United States Patent [19]

Catlett

[11] **3,834,081**

[45] **Sept. 10, 1974**

[54] **AUTOMATIC SLIDING DOOR SYSTEM**

[75] Inventor: **John C. Catlett,** Elm Grove, Wis.

[73] Assignee: **Gyro Tech Incorporated,** Greendale, Wis.

[22] Filed: **Mar. 30, 1973**

[21] Appl. No.: **346,476**

[52] **U.S. Cl.** **49/360,** 49/118, 49/138, 49/139, 49/327

[51] **Int. Cl.** **E05f 11/54**

[58] **Field of Search** 49/116–118, 49/123, 110, 141, 138, 327, 332, 360, 370, 379, 139, 386, 29, 30, 273, 274

[56] **References Cited**

UNITED STATES PATENTS

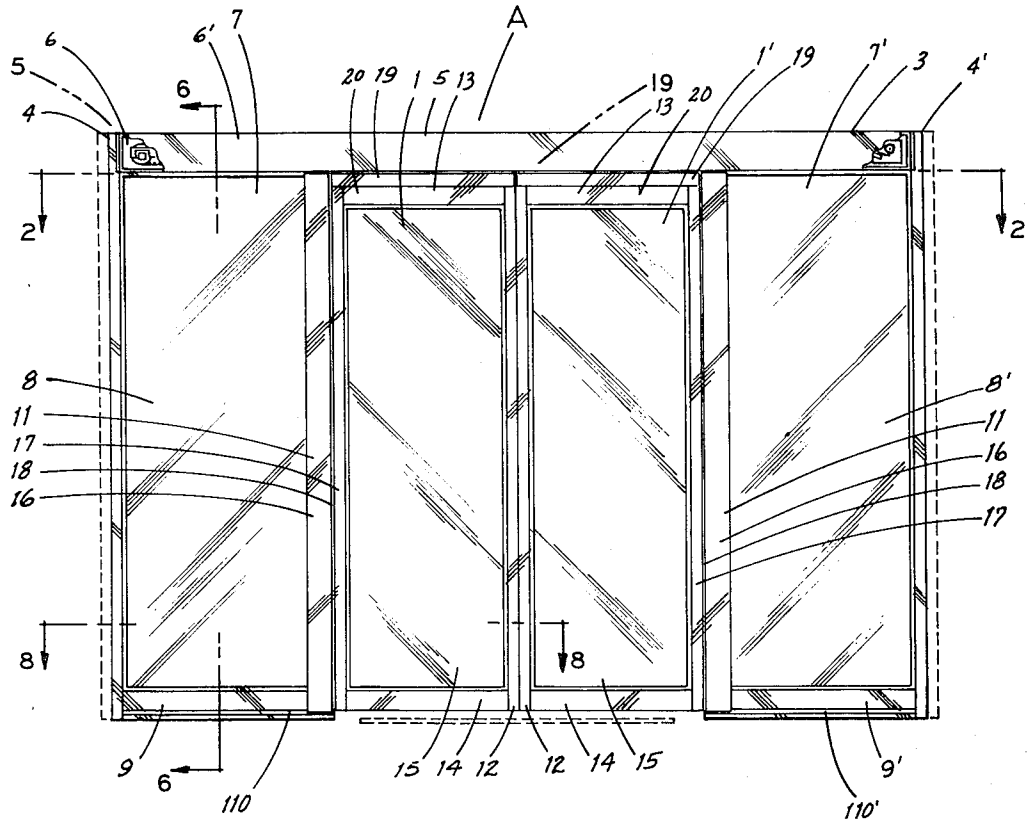
580,370	4/1897	Canfield	49/30
2,653,022	9/1953	Armstrong	49/118 X
3,172,651	3/1965	Wilson	49/360
3,354,581	11/1967	Dimmitt et al.	49/327 X
3,406,484	10/1968	Atkey et al.	49/138 X
3,468,061	9/1969	Ozaki	49/360

Primary Examiner—Kenneth Downey
Attorney, Agent, or Firm—Ralph W. Kalish

[57] **ABSTRACT**

An automatic sliding door system comprising a door frame having a header constituting a housing, a door carrier provided in said housing and projecting downwardly through an elongated opening therein, a door suspended from said door carrier, a prime mover in said housing, a first gear train connecting said prime mover to an operating sprocket, an idler sprocket, belt members extending about said sprockets and connected to said door carrier for effecting traverse of said housing by said door carrier for sliding the door to and from open position. A spring stressed during door opening operation and a second gear train connecting said spring and said operating sprocket for causing the door carrier to restore the door to closed condition. Circuit controlling components are provided for causing two-speed door-opening and door-closing.

11 Claims, 20 Drawing Figures



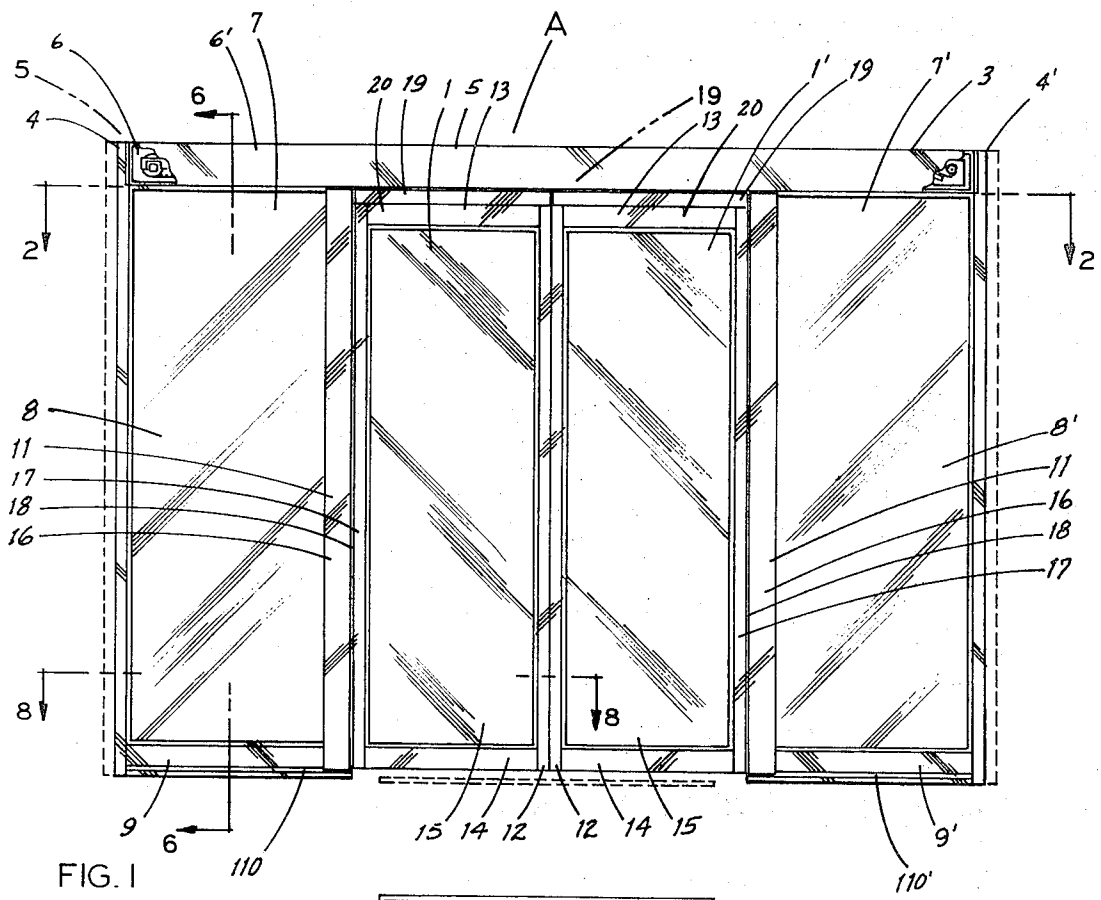

A
6
5
4
6'
7
6
20
19
1
5
13
19
13
20
1'
19
7'
3
4'
2
2
8
11
17
18
16
8'
11
16
18
17
8
8
9
6
110
15
14
12
12
14
15
9'
110'

FIG. 1

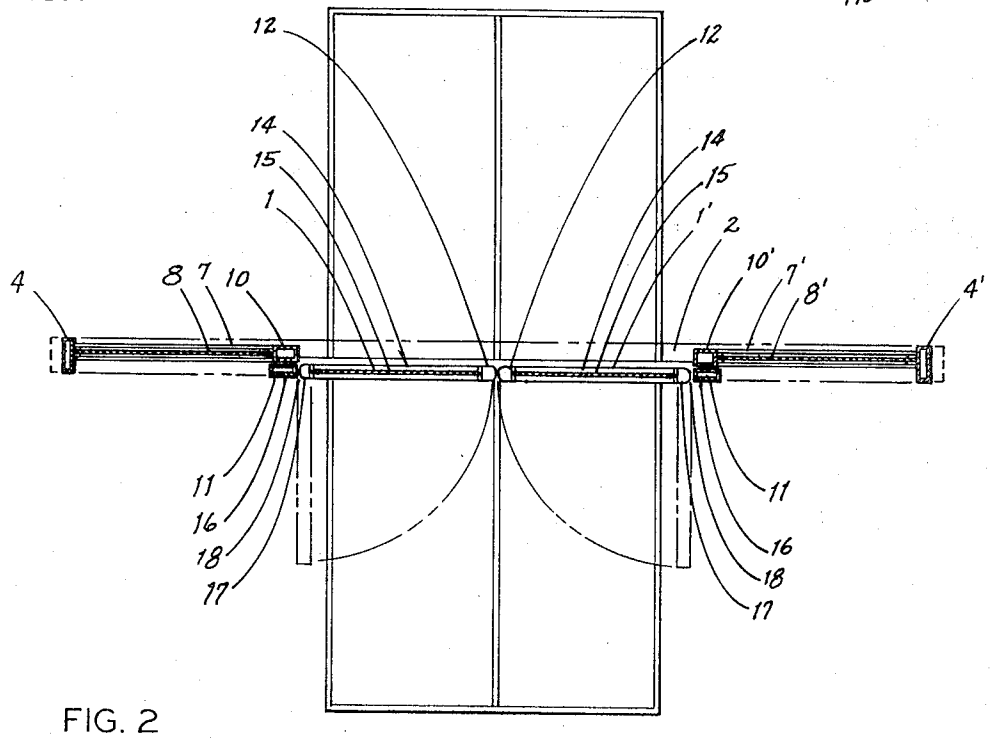

12
12
14
15
1
14
15
1'
2
10'
7'
8'
4'
4
8
7
10
11
16
18
17
11
16
18
17

FIG. 2

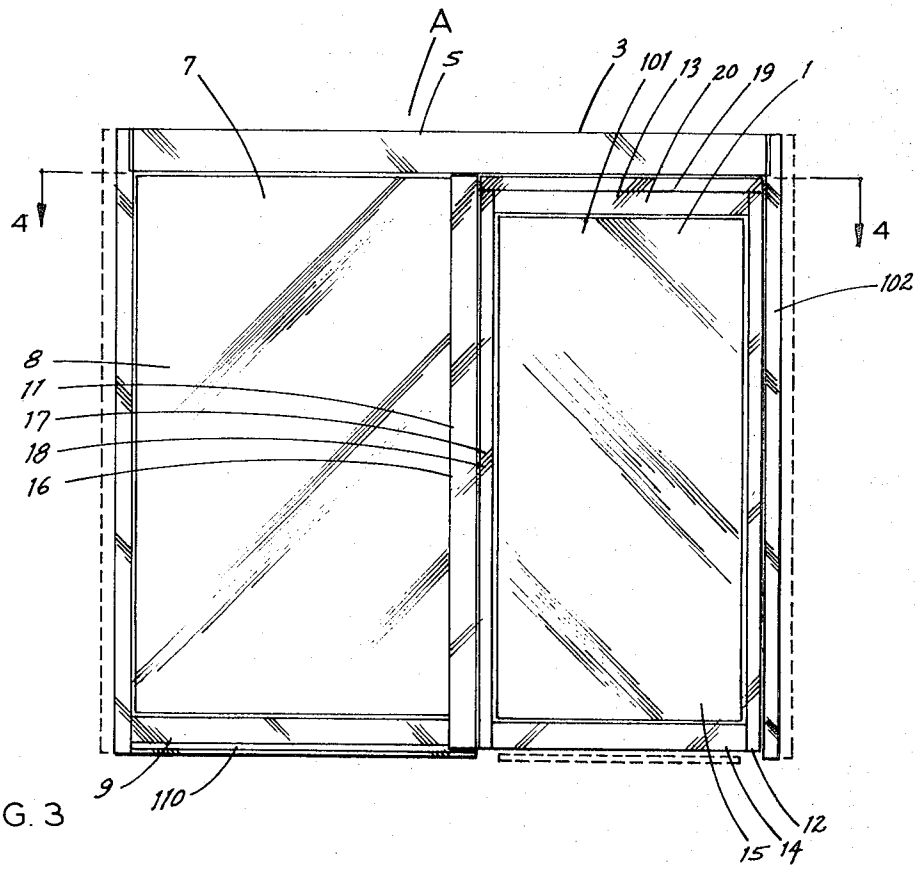

A
5
7
3
101
13
20
19
1
4
4
102
8
11
17
18
16
9
110
12
15
14

FIG. 3

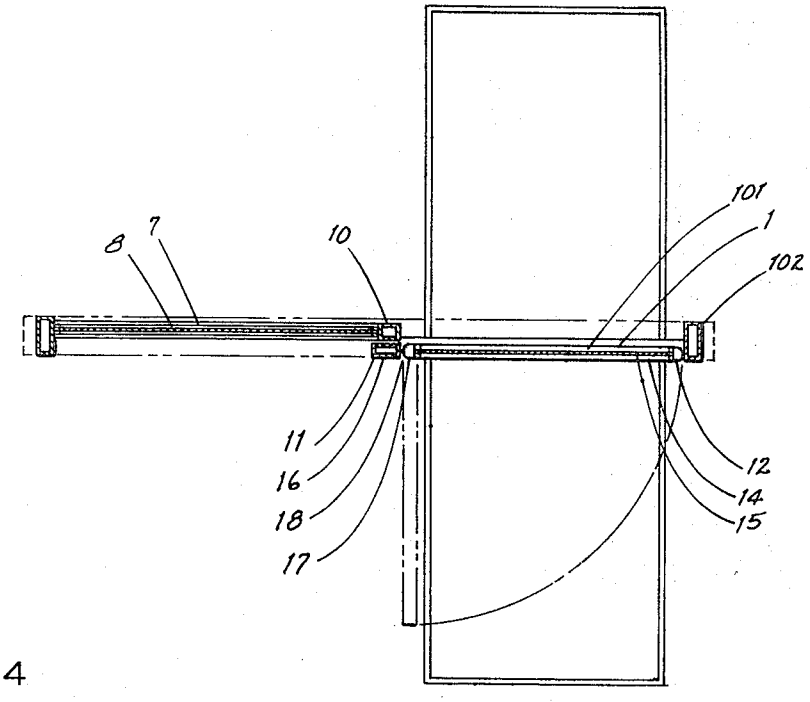

101
1
102
8
7
10
11
16
18
17
12
14
15

FIG. 4

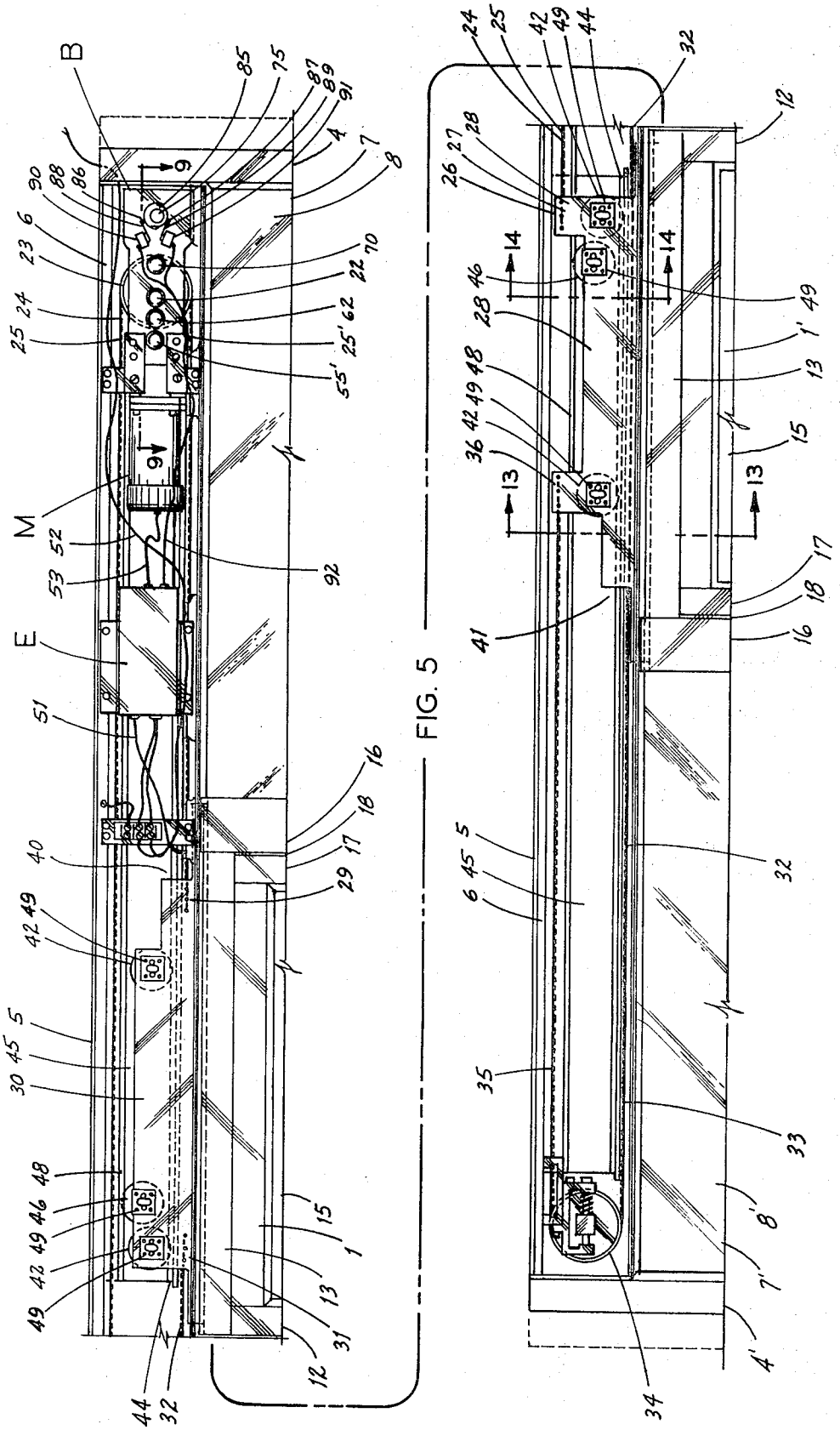


FIG. 5

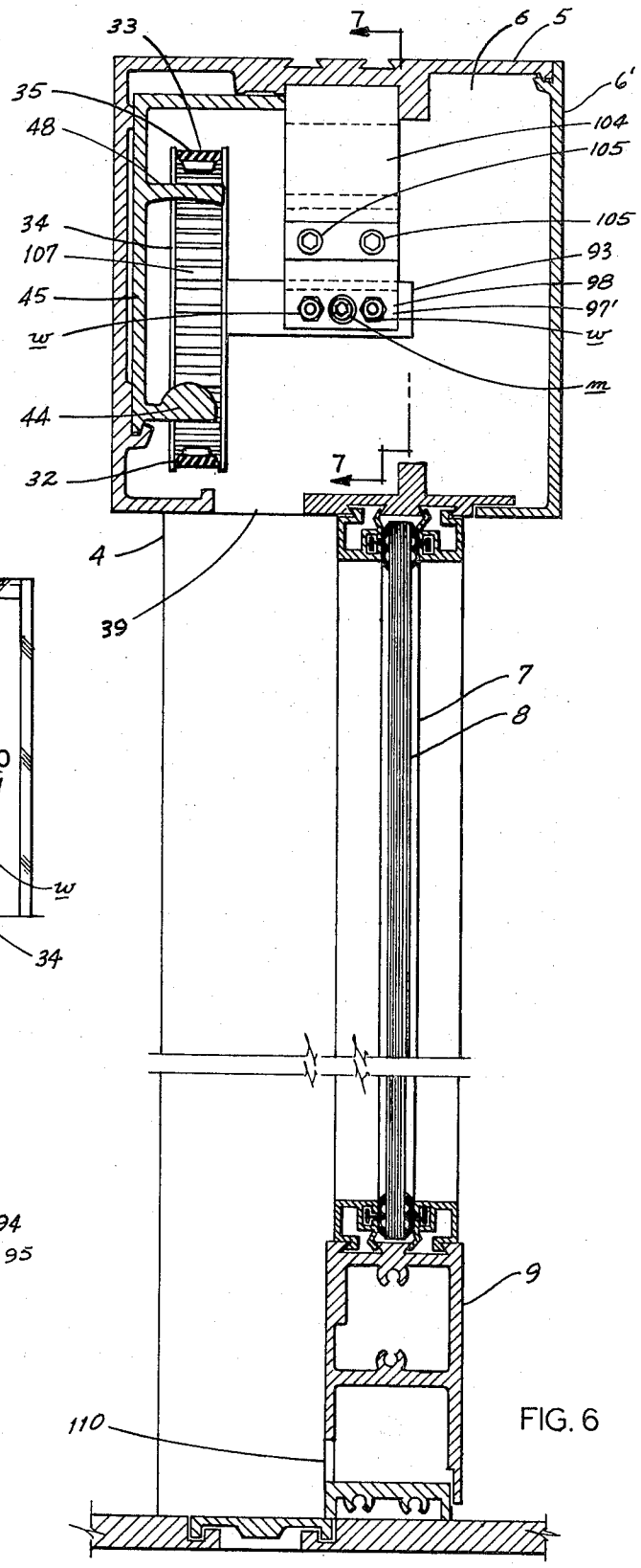


FIG. 6

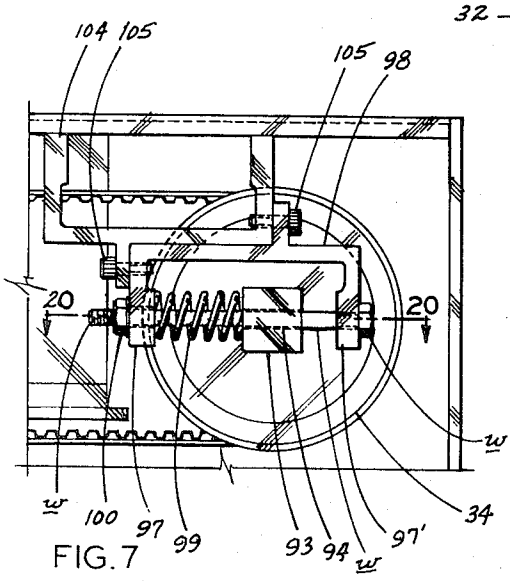


FIG. 7

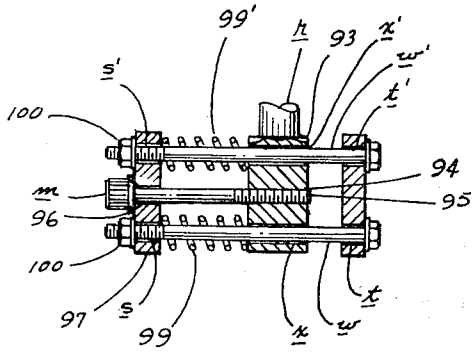


FIG. 20

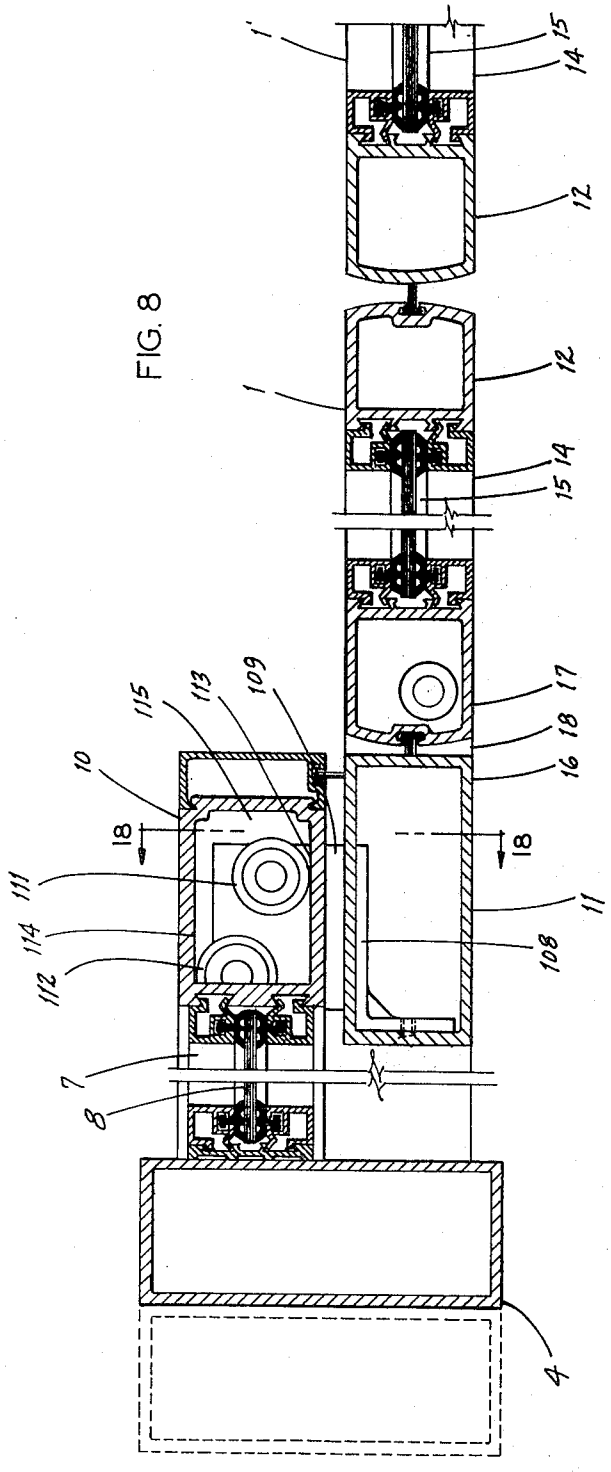

1
15
14
12
1
12
14
15
17
18
16
18
18
11
108
10
115
113
109
111
114
112
7
8
4

FIG. 8

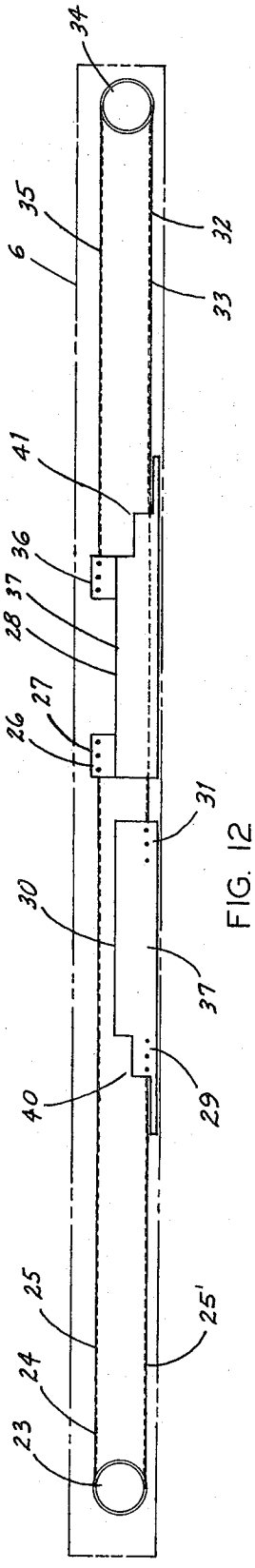

34
35
6
32
33
41
36
37
28
26
27
31
30
37
40
29
25
25'
24
23

FIG. 12

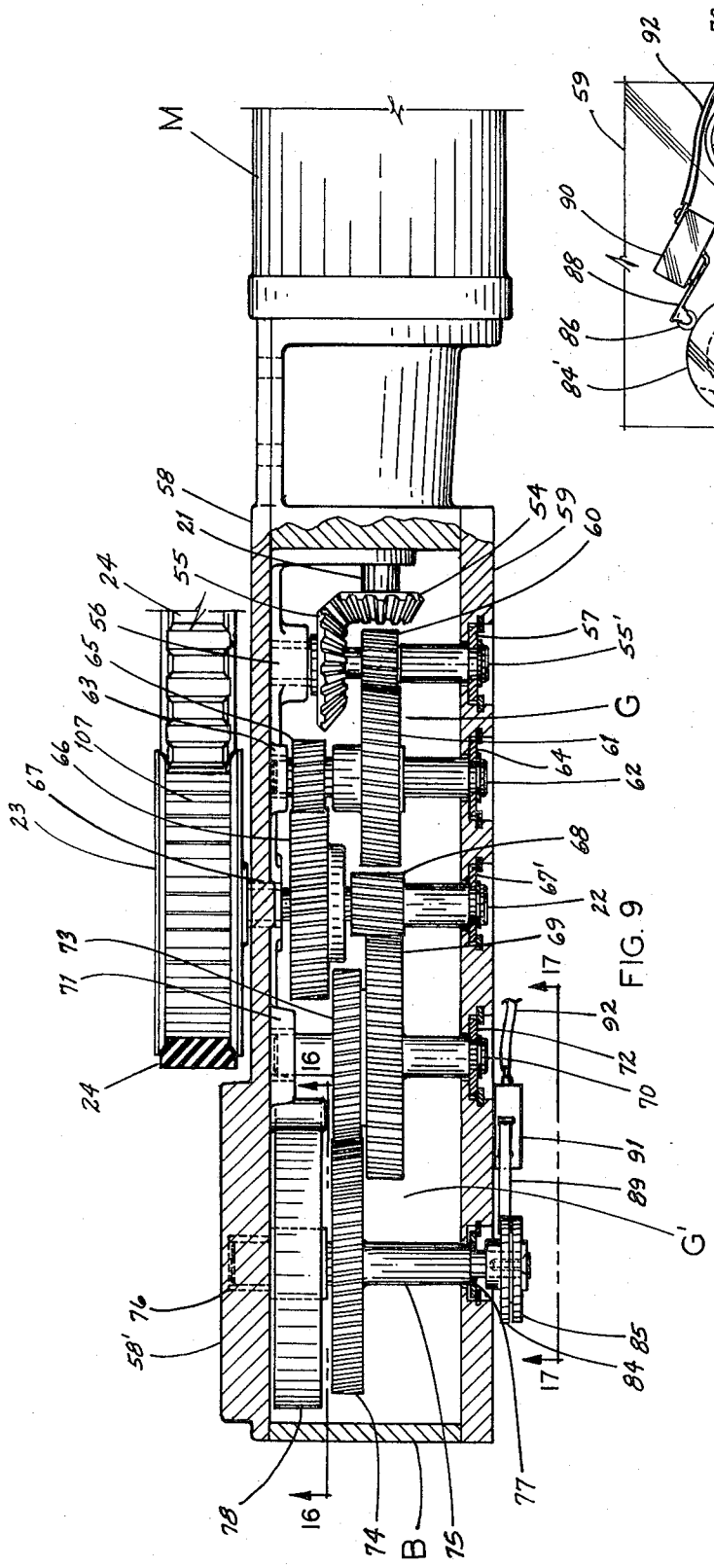

M
58
21
55
24
56
65
63
107
66
67
23
54
59
60
57
55'
G
64
61
62
68
67'
22
69
17
73
71
92
72
70
91
89
G'
24
16
58'
76
84
85
17
77
78
16
74
B
75

FIG. 9

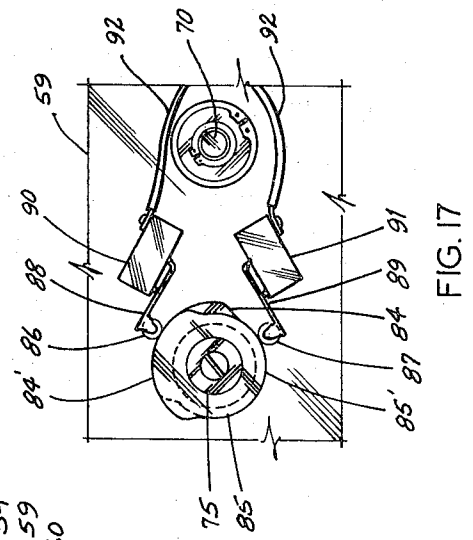

92
70
92
59
90
91
88
89
86
84
84'
87
85'
75
85

FIG. 17

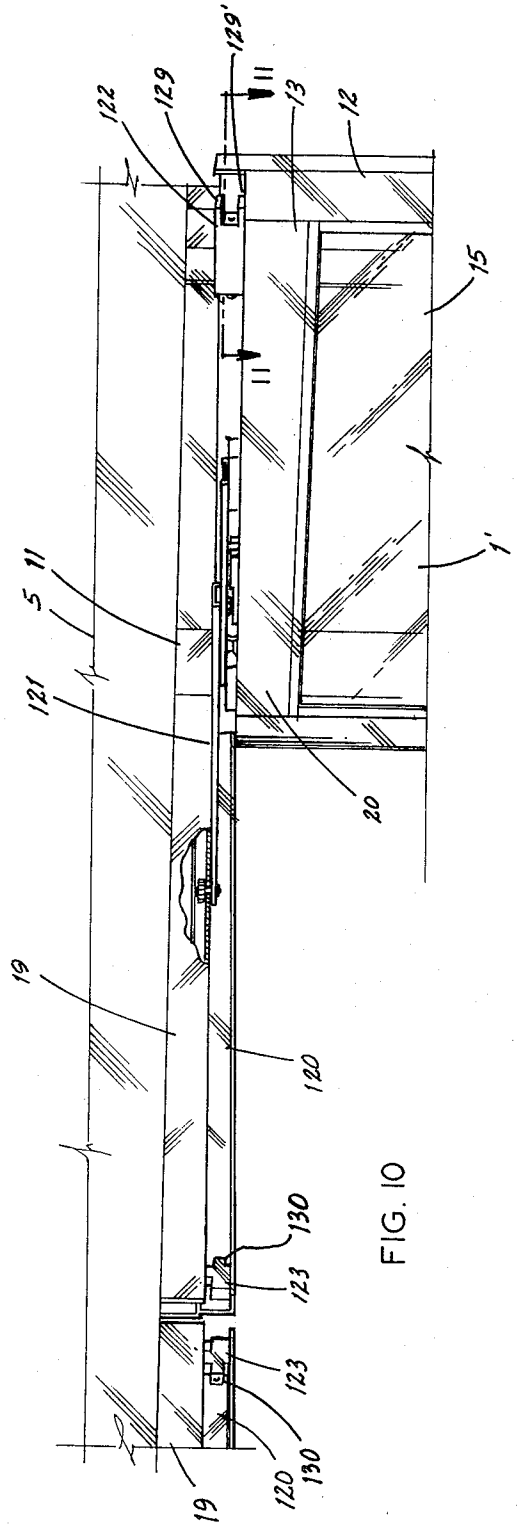


FIG. 10

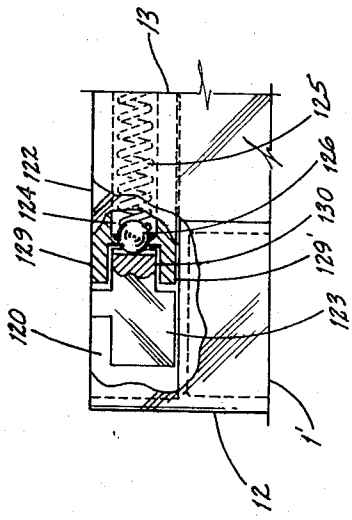


FIG. 19

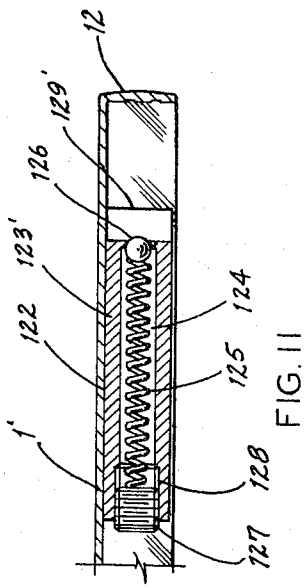


FIG. 11

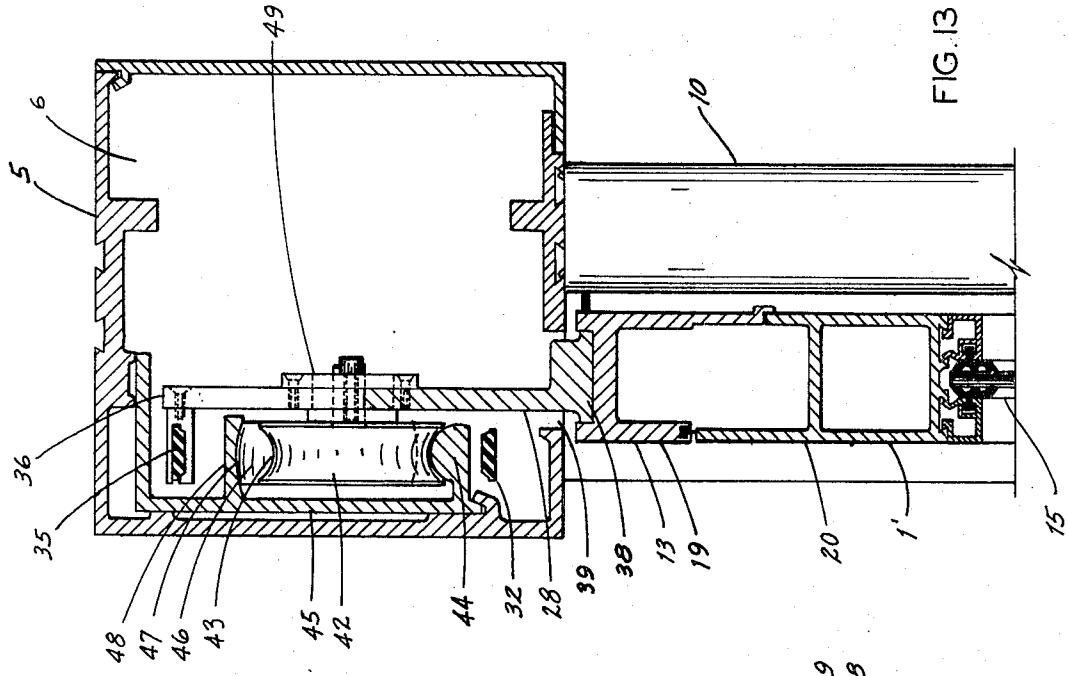


FIG. 13

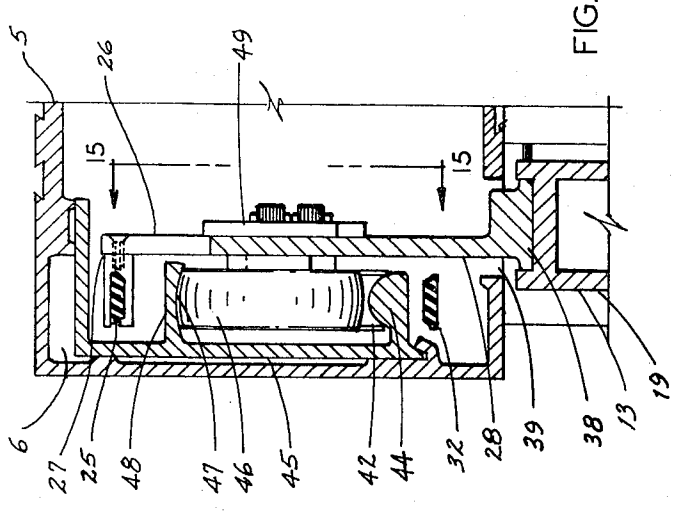


FIG. 14

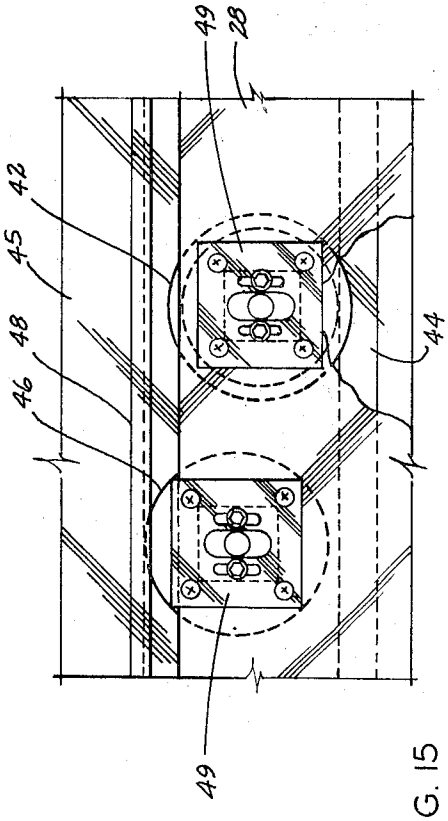


FIG. 15

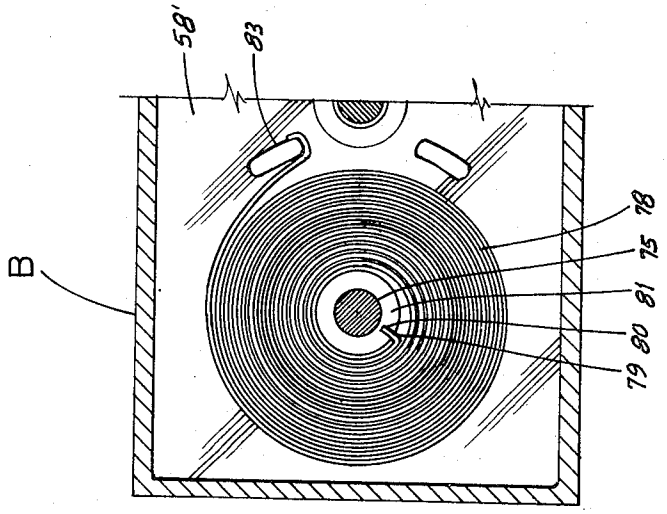


FIG. 16

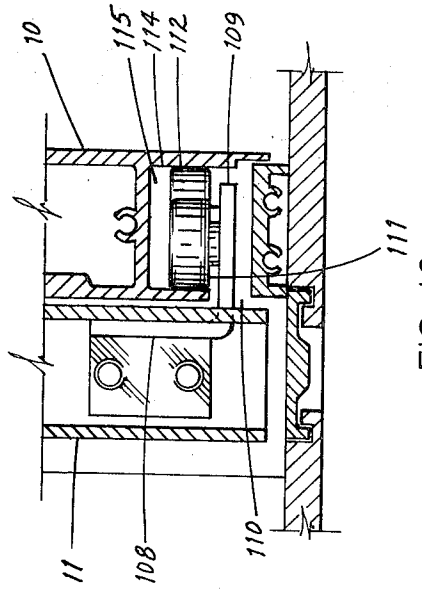


FIG. 18

AUTOMATIC SLIDING DOOR SYSTEM

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates in general to entrance systems and, more particularly, to an automatic sliding door entrance.

It is a primary object of the present invention to provide an automatic sliding door system which is substantially self-contained, embodying a power system and motion transmission means requiring connection to a conveniently located source of electrical energy and actuating switch means for operation.

It is another object of the present invention to provide an automatic sliding door system which incorporates simple electro-mechanical operating means and thus obviates the utilization of gases or liquids in the transmission and operation of the door, thereby conducing to economy and reliability in use.

It is a further object of the present invention to provide an automatic sliding door system which effects door closure under release of mechanical energy stored during door operation to thereby enhance the safety of door closing; rendering the door amenable to manually impelled swinging action in the event of power failure, as well as to obviate utilization of door edge switches as may be found in current constructions.

It is a still further object of the present invention to provide an automatic sliding door system which embodies novel control means for causing variation in the speeds of door opening and door closing movements for promoting both safety and relatively repair-free longevity of use.

It is another object of the present invention to provide an automatic sliding door system which is readily adapted for doors of the double leaf or the single leaf type and which systems are particularly amenable to presentation in attractive, ornamental design.

It is a still further object of the present invention to provide a system of the character states which is constituted of relatively few components, all of which are of durable, wear-resistant construction; and which system incorporates easily manipulated means for appropriately adjusting components to assure of effective operation of the system without requiring the customary dismantling procedure with attendant down-time.

It is another object of the present invention to provide a system of the character stated which is economical in construction, as well as in installation, and which requires the very minimum in maintenance.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an elevational view of a sliding door system constructed in accordance with and embodying the present invention, illustrating a door of the double leaf type.

FIG. **2** is a view taken substantially along the line **2—2** of FIG. **1.**

FIG. **3** is an elevational view of a sliding door system constructed in accordance with and embodying the present invention but illustrating a door of the single leaf type.

FIG. **4** is a view taken along the line **4—4** of FIG. **3.**

FIG. **5** is a fragmentary elevational view of the header with the cover panel removed; this view being taken as indicated by the arrow in FIG. **1.**

FIG. **6** is a vertical transverse sectional view taken along the line **6—6** of FIG. **1.**

FIG. **7** is a vertical transverse sectional view taken along the line **7—7** of FIG. **6.**

FIG. **8** is a horizontal transverse sectional view taken on the line **8—8** of FIG. **1.**

FIG. **9** is a horizontal view, partially in section, taken on the line **9—9** of FIG. **5.**

FIG. **10** is a fragmentary perspective view illustrating one of the door leafs in openly swung condition.

FIG. **11** is a horizontal transverse sectional view taken on the line **11—11** of FIG. **10.**

FIG. **12** is a schematic view of the belt and door carrier assembly.

FIG. **13** is a vertical transverse sectional view taken on the line **13—13** of FIG. **5.**

FIG. **14** is a vertical transverse sectional view taken on the line **14—14** of FIG. **5.**

FIG. **15** is a vertical view taken on the line **15—15** of FIG. **14.**

FIG. **16** is a vertical transverse sectional view taken on the line **16—16** of FIG. **9.**

FIG. **17** is a vertical view taken on the line **17—17** of FIG. **9.**

FIG. **18** is a fragmentary vertical sectional view taken on the line **18—18** of FIG. **8.**

FIG. **19** is a view taken as indicated by the line **19** in FIG. **1.**

FIG. **20** is a horizontal transverse sectional view taken on the line **20—20** of FIG. **7.**

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now by reference characters to the drawings which illustrate the preferred embodiment of the present invention, A designates generally an automatic sliding door system which may be of the double leaf type, in comprising a pair of cooperative, vertically disposed, horizontally aligned sliding doors **1,1′**, adapted for edge-to-edge abutment in flush arrangement, when closed (see FIG. **1**), and, hence, being movable away from each other for door opening. As illustrated in FIGS. **3** and **4**, the system of the present invention may also be only of the single leaf type having but one slideable door **101** which would thus move toward and away from a jamb **102** during closing and opening operation. However, for purposes of exposition herein, the double leaf type will be described, but with the recognition that the present invention is equally adaptable for a single leaf door.

Doors **1,1′** are, accordingly, designed for closure of an opening **2** provided within an entrance structure, indicated generally **3**, located within a wall opening; said structure **3** incorporates spaced-apart vertical jambs **4,4′**, as fabricated of extruded metal stock, and with portions, as indicated by dotted lines, being receivable within the wall structure; there being a header **5** extending transversely of the opening **2** being suitably supported upon the upper ends of jambs **4,4′** and affixed to the structure overhead (not shown). Header **5**, which is also fabricated of sheet metal, constitutes a housing **6** with there being a removable cover paneling, indicated **6′**; for ready access to the interior of housing **6.** Frame **3** also includes so-called screens **7,7′** which

are coplanar and the inner margins of which define the edges of opening **2.** Each screen **7,7'** is suitably engaged to header **5** (see FIG. **6**) as well as to the proximate jambs **4,4'** and with there being a bottom rail **9,9'** and marginal verticals, as at **10,10'**, parallel to jambs **4,4'** and constituting the borders of opening **2.** As may best be seen in FIG. **2,** screens **7,7'** are presented within a plane parallel to the plane of movement of doors **1,1'** so that the latter in moving into closed condition will travel into substantially registering relationship with the related screen **7,7'**; it being recognized that the width of header **5** is greater than the combined thickness of the related screens and doors (see FIG. **6**), so that the same will, as shown below, accommodate the door operating components, as well as provide a suitable finish to the structure **3.** It is to be recognized that although screens **7,7'** are shown as comprising transparent panels **8,8'**, the same could be of solid opaque materials, such as wood and the like, if desired, for decorative purposes.

In actual practice, entrance structure **3** will be presented with relation to the adjacent wall so that screens **7,7'** will be located on what might be considered the outer side of such wall. Consequently, the view in FIG. **1** may be considered from the inside of said structure **3.**

Each door **1,1'** comprises vertical rails **11,12** and upper and lower rails **13,14** respectively, which are desirably formed of extruded metal and adapted to support a transparent panel **15,** as of glass.

As shown in the drawings, door rails **11** are of two-part character comprising a support component **16** and a companion component **17** with the same being as by spaced hinges **18;** and with the upper rail **13** being also of two-part construction having a top and bottom cooperating components **19,20;** said top component **19** being rigid at its ends with the adjacent support component **16.** This particular construction of the stated door leaves is for the purpose of permitting swinging of door leaves **1,1'**, as indicated in phantom lines in FIG. **2,** under so-called panic or emergency conditions. This capability will be discussed more fully hereinbelow but, however, during the exposition of the slideable operation of doors, **1,1'** the referred to door rails will be considered unitary for simplicity purposes.

Doors **1,1'** are provided with overhead suspension and there being means for automatically sliding said doors **1,1'** between open and closed position through actuation of a conveniently located switch or other control, such as, for example, floor switch mats, photoelectric cells, sonic switches, wall switches, remote switching systems and the like, so that door operation does not require any conscious manipulation by door users.

Referring now to FIGS. **5–9,** inclusive, it will be seen that there is provided within header housing **6** a compact, self-contained power system which obviates the requirement for remotely located equipment for door operation other than a customary source of electrical energy, as 115 volt A.C., and the switching or actuation devices as above indicated.

Said power system incorporates a motor M, as of the direct current, permanent magnet-type, having a drive shaft **21** receivable within a gear box B for connection by means of a gear train G, to be described hereinbelow, to a shaft **22,** whose axis extends transversely of housing **6,** upon an outwardly extending end of which is mounted an operator sprocket **23,** about which latter extends a transmission belt **24,** as fabricated of molded rubber, and having upper and lower courses **25,25'** progressing in a direction lengthwise of housing **6** proximate the upper and lower walls thereof. At its end extremity upper course **25** of belt **24** is fixed to a boss **26** formed at the proximate upper end, as at **27,** of a door carrier **28** disposed above, and secured to, the upper rail **13** of door **1'**. The lower course **25'** of belt **24,** at its normally free end, is secured to the adjacent lower end portion, as at **29,** of a door carrier **30** disposed above, and secured to, the upper rail **13** of door **1.** The opposite end of door carrier **30** in its lower portion, as at **31,** is fixed to the end of the lower course **32** of a transmission or timing belt **33,** of the same construction as belt **24,** which lower course **32** proceeds in a direction lengthwise of header housing **6** for engagement about the periphery of an idler sprocket **34,** of like construction as operator sprocket **23,** and located at the opposite end of housing **6** therefrom; said belt **33** having an upper course **35** which at its free end is secured rigidly to a boss **36** extending upwardly from the adjacent end portion of door carrier **28** (see FIG. **5**).

FIG. **12** illustrates schematically the sprocket wheel belt and door carrier arrangement and by reference thereto it will be seen that upon rotation of operator sprocket **23** in a clockwise direction, as viewed in FIG. **12,** a pulling will be effected upon door carrier **30,** and with a like pulling upon door carrier **28** by virtue of rotation of idler sprocket **34,** thereby causing the associated doors **1,1'** to be moved away from each other toward the related jambs into open condition. Conversely, upon rotation of operator sprocket **23** in a counterclockwise direction, as viewed in FIG. **12,** a pulling will be effected upon door carrier **28** with a concomitant pulling of door carrier **30** toward idler sprocket **34** by rotation of the latter thereby causing doors **1,1'** to be moved into closed condition.

Each door carrier **28,30** is of relatively heavy gage sturdy metal and having flat upstanding bodies, as at **37;** carrier **28** being contourwise distinguishable by virtue of the provision of bosses **26,36** for convenient attachment to the upper courses of the belts **24,33.** Each carrier **30,28** has a relatively widened base portion, as at **38** (see FIGS. **13, 14**) for extension downwardly through an elongated slot-like opening **39** formed in the bottom wall of housing **6** which is substantially coextensive with said housing for permitting traverse therethrough of said carriers **30,28** for door operation. Said base portions **38** of carriers **30,28** are suitably fixed to the upper rails **13** of the related doors **1,1'**, as through suitable fasteners and the like (not shown). Each carrier **30, 28** is contoured upwardly of opening **39** at their ends proximate the related jambs **4,4'** in a stepped manner, as indicated generally at **40,41,** respectively, to avoid interferring contact with sprockets **23,24,** respectively, when said carriers **30,28** are in door-open position.

Each carrier rotatably mounts a pair of longitudinally, spaced-apart support rollers **42** being formed of wear resistant material and having a grooved periphery **43** for engaging a track **44,** convex in cross section, and integral with an extruded bracket **45** in its lower end portion, said latter being suitably mounted within housing **6** but preferably in a readily detachable manner for ease of replacement and repair. Thus, rollers **42** effectively support the associated doors **1,1'**. Each carrier

30,28 also rotatably mounts a control roller 46 having a slightly convex peripheral surface, as at 47, for engaging in its upper portion the complementary concave under face of an abutment 48 also integral with bracket 45 and in vertically spaced, substantially registering relationship with track 44. Thus, the engagement of roller 46 and abutment 47 acts as a limit against upwardly shifting of doors 1,1' so as to prevent same from undesired vertical movement when power is applied for door operation. Each of rollers 42,46 of carriers 30,28 are mounted for limited vertical adjustment, as by means broadly indicated at 49, so that the proper disposition of doors 1,1' may be at all times maintained through the simple expedient of regulating the adjusting means 49 and with rollers 46 being equally readily controlled.

Provided within header housing 6 is an electrical control box E for receiving the various electrical components, such as rectifiers, relays, resistors, transformers and the like, there being connection, as by a conductor 51, to the actuating switch device and a conductor 52 for connection to the convenient source of electrical energy. Said control box E is also connected to motor M as through a conductor 53.

Turning now to FIG. 9, it will be seen that motor drive shaft 21 mounts on its end within gear box B a driving bevel gear 54 meshing with a driven bevel gear 55 fixed upon a shaft 55' axially perpendicular to drive shaft 21 and journalled at its ends within bearings 56,57 provided in the opposed side walls 58,59, respectively, of box B. Carried upon shaft 55', substantially centrally thereof, is a gear 60 which meshes with a pinion 61 keyed or otherwise mounted upon a shaft 62 axially parallel with shaft 55' and similarly journalled at its ends within bearings 63,54 provided in gear box walls 58,59, respectively. On the end portion of shaft 62 proximate wall 58 there is carried a gear 65 engaging a relatively enlarged pinion 66 secured on shaft 22 which is axially parallel to shaft 55' and 62. Shaft 22 is journalled at its ends in bearings 67,67', provided in gear box walls 58,59, respectively, and projecting outwardly of wall 58 to provide an extension or take-off for mounting thereon of operator sprocket 23 as above described. Accordingly, it will be seen that gear train G comprises bevel gears 54,55, and gears 60, 61, 65 and 66 whereby operator sprocket 23 may be rotated through operation of drive shaft 21 for causing rectilinear motion of door carriers 30,28 by means of transmission belts 24,33.

Also provided within gear box B is a second gear train, indicated generally G', which constitutes a gear 68 fixed upon shaft 22 meshing with a relatively enlarged gear 69 carried upon a shaft 70, axially parallel to shaft 22 and journalled at its ends in bearings 71,72 formed in gear box walls 58,59, respectively. Also fixed on shaft 70 on the side of gear 69 proximate bearing 71 is a driving gear 73 meshing with a relatively diametrically enlarged gear 74 carried on a shaft 75 journalled at its ends in bearings 76,77 formed in a lateral extension of wall 58, as indicated 58' and wall 59.

Fixed upon shaft 75 between gear 74 and wall extension 58' is a prewound compression spring 78 of spiral character, being concentric with shaft 75 and having its inner end 79 accepted within a radial slot 80 formed in a collar 81 rigid with shaft 75. The outer end 82 of spring 78 is suitably anchored about a finger 83 formed on the inner face of wall 58' and projecting inwardly thereof. It will thus be seen that gear train G' is constituted of gears 68, 69, 73, 74 which cause a winding or stressing of spring 78 during operation of motor M with consequent rotation of drive shaft 21. Thus, as will be shown hereinbelow, during door opening action, spring 78 will be stressed for energy storage.

Shaft 75 in its end portion remote from spring 78 extends beyond gear box 59 and on such projecting portion mounts a pair of plate cams 84,85 each having operating edges 84', 85' for engagement by cam followers 86,87, respectively, provided at the ends of control arms 88,89 of microswitches 90,91, respectively, which latter are each connected as by a cable 92 to control box E for purposes presently appearing.

Referring to FIGS. 6, 7 and 20, idler sprocket 34 is carried upon a stub shaft *r* journalled within an elongated bearing block 93 having a transversely extending, substantially centrally located internally threaded bore 94 within which is engaged the inner end portion of a mounting screw 95; the opposite end of which extends through an opening 96 in a depending flange 97 of a channel-shaped mounting bracket 98, which latter includes a flange 97' parallel to flange 97; said flanges being presented transversely of housing 6. Screw 95 is engaged at its outer end, beyond flange 97, by a cap screw *m*, there being, if desired, a gasket for enhancing the securement. Flanges 97,97' have aligned openings *s*, *t*, and *s'*, *t'*, respectively, through which extend smooth stemmed bolts *w*,*w'*, respectively; the same also passing freely through relatively enlarged openings *x*,*x'*, respectively, in bearing block 93. At their projecting ends bolts *w*,*w'* are secured to nuts, as at 100, for maintenance in position. Encirclingly disposed about each bolt *w*,*w'* is a compression spring 99,99' which bear at one end against the inwardly directed face of flange 97 and at their other end against the confronting face of bearing block 93. Said springs 99,99' are preset and serve to permit of relative movement of bearing block 93 with respect to bolts *w*,*w'* for assuring of appropriate tension upon the belt about idler sprocket 34. It will thus be seen that opening 96 is smooth surfaced so that screw 95 may move relatively therethrough under spring pressure. Bracket 98 is suspended from a support 104 suitably secured to the top wall of housing 6, there being screws 105 for effecting securement between mating surfaces of bracket 98 and support 104. It should be noted that timing belts 24,33 being, as indicated, preferably of molded rubber, are probided with teeth, as indicated at 106, for engagement within complementary recesses 107 provided in the periphery of sprockets 23,34 so that slipping is eliminated and wherefore the horizontal movement of the courses of both belts 24,33 will be equal to the rotating speed of the operator sprocket.

In order to stabilize doors 1,1' against inadvertent vertical tilting, there is provided at the lower, normally screen-presented end of vertical rails 11 a bracket 108 having a flange 109 supporting normally outwardly from the rail for extension into guideways 110,110' provided in the bottom rails 9,9' of screen 7,7', respectively; said guideways 110,110' being coextensive with said rails 9,9'. Carried upon the upper face of flange 109 is a pair of offset guide rollers 111,112 adapted for rotation about vertical axes for respectively abutting the inner and outer side faces 113,114 of an inverted trackway 115 formed interiorly of the said bottom rails 9,9'. Thus, as doors 1,1' travel with respect to the prox-

imate screen 7,7' the same are maintained by guide rollers 111,112 against undesired tilting or shifting within a vertical plane and thus are maintained in appropriately aligned and stabilized condition.

From the foregoing the operation of system A should become quite apparent. With doors 1,1' in closed condition (as shown in FIG. 1) the control switch, such as, for instance, located in a floor mat, is actuated and whereby power is applied through control box E to motor M whereby the drive shaft 21 is rotated and operator sprocket 23 is caused to rotate by motion transmission through gear train G. Thereupon, belts 24,33 will cause door carriers 30,28 to move away from each other toward the respective proximate jambs 4,4' and thus effect door opening. However, at a predetermined point in the travel of said door carriers 30,28 into position, the power is reduced for slowing the door opening speed. Such power reduction is effected by predetermined disposition of cam 84 so that relative travel along its operating edge 84' of cam follower 86 will effect the appropriate action within control box E through triggering of the associated micro switch 90. However, as long as the control switch, that is the one actuated by an individual utilizing system A, is in closed condition the doors 1,1' will remain open. Accordingly, the present invention contemplates slowing the door opening speed through power reduction at a predetermined juncture in the door opening movement which may be considered the back check part of the drive so that there is actually provided a two speed opening. Obviously, the opening speeds are adjustable and changes in speed in the opening cycle is simply effected by adjusting of the appropriate cam 84.

During the door opening operation with consequent rotation of shaft 22, motion will also be transmitted through gear train G' for causing a tight winding of spring 78 for compressing same and causing the storing of mechanical energy. In actual practice, the spring 78 also assists in slowing the door opening speed when the power is reduced.

Upon opening of the control switch, as by a person passing from the switch mat or the like, power to motor M is cut off. Thereupon the energy stored in spring 78 is released to cause shaft 22, by means of gear train G', to rotate in the direction opposite to that in which it rotated under influence of motor drive shaft 21 for door opening, thereby causing door carriers 30,28 to move from open to closed position. However, the speed of door closing is uniquely controlled since by rotation of shaft 22 drive shaft 21 will be rotated, by means of gear train G, in reverse relationship to that during door opening operation resulting in rotation of the motor armature (not shown) so as to cause the motor to act as a dynamic brake. It is to be noted that gear train G is designed to operate as a reducer in one direction, that for door opening, and as an increaser in the opposite direction, that being for door closing. Accordingly, motor M becomes a generator creating a brake resistance between its armature and the permanent magnet field. The motor armature is connected to a closed electrical circuit (not shown) which includes two variable resistors (not shown) so that the closing speed may be increased or decreased by appropriate adjustment of the said resistors.

The closing of doors 1,1' may thus be effected also in a two-speed arrangement with cam 85 being so adjusted that when its operating edge 85' is engaged by cam follower 87 microswitch 91 can cause, as it were, a switching in of one resistor and a switching out of the other. Thus, by an increased amount of resistance the closing speed is relatively increased and by decreasing the resistance a decrease in the closing speed is brought about. Thus, with the resistors appropriately set, the closing sped may be suitably reduced at a predetermined juncture during the travel of doors 1,1' to closed condition, there being an initial closing speed and a latching speed. When doors 1,1' are open manually, to be described hereinbelow, such will control the closing speed as in this condition the armature circuit is operated independently of the power supply. In view of the foregoing, it will be seen that in the door opening operation, motor M serves as the motivating force, while in door closing operation spring 78 provides the requisite force.

The utilization of spring 78 provides a safer operating door and eliminates the need of recycle door edge switches which are often required for safety. Spring 78 maintains the doors in closed condition and at the same time permit of manual swinging of the doors, to be shown below, in the event of emergency, such as power failure.

Doors 1,1' of system A may be adapted for what is termed breakaway operation under emergency conditions, that is, to permit same to be swung about a vertical axis into open condition where the same are in substantially planar perpendicular relationship to the adjacent screens 8,8' as indicated in phantom lines in FIG. 2.

As shown in FIGS. 13 and 10, upper door rail 13 of each door 1,1' is of two part construction, having a top component 19 and a lower component 20 which cooperate to define a compartment 120 for receiving a linkage system, indicated generally at 121 for controlling the relative swinging of door 1,1' about hinges 18. There is carried upon the upper surface of rail component 20, at its hinge remote end, a latch 122 for engaging a latch hook 123 in order to maintain the related door construction in a unitary manner for slideable movement. However, upon release of latch 122 each door is adapted for free swinging under what are commonly referred to as panic conditions so that doors 1,1' may be opened in the event of a power failure or other type of emergency and with such swinging being effective regardless of the disposition of doors 1,1' with respect to their reciprocal paths of sliding movement.

As shown in FIG. 11, latch 122 comprises a housing 123', as formed of steel or the like, having an axial bore 124 within which is disposed a compression spring 125 bearing at one end against a ball 126 partially exposed through the adjacent end of bore 124 for purposes presently appearing; and which spring 125, at its other end, abuts against the inner end face of an adjusting plug 127 threadedly engaged within a counterbore 128 formed at the ball remote end of housing 123'. Thus, the pressure on ball 126 may be readily controlled by appropriate tightening or loosening of plug 127. Extending endwise of housing 123', both above and below the ball bearing end are upper and lower flanges 129,129' which serve as guides for accepting a cooperating tongue-like member 130 formed on latch hook 123 and having a concave recess (not shown) for receiving the exposed portion of ball 126 with the same being urged thereagainst by spring 125 for maintaining rail components 19,20 in reliably engaged condition so

that the related doors **1,1'** are secure against inadvertent swingable movement during normal operation.

From the foregoing, it should be quite apparent that the present invention is readily adapted for systems of the type shown in FIGS. **3** and **4** which comprehend but a single sliding door as at **101**, wherein obviously a single door carrier would be required. Also single door models are easily equipped with the breakaway safety feature above described in conjunction with doors **1,1'**, with the operation effected by such feature being indicated in FIG. **4**.

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

1. A sliding door entrance system comprising a door frame having side jambs and a header defining a door opening, said header having a compartment, a door for disposition planarwise parallel to said door opening for normal closing relationship thereto, door suspension means provided in said header compartment comprising a door carrier having a body with a lower portion engaged to the upper end of the door for suspension of the latter; a prime mover having a drive shaft, motion transmission means comprising an operator sprocket, an idler sprocket, belt means trained about said operator sprocket and said idler sprocket, said belt means being engaged to said door carrier body a first gear train operatively connecting said drive shaft and said operator sprocket, a spring provided in said header compartment, and a second gear train operatively connecting said spring and head operator sprocket whereby when the latter is driven through said first gear train, said spring will be stressed.

2. A sliding door entrance system as defined in claim **1** and further characterized by said first gear train being adapted to effect a speed reduction from said drive shaft to said operator sprocket.

3. A sliding door entrance system as defined in claim **1** and further characterized by said second gear train being adapted so that upon release of energy stored in said spring during stressing, said operator sprocket will be caused to rotate in a direction opposite to that when rotated by said first gear train for effecting travel of said door carrier for causing said door carrier to return to door closed condition.

4. A sliding door entrance system as defined in claim **3** and further characterized by means altering the angular speed of said operator sprocket at a predetermined juncture prime mover driven operation and spring-driven operation for providing multi-speed door-opening and door-closing.

5. A sliding door entrance system as defined in claim **4** and further characterized by said means altering the angular speed comprising cam means operatively connected to said second gear train and control elements having cam followers engageable by said cam means.

6. A sliding door entrance system as defined in claim **1** and further characterized by said door comprising a vertical rail consisting of a first and second components hingedly engaged to each other, latch means carried by said door for maintaining said first and second components in normal coplanar relationship, said latch means being adapted for opening action to permit of swinging of said door about said hinges.

7. A sliding door entrance system as defined in claim **1** and further characterized by means guiding said carrier for traverse of said header compartment comprising a trackway provided in said compartment and extending axially parallel therewith, and support rollers mounted on said carrier body and engaging said trackway.

8. A sliding door entrance system as defined in claim **7** and further characterized by an elongated abutment member disposed in said header compartment in elevated relationship to said trackway and a limit roller carried on said carrier for engaging said abutment to restrict vertical displacement of said carrier.

9. A sliding door entrance system as defined in claim **1** and further characterized by means for adjusting said idler sprocket for maintaining tension upon the belt means trained thereabout.

10. A sliding door entrance system as defined in claim **1** and further characterized by remote control means connected to said prime mover whereby upon actuation of said control means said operator sprocket will be rotated in one direction by means of said first gear train and said drive shaft and upon deactuation of said control means said operator sprocket will be rotated in the opposite direction by means of said spring and said second gear train causing said prime mover drive shaft to rotate in the opposite direction to cause said prime mover to act as a dynamic brake.

11. A sliding door entrance system as defined in claim **10** and further characterized by a normally driven shaft provided in said header compartment, said spring being mounted upon said driven shaft, gear means operatively connecting said second gear train and said driven shaft whereby upon deactuation of said control means said driven shaft will be rotated under influence of the release of energy by the spring for causing said operator sprocket to rotate in the direction opposite to that caused upon actuation of said control means.

* * * * *

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,834,081 Dated September 10, 1974

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 9, Claim 4, Line 49, after "juncture" insert ---during---.

Signed and sealed this 19th day of November 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents