprising vertical jambs 2,3, a header 4, and a base 5. Door 1 may incorporate vertical rails 6,7, and upper and lower leafs 8,9, respectively, which are preferably formed of metal and adapted to receive the edge portions of glass panels 10,11. Said rails and leafs may be desirably produced through extrusion to present interior volumes for purposes presently appearing.

Door 1 is of the balanced type, being related to door frame *f* for swinging about an axis located inwardly of jamb 3, whereby, upon swinging, a part of the door, as indicated at *a* in FIG. 3, will swing inwardly and the other equal part, as indicated at *b*, will swing outwardly, with door 1 being folded back toward jamb 3. Provided interiorly of jamb 3 is a hinge shaft 12 of customary construction being of tubular form (FIG. 6) and terminating at its upper and lower ends adjacent the upper and lower edges, respectively, of the related door leafs 8,9. Suitably fixed to the upper and lower ends of shaft 12 for rotation therewith are the usual upper and lower door pivot arms or levers 13,14, each of which has an effective length substantially one-fourth the transverse extent of door 1, and are receivable within outward recesses 15,16, respectively, formed in the outer face of the related door leaf 8,9. Therefore, when door 1 is in closed position, the outer face of each pivot arm 13,14 will be surfacewise aligned with the associated door leaf. Each pivot arm 13,14 at its outer end is suitably connected by a pivot pin (not shown) to the related door leaf; said pivot pins being vertically aligned for establishing the pivot axis of the door. The particular construction of the pivot assemblies do not form a part of the present invention, but may be of constructions heretofore known in the art.

There may be provided within hinge shaft 12 a head reinforcing beam 17 which, at its upper end is axially tapped, as at 18, for receiving a connector bolt 19 for a shaft extension 20 projecting upwardly into header 4 in axial alignment with shaft 12; the hub portion 21 of pivot arm 13 being suitably engaged to said bolt 19 and to the lower portion of shaft extension 20 (FIG. 6). In its central portion, shaft extension 20 is journalled within an elongated bearing 22 suitably mounted within the side portion of header 4. At the upper end extremity of shaft 20 there is keyed, or otherwise mounted thereon, a crank arm 23 embodying a clevis, as at 24, for supporting a pin 25 for connection to the head 26 of a threaded rod end 27, which latter is suitably engaged as by an adaptor 28 to a rod 29 extending lengthwise of header 4, or in a transverse direction with relation to doorway *w*. At its end, remote from hinge shaft 20, rod 29 is engaged to a threaded connector rod 30 having an enlarged head 31 centrally engaged upon a pin 32, which latter is received at its ends within aligned openings formed in the arms of a clevis 33 integrally provided at one end of a crank 34 rigidly engaged upon the upper end of a drive shaft 35 of a conventional power operator, indicated generally at 36; said drive shaft 35 projecting vertically upwardly thereof. The particular power operator does not form a

part of the present invention and may comprehend transmission systems heretofore known in the art. Power operator **36** is suitably connected to a prime mover or motor **37** located between said power operator **36** and hinge shaft **12**; said prime mover **37** being preferably of the well known direct current type. Power operator **36** and prime mover **37** are suitably maintained in desired positionment by connection to supports, indicated broadly at **38**, **39**, which latter are provided with shock-absorbing mounts **40**, as of rubber of the like. A conventional source of electric power E is provided within header **4** and connected by suitable leads (not shown) to power operator **36** and prime mover **37**.

As suggested in phantom lines in FIG. **5**, crank arm **34** may be of dual-type so as to permit of engagement to a companion rod **29'** for operational connection to an adjacent door in the event the present invention is to be utilized for operating a pair of doors. It will thus be recognized that the description of this invention will be restricted to its relationship to a single door but the versatility of the same for effecting joint operation of a pair of doors is to be recognized.

In view of the foregoing, it will be seen that upon energization of motor **37**, as by closure of a switch mat or other circuit establishing devices, shaft **35** will be caused to rotate effecting swinging of crank arm **34** toward jamb **3**, or in a direction counterclockwise, as viewed in FIG. **5**, thereby causing rod **29** to be "pushed" bringing about a swinging of crank arm **23** in a counterclockwise direction, as viewed in FIG. **4**, resulting in rotation of hinge shaft **12** carrying pivot arms **13**, **14** toward the position illustrated in FIG. **1** for door opening action.

Carried upon door leaf **8**, by means to be more fully described hereinbelow, for projection above the upper edge thereof, is a horizontally presented guide roller **41** which is receivable within an elongated downwardly opening guideway **42** provided in the lower central portion of header **4** and which may be of extruded character having a top wall **42'** and front and back walls **43**,**43'**, respectively. As door **1** is moved into open position consequent to swinging of hinge shaft **12**, as above described, roller **41** will be moved relatively within guideway **42** toward hinge shaft **12**; said roller **41** thus serving to provide added connection between door **1** and frame *f*, while coordinating with guideway **42** to prevent misalignment of said door **1** during opening and closing actions. Roller **41** follows a linear path while door **1** is being swung above its pivot axis.

Mounted within header **4** at the end of guideway **42** adjacent shaft **12** is a latch assembly, indicated generally **44**, having a support or mounting bracket **45** secured, as by screws **46**, upon the upper wall **42'** of guideway **42** (FIG. **10**); said mounting bracket **45** extending beyond the forward and rearward sides of guideway top wall **42'**. Said mounting bracket **45** in its rearward portion is drilled to provide a vertical bore **47** for bearingly receiving the smooth shanked portion **48** of a bolt **49**, the lower threaded end of which, as at **50**, is secured to a plate cam **51** planarwise parallel to the bottom portion of header **4** and partially projecting through an opening **52** formed in rearward side wall **43'** of guideway **42** so as to present its operating edge, indicated **53**, within guideway **42** and, hence, within the path of travel of roller **41**. Said operating edge **53** includes a linear portion **54** and an arcuate portion **55**, said latter being formed on such radius as to peripherally accommodate roller **41**. Said cam **51** in its portion normally rearwardly of wall **43'** of guideway **42** is provided with an upwardly opening curvate cam slot **56** within which is disposed a cam follower **57** of general cylindrical form and carried at the lower end of a vertical support stem **58** secured at its upper end within a latch arm **59**. Thus, as plate cam **51** swings about the axis established through bolt **49**, cam follower **57** will be moved relatively within cam slot **56** for controlling the movement of latch arm **59**. Said latch arm **59** is elongated, being presented above guideway top wall **42'** for extension forwardly of side wall **43** and at its rearward end is swingably mounted upon a boss **60** integrally formed with mounting bracket **45**. Latch arm **59** in its forward portion is of relatively increased cross section for accommodating, substantially centrally of its thickness, a relatively wide slot **61** extending from one side to the other of latch arm **59** for freely receiving one end portion of a flat, elongated steel armature **62**; the width of the same being less than that of slot **61** so as to permit relative movement therein. Fixed within armature **62** is a pin **63** which projects upwardly above and downwardly below the proximate faces of said armature **62** for extension through elongated guide apertures **64**,**65** formed within latch arm **59**, in alignment, above and below said slot **61**. Thus, pin **63** at its opposite ends is retained within aperture **64**,**65** for effecting a connection between armature **62** and latch arm **59**, as well as providing for desired coaction upon operation of cam **51** as will be shown below.

Armature **62** at its opposite end portion is received within a solenoid **66** supported from mounting bracket **45**. There is also disposed upon mounting bracket **45** a micro-switch **67** in circuit with prime mover **37** and having an actuator button **68** projecting toward latch arm **59** and being within the same plane thereof for engagement thereby for purposes presently to be described. Encircling bolt **49** is a return spring **69** with one of its ends engaged to cam **51** and its other end engaged to bracket **45**; said spring normally urging cam **51** into the position shown in FIG. **8**.

With door **1** in closed position, latch assembly **44** will be in the position shown in FIG. **8** with armature **62** withdrawn with respect to solenoid **66**; and wherein latch arm **59** will axially define an angle of less then 90° with the longitudinal axis of armature **62**. The linear portion **54** of operating edge **53** of cam **51** will be substantially coaxial with the major axis of header **4**. Micro-switch **67** is in normally closed condition with actuator button **68** being presented outwardly.

With door **1** being opened as through action, for example, of a switch mat and hinge shaft **12** being rotated with arms **13**,**14** moving away from jamb **3**, roller **41** is forced along guideway **42** toward latch assembly **44** and such movement of roller **41** will continue until just before it reaches door open condition when it will engage the linear portion **54** of operating edge **53** of cam **51** which juts partially into its path of travel. Such engagement will direct roller **41** into the arcuate operating edge portion **55** and thereby cause cam plate **51** to be swung about the pivot axis developed by bolt **49**, against the bias of a return spring **69**. By this action, cam follower **57** is moved relatively within cam slot **56** which is so contoured as to cause latch arm **59** to be swung about its pivoted rearward end with one side of its forward end being brought into abutment with the adjacent end face of solenoid **66**. Such movement is effected by the contour of cam slot **56**. The swinging of latch arm **59** assists travel of armature **62** to full inward disposition with respect to solenoid **66** which is energized. As armature **62** is moved into solenoid **66**, upon action of latch arm **59**, the magnetic force developed by the current in solenoid **66** is adequate to retain said armature **62** and to hold latch arm **59** in abutment thereagainst, whereby cam **51** is maintained in roller-engaging state so that the said roller **41** may not at that juncture be withdrawn for door closure. Thus, while latch assembly **44** is in closed condition (shown in FIG. **9**) door **1** will remain open. Solenoid **66** serves to assist the power equipment in maintaining the door in this condition as long as it may be required. However, substantially simultaneously with armature **62** completing its entry into solenoid **66**, latch arm **59** will engage actuator button **68**, causing same to be pushed inwardly for thereby opening micro-switch **67** and effecting cutoff of the power supply to prime mover **37**. This action of micro-switch **67** will avoid overheating and stalling. As solenoid **66** remains in energized state, armature **62** is retained in fully held position and remains in such state until power is cut off to solenoid **66** as by a conventional timer (not shown) within power operator **36**. Upon de-energization of solenoid **66**, armature **62** together with latch arm **59** are moved to outward position under the influence of spring **69** which cooperates with a spring (not shown) provided within the power operator **36**. Such spring action causes latch arm **59**

to be returned to open condition thereby permitting microswitch 67 to be restored to circuit-closing relationship and cam 51 to be swung for freeing roller 41 so that the latter, under the power operator spring, may travel returningly within track 42 away from hinge shaft 12 into door closed position. Thus, cam 51 is thereby reset for the next door opening operation and the circuit to motor 37 is closed for the next door opening action.

In view of the foregoing it is apparent that door 1 operates in an efficient and effective manner by means of a drive system located within the header and being thus entirely concealed from view. This novel system permits of obviating the need to utilize the customary exposed two-piece drive are unit presented on one side or the other of the door. In addition to being aesthetically displeasing, the use of the exposed drive arm assembly has created various problems in mounting, particularly, to meet certain carefully planned architectural requirements, as the location of such exposed arms with reference to the swing of the door is most critical.

Although roller 41 may be carried upon door leaf 8 in a conventional manner the present invention also contemplates the mounting of same in such a manner as to cause automatic removal of roller 41 from guideway 41 under certain unusual operating conditions so as to avoid damaging door 1 and the related structural elements. With reference being now made particularly to FIGS. 12-15, inclusive, roller 41 may be rotatably carried upon the upper end of a pin (not shown) mounted within a block 70, as preferably formed of aluminum of other lightweight sturdy material, which is normally disposed in an upwardly opening recess 71 formed within upper door leaf 8. In its front, back and top portions, recess 71 is open so that the forward, rearward and top surfaces 72, 73, and 74, respectively, of block 70 are normally surfacewise aligned with the adjacent surfaces of door leaf 8. Door leaf 8 being preferably formed by an extrusion is provided with a forward wall 75, a rearward wall 76, a bottom wall 77, and a top wall 78 for defining an interior volume 79. However, for purposes to be described, a mounting block, as indicated at 80, may be disposed within said volume 79 so that the upper central portion thereof will develop the base of recess 71. At its end remote from hinge shaft 12, roller block 70 mounts, as by screws 81 and the like, a preferably hardened steel insert 82 having an outwardly opening partispherical-concavo recess 83 for receiving the confronting portion of a ball 84 slideably mounted within the bore 85 of a housing 86, as fabricated of steel, disposed within door leaf 8 and being secured, as by a multiplicity of screws 87, upon mounting block 80. Disposed within bore 85 is a compression type coil spring 88 one end of which bears against ball 84 for urging same into recess 83, the other end of said spring 88 bearing against an adjusting plug 89 threadedly engaged within a counterbore 90 formed at the end of said housing 86 remote from said ball 84. Thus, the pressure on ball 84 may be readily controlled by appropriate tightening or loosening of plug 89. It will thus be seen that ball 84 is urged into recess 83 for biasing block 70 within recess 71 in surface-conforming relationship to the adjacent portions of door leaf 8.

At its other end, that being proximate hinge 12, block 70 is provided with an endwise opening vertical slot 91 opening at its ends through the bottom and top surfaces of block 70 for receiving the shank 92 and head 93 of a detent-forming bolt 94, the lower end of which is threadedly secured within mounting block 80 (FIG. 13). Said slot 91 is suitably enlarged at its upper end to receive the diametrally increased head 93. The slot-adjacent end face of block 70 slopes inwardly and rearwardly, as at 95, throughout the major portion of its extent for clearance purposes to be shortly described. In its forward extreme end portion said slot-adjacent end wall is reversely angulated, as at 95', for normal complementary abutment against the adjacent edge of wall 75 of leaf 8. While the face of end insert 82 between recess 83 and rearward surface 73 of block 70 is inclined, as at 96, the plane of same forms an obtuse angle with said rearward surface 73.

In view of the foregoing it will be seen that block 70 is thus normally secured, and in a most stable fashion maintained, within recess 71 whereby roller 41 may be fully operative for reciprocal travel along guideway 42 during door opening and door closing operations. However, in the event of some emergency or panic condition, an individual were to attempt to effect opening of door 1 for swinging same in a direction opposite to that in which it is intended to swing, as illustrated in FIGS. 1 and 3, block 70 is adapted to lose engagement with door leaf 8 so that door 1 could in such emergency be opened by swinging in the "wrong" direction. With especial reference to FIGS. 14 and 15, if a force were applied upon the right hand side of said door 1, corresponding to the handle-bearing portion as shown in FIGS. 1 and 2, and which force has a direction indicated by the arrows, door 1 would be caused to swing so that a reverse condition would exist to that shown in FIG. 3, that is, the portion indicated *a* would be forwardly of frame *f* and the portion indicated *b* would be rearwardly thereof with arms 13,14 extending in a direction forwardly of frame 3 rather than rearwardly. Normally, such force would be resisted by the engagement of roller 41 in guideway 42. However, the present system would cause ball 84 to be relatively moved against the bias of spring 88 so that the same would "clear" recess 83 and thence move relatively along inclined, cam-forming surface 96 with ultimate loss of engagement with insert 82 so that by such continued movement the slotted end of block 70 would move relatively away from bolt 94 (see FIG. 15) thereby bringing about total disengagement between block 70 and leaf 8, and freeing block 70 so that through gravity roller 41 may be removed from guideway 42. Thereupon door 1 is free to continue its swinging in the normally opposite direction without causing any damage to any component of the structure.

After the emergency has ceased, block 70 together with roller 41 may be easily restored to locked condition within leaf 8 and roller 41 thereby returned to fully functional relationship within guideway 42.

By means of this novel expedient, door 1 is adapted to serve as an emergency exit so that the utilization of same within the structure would obviate the necessity of the independent construction of such an exit. The adjustability of the pressure of spring 88 upon ball 84 permits of the use of demountable block 70 in doors accommodating openings of various dimensions.

Referring now to FIGS. 16 and 17 a latch assembly, indicated generally 44' may be provided for incorporation within the present invention; the same operating substantially in the same manner as latch assembly 44 hereinabove described, but incorporating certain structural distinctions which will now be described. As certain of the components of latch assembly 44' are the same as with latch assembly 44, like reference numerals will be used to identify such components for the sake of clarity.

Thus latch assembly 44 being disposed at the same location within header 4 as latch assembly 44 and cooperating with guide roller 41 in the same manner, incorporates a mounting bracket 45 secured upon upper wall 42' of guideway 42 (FIG. 16); said bracket 45 being drilled to provide a bore 102 for bearingly receiving a shaft 100. The lower end of said shaft 100, beneath bracket 45, is engaged to cam 51; there being a return spring 103 encircling shaft 100 between bracket 45 and cam 51 with the upper end 104 of said spring 103 being engaged to bracket 45 and the lower end 105 being secured within cam 51 for urging said shaft into such position as to cause cam 51 to project normally into the path of guide roller 41 for purposes above described. The upper end of shaft 100, upwardly of bracket 45 mounts a block 101 which integrally embodies a cylindrical extension 106 having an axial bore 107 throughout its extent for slideably accommodating a piston 108. With reference to FIGS. 16 and 17 it will be seen that cylindrical extention is provided on block 101 for normal presentation on the side of bracket 45 remote from the adjacent jamb and, by virtue of the influence of spring 103 the

axis of bore **107** will define an acute angle with a line extending from front to rear of header **4**. The rearward end of piston **108** mounts a head **10** and a resilient washer **110** which latter abuts normally against the adjacent end face of said extension. The said cylindrical extension **106** and piston **108** jointly serve as a latch arm in this embodiment. The other or forward end of piston **108** is diametrically reduced and flattened as at **109** for reception within a clevis **113** of a connecting block **112**; there being a pivot pin **114** extending through the arms of clevis **113** for swingably engaging piston **108** therebetween. Block **112** is provided forwardly of clevis **113** with an enlarged opening **115** for receiving the outer end of an armature **116** which latter is suitably secured within said opening **115**. Armature **116** is of general cylindrical form and is receivable within solenoid **66**.

As will be observed in FIG. **17**, micro-switch **67** is disposed upon bracket **45** between solenoid **66** and shaft **100** and carries actuator button **68** for depression upon engagement by cylindrical extension **106**.

It will thus be seen that latch assembly **44'** will be normally urged into open condition (FIG. **17**) which corresponds to door-closed state. Upon swinging of shaft **100** against the bias of spring **103** through engagement of roller **41** with cam **51**, block **101** will swing causing extension **106** to move in a direction toward micro-switch **67** with armature **116** being moved inwardly of solenoid **66** through the connection between piston **108** and connecting block **112**. Thus as with latch assembly **44**, abutment against actuator button **68** by extension **106** will cause the motor to be disconnected and armature **116** will be retained within solenoid **66** during the period of energization of the latter for thereby effecting a latching of the door in open condition for a predetermined time juncture.

Having thus described my invention, what I claim and desire to obtain by Letters Patent is:

1. In combination with a balanced door having a door frame comprising a header and side jambs forming an opening, at least one of said side jambs and said header defining interior volumes, a hinge shaft mounted in one of said side jambs, a door provided in said opening, lever means connecting said hinge shaft and said door, means for effecting opening and closing of said door comprising a door operator mounted within said header, a prime mover provided within said header and operatively engaged to said door operator, an output shaft provided on said door operator, said output shaft being mounted for rotation about a vertical axis parallel to the axis of said hinge shaft, an elongated rod extending lengthwise of said header, first means engaging one end of said rod to said output shaft, and second means engaging the other end of said rod operatively to said hinge shaft.

2. The combination as defined in claim **1** and further characterized by said first means engaging said rod to said output shaft comprising a crank fixed to said output shaft for rotation therewith and a rod end interengaging said rod and said crank, said second means connecting the other end of said rod to said hinge shaft comprising a hinge shaft extension presented in axially perpendicular relationship to said rod, a crank mounted on said extension, and a rod connector engaging said crank to the proximate end of said rod, whereby upon rotation of said output shaft said rod will be moved axially for effecting rotation of said hinge shaft through the said connections.

3. In combination with a balanced door having a door frame comprising a header and side jambs forming an opening, at least one of said side jambs and said header defining interior volumes, a hinge shaft mounted in one of said side jambs, a door provided in said opening, lever means connecting said hinge shaft and said door, means for effecting opening and closing of said door comprising a door operator mounted within said header, a prime mover provided within said header and operatively engaged to said door operator, means disposed within said header connecting said door operator and said hinge shaft, door control means comprising a latch assembly mounted in said header and being in normally unlatched condition, a guide roller mounted on said door moveable within said header toward said latch assembly upon opening swinging of said door, and means engageable by said guide roller and operatively interengaged with said latch assembly locking the latter responsive to engagement with said guide roller.

4. The combination as defined in claim **3** and further characterized by a source of electrical power, normally closed switch means connecting said source of power and said prime mover, and means for opening said switch means responsive to locking of said latch assembly.

5. In combination with a balanced door having a door frame comprising a header and side jambs forming an opening, at least one of said side jambs and said header defining swinging volumes, a hinge shaft mounted in one of said side jambs, a door provided in said opening, lever means connecting said hinge shaft and said door, means for effecting opening and closing of said door comprising a door operator mounted within said header, a prime mover provided within said header and operatively engaged to said door operator, and means disposed within said header connecting said door operator and said hinge shaft, door control means comprising a latch assembly mounted in said header, a guide roller mounted on said door moveable within said header toward said latch assembly upon opening swing of said door, said latch assembly comprising a swingably mounted cam, said cam being presented for engagement with said guide roller, a latch arm, means urging said latch arm normally into unlatched condition, said latch arm being engaged to said cam whereby upon swinging of said cam through engagement with said guide roller said latch arm will be moved into latched condition, and means for maintaining said arm in such latched condition.

6. The combination as defined in claim **5** and further characterized by a source of electrical power, normally closed switch means connecting said source of power and said prime mover, a switch control member provided in said latch assembly and connected to said switch means, said switch control being presented in the path of movement of said latch arm for engagement by the latter when moving into latched condition for opening of said switch means.

7. The combination as defined in claim **5** and further characterized by said latch arm maintaining means comprising a solenoid, an armature slideable within said solenoid and means for connecting said armature and said latch arm.

8. The combination as defined in claim **7** and further characterized by means for maintaining said solenoid in energized, armature-attracting state for a predetermined period of time.

9. In combination with a balanced door having a door frame comprising a header and side jambs forming an opening, at least one of said side jambs and said header defining interior volumes, a hinge shaft mounted in one of said side jambs, a door provided in said opening, lever means connecting said hinge shaft and said door, means for effecting opening and closing of said door comprising a door operator mounted within said header, a prime mover provided within said header and operatively engaged to said door operator, said door having an opening in its upper portion, a discrete mounting block detachably received within said opening in said door, a guide roller carried upon the upper portion of said block for extension into said header, first and second readily disengageable cooperating means provided at each end portion of said opening of said door and on each end of said mounting block for normally mounting same in operative position and for allowing facile dislodgement of said block from said door upon application thereon of an applied force in a predetermined direction.

10. The combination as defined in claim **9** and further characterized by said first cooperating means comprising said block having a recess at one end, a spring biased member mounted on said door at one end of said opening of said door for normal projection into said block recess, said second

cooperating means comprising a rigid upright member provided at the other end of said opening of said door, said block having an indentation formed in its end face confronting said upright member and being complementary thereto for receiving same, the end faces of said block having a horizontal inclination in the same direction so that upon application of the said force the said block will simultaneously lose engagement with said spring biased member and said rigid upright member for complete removal from said opening of said door.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,675,370 Dated July 11, 1972

Inventor(s) JOHN C. CATLETT

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 8, line 16, Claim 5, "swinging" should be ---interior---; line 27, "swing" should be ---swinging---.

Signed and sealed this 6th day of February 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents