Sept. 1, 1953 W. S. EDWARDS 2,650,386

SWINGING DOOR CONTROL

Filed Jan. 12, 1949 3 Sheets-Sheet 1

Fig.1.

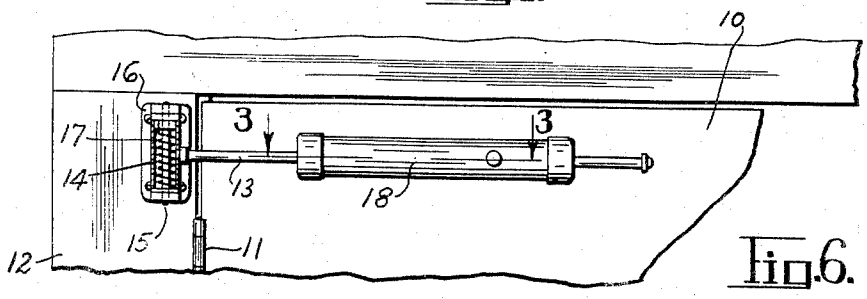


Fig.6.

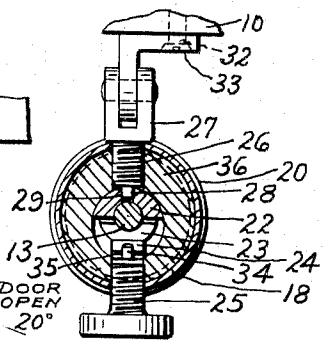


Fig.2.

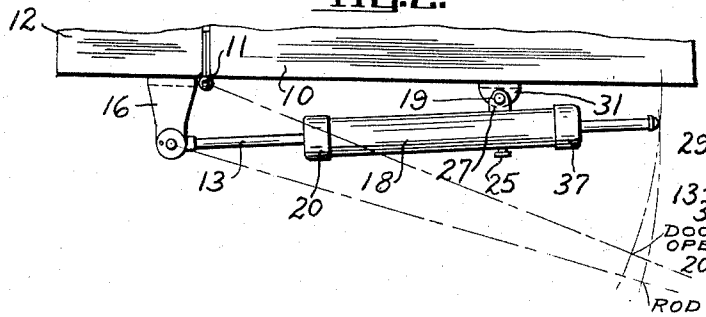


Fig.3.

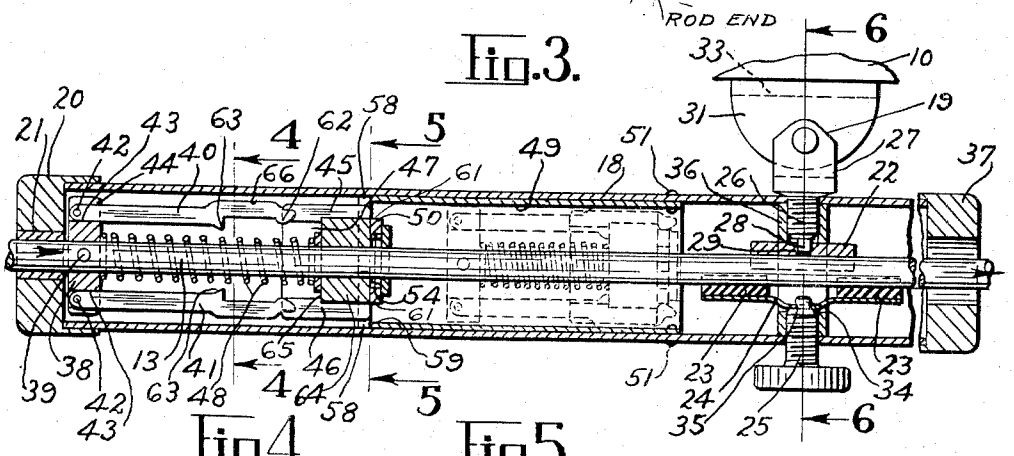


Fig.4.

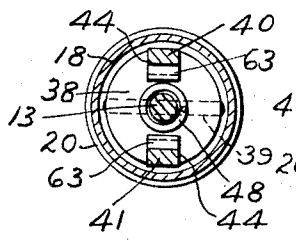
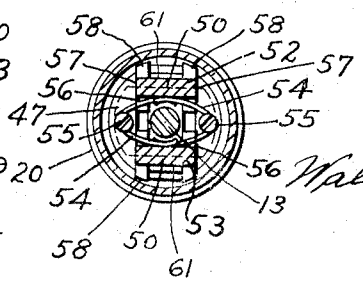


Fig.5.



INVENTOR

Walter S. Edwards

Sept. 1, 1953 W. S. EDWARDS 2,650,386

SWINGING DOOR CONTROL

Filed Jan. 12, 1949 3 Sheets-Sheet 2

Fig. 7.

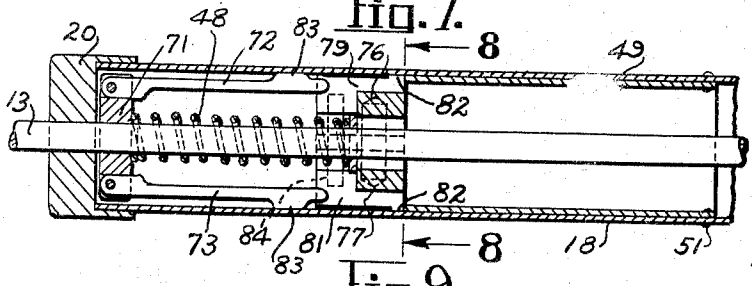


Fig. 8.

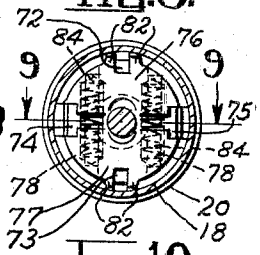


Fig. 9.

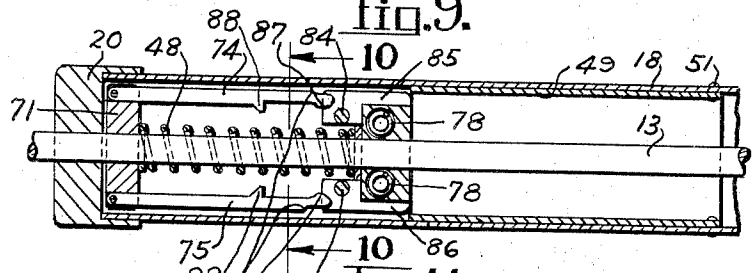


Fig. 10.

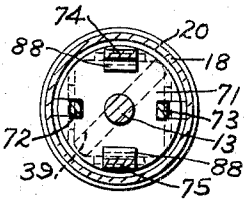


Fig. 11.

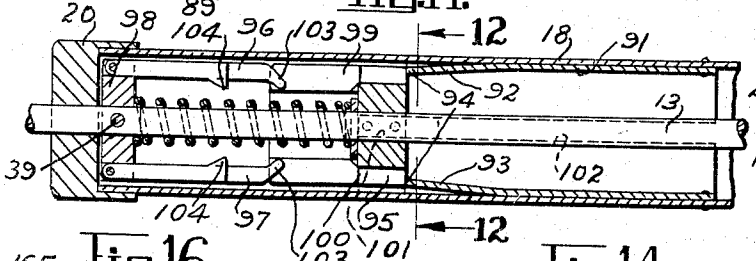


Fig. 12.

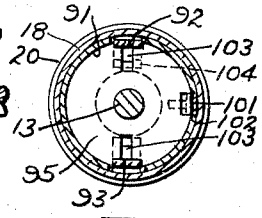


Fig. 16.

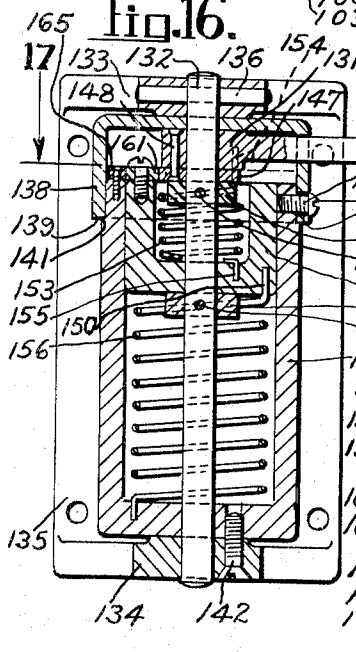


Fig. 14.

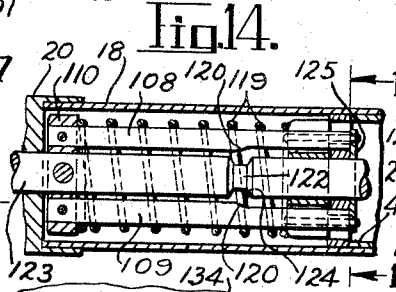


Fig. 15.

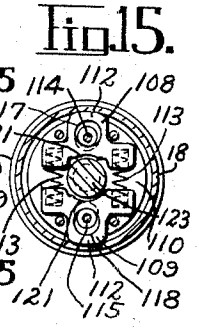
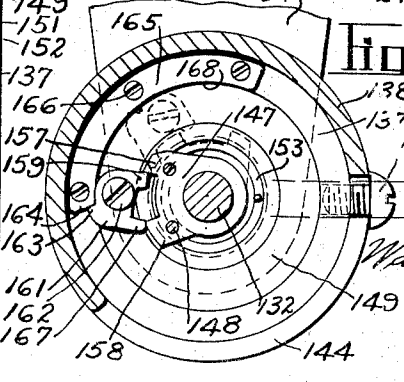


Fig. 17.



INVENTOR

Walter S. Edwards

Sept. 1, 1953 W. S. EDWARDS 2,650,386

SWINGING DOOR CONTROL

Filed Jan. 12, 1949 3 Sheets-Sheet 3

Fig. 18.

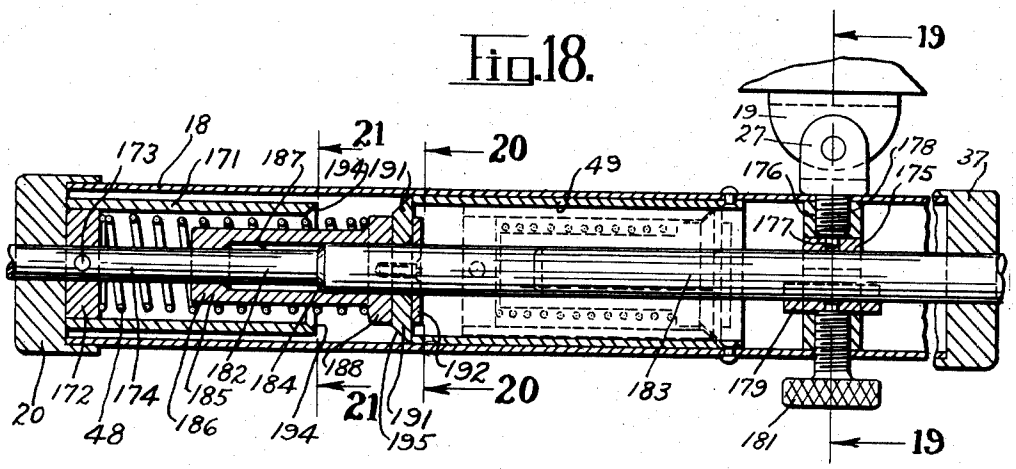


Fig. 19.

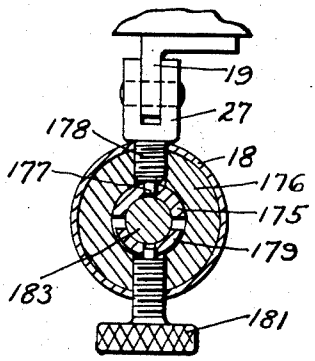


Fig. 20.

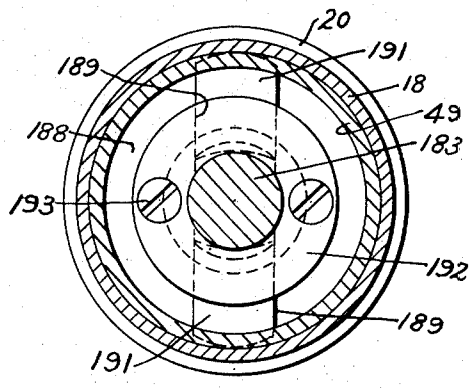


Fig. 21.

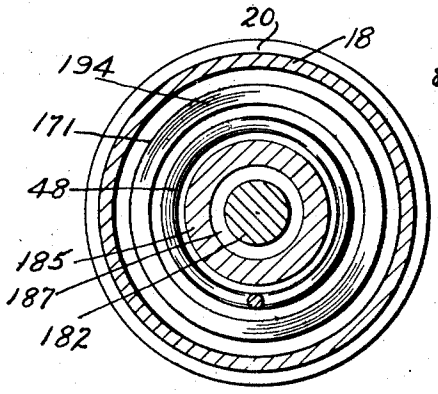
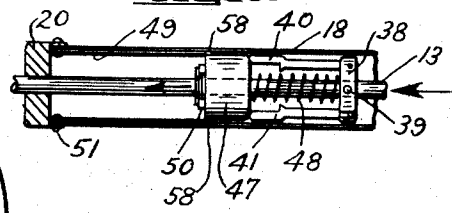


Fig. 13.



INVENTOR

Walter S. Edwards.

Patented Sept. 1, 1953

2,650,386

UNITED STATES PATENT OFFICE

2,650,386

SWINGING DOOR CONTROL

Walter S. Edwards, New Haven, Conn.; Martha Furbish Edwards, executrix of said Walter S. Edwards, deceased

Application January 12, 1949, Serial No. 70,415

19 Claims. (Cl. 16—49)

1

This invention relates generally to swinging door controls and more particularly to spring actuated door controls whereby the closing movement of a door, or like swinging member, will be controlled to prevent undue slamming while insuring complete and positive closing and latching.

Many door closers, checks, and movement controlling devices for swinging doors, and the like, have been devised and made, actuated by springs, or hydraulic pressure. Most of these had the actuating mechanism placed under tension when the door was swung open and, upon release of the door, acted upon this mechanism to close it. Various means are provided in such devices intended to insure that the door would not unduly slam while being securely closed and latched. Practically all of them, some apparently operating satisfactory at first, failed to accomplish the results desired. The tension developed, when opening the door, gradually increases as the door approached open position. Thus the greatest urge upon the door to close it is when the door is open. This closing urge gradually diminishes as the door approaches its closed position and then is of insufficient strength to completely close the door and cause operation of the door latch. Increasing the tension to insure complete closing and latching causes slamming of the door.

One object of this invention is to provide a door, or like, control device which will be placed under tension upon the opening of the door and which will have sufficient strength, as the door approaches its closed position, to completely and securely close and latch it without undue slamming.

Another object is to provide in a door, or like, a movement control device, means to store up supplemental door closing energy during the first part of the door opening movement, retain this energy during the remaining door opening movement, and then as the door approaches its closed position to release this stored up energy to close and latch the door.

Still another object of the invention is to provide in a swinging door, or like, control, means to close an open door up to a determined point, and means to apply additional door closing force to the door at this determined point, to insure complete closing and latching of the same.

A further object of this invention is to provide an improved swinging door, or like, control which will be relatively inexpensive to manufacture, simple in construction, compact, of pleasing appearance, and very efficient and durable in use.

2

With these and other objects in view, which will appear as the descritpion proceeds, there have been illustrated in the accompanying drawings, several forms in which the features and principles of this invention may be conveniently embodied in practice.

In the drawings:

Figure 1 is a side view, part thereof in section, of a door control embodying the features and principles of this invention and shown operatively applied to a swingable door;

Figure 2 is a side view of the control shown in Figure 1;

Figure 3 is a longitudinal sectional view taken on the line 3—3 of Figure 1;

Figure 4 is a cross-sectional view taken on the line 4—4 of Figure 3;

Figure 5 is a cross-sectional view taken on the line 5—5 of Figure 3;

Figure 6 is a cross-sectional view taken on the line 6—6 of Figure 3;

Figure 7 is a broken longitudinal sectional view similar to Figure 3 but of a slightly different form of control device;

Figure 8 is a cross-sectional view taken on the line 8—8 of Figure 7;

Figure 9 is a broken longitudinal sectional view taken on line 9—9 of Figure 8;

Figure 10 is a cross-sectional view taken on the line 10—10 of Figure 9;

Figure 11 is a broken longitudinal sectional view similar to Figure 3 but of a somewhat modified form of control means;

Figure 12 is a cross-sectional view taken on the line 12—12 of Figure 11;

Figure 13 is a broken longitudinal sectional view similar to Figure 3 but with the parts thereof reversed lengthwise to adapt the device for installation in a different position on a door;

Figure 14 is a broken longitudinal sectional view of a different form of door control embodying the features and principles of this invention;

Figure 15 is a cross-sectional view taken on the line 15—15 of Figure 14;

Figure 16 is a sectional view of another modified form door control embodying the features of this invention;

Figure 17 is an enlarged sectional view taken on the line 17—17 of Figure 16 with certain parts in another position.

Figure 18 is a broken longitudinal sectional view similar to Figure 3 but of a modified form of control device;

Figure 19 is a cross-sectional view taken on the line 19—19 of Figure 18;

Figure 20 is an enlarged cross-sectional view taken on the line 20—20 of Figure 18; and

Figure 21 is an enlarged cross-sectional view taken on the line 21—21 of Figure 18.

Referring now to the drawings wherein like reference numerals designate like parts throughout the several views, the reference numeral 10 denotes a door, or the like, swingably connected by a hinge 11 to a door frame 12. The door 10 is provided with the usual latch (not shown) but which securely catches the door when it is closed to retain it in closed position. In some instances the hinge 11 may be of the spring type, which acts upon the door to constantly urge it in closed position. Such a spring hinge, there being many well known forms available, may constitute the door closing means of this invention when the same is provided. In instances where spring hinges are not provided, the door closing means may be constituted by a spring actuated rod 13, see Figure 1, secured to and extending outwardly from a casing 14, which is pivoted on a stationary shaft 15 secured to a bracket 16. The rod 13 is acted upon by a coiled spring 17 to constantly rotate it and urge the rod 13 toward the door 10, due to having one of its ends attached to the casing 14 and its other end attached to the shaft 15, whereby the spring will be wound up and thus placed under tension when the door 10 is opened. The bracket 16 is adapted to be secured to the door frame 12. The rod 13 slides in a tubular casing 18 which is adapted to be suitably secured to the door 10 by suitable connections 19 hereinafter described. Pressure of the rod 13 upon the tubular casing 18, caused by the tension of the coiled spring 17, will act on the door 10 to give it closing movement. The above structure is generally old and well known.

In a door control structure as above outlined there is usually provided some means of controlling the sliding movement of the rod 13 through the tubular casing 14 and this means may comprise a friction shoe adapted to be pressed against the rod 13. By this means the door closing movement may be slowed down to prevent slamming. It has been found that during the last portion of the door closing movement the decreased tension of the spring 17, or the spring in the hinge, and the friction of the friction shoe on the rod 13 causing a braking action, results in such a loss in the closing pressure on the door 10 that it often fails to close completely and to become securely latched. Even in instances where the friction shoe is released from engagement with the rod 14 at the last portion of the door closing movement, the closing spring is not strong enough to completely close and latch the door.

By the inclusion of the features and principles of this invention there is provided an additional source of energy which is adapted to be applied to the door closing means to supplement the action of the door closing spring 17 during the last portion of the door closing movement. Preferably this additional energy is applied when the door is within substantially twenty degrees of being completely closed and, during the opening movement of the door and up to substantially twenty degrees open, this supplemental closing means is tensioned and locked in tensioned position to be released at the twenty degree position of the door when the door is closing. One means for accomplishing the above result is to provide the structure shown in Figures 3, 4, 5 and 6 in combination with a door closing means generally

constituted by a spring hinge, or the spring 17, the rod 13, and the tubular casing 18.

In the form shown in Figures 3–6 inclusive the rod 13 extends through the tubular casing 18, entering at one end through an end cap 20 and a bearing bushing 21, and being guided by a half bearing bushing 22 adjacent the other end of the casing 18 and frictionally engaged by a shoe, or shoes, 23 opposite to the half bushing 22. The shoes 23 are attached to a leaf spring 24 which is engaged by an adjusting screw 25 by which spring tension of the spring 24 may be regulated to adjust the friction of the bushing 22, and the shoes 23, upon the rod 13. The half bushing 22 is retained in place by the threaded shank 26 of one portion 27 of the connection 19, a teat 28 extending from the shank 26 into a hole 29 in the half bushing 22. The connection portion 27 is pivoted to another connection portion 31 which is adapted to be attached to the door 10 by screws 32 passing through a base member 33. The shoes 23 partially surround the rod 13 and they, with the leaf spring 24, are retained in place by a teat 34 extending from the end of the screw 25 into a hole 35 in the spring 24. The screw 25 and the shank 26 thread into a disc 36 positioned within the tubular casing 18. The rod 13 passes freely through an end cap 37 after leaving the half bearing 22.

As shown in Figure 3 a plate member 38 is secured by a pin 39 to the rod 13, the rod being shown in its normal position when the door 10 is in completely closed and latched position, whereby the member 38 lies closely adjacent to the inside end of the cap 20. As the door 10 is opened the rod 13, with the member 38, moves in the direction of the arrows in respect to the casing 18 and, when the door 10 is moved into a position substantially twenty degrees open, the rod 13 and member 38 have moved away from the cap 20 an appreciable amount, approximately three quarters of an inch. Pawls 40 and 41 are pivoted at their rear ends to the plate member 38 by pins 42 and are prevented from swinging inwardly toward each other by being arranged to engage the bottom surface 43 of the slot 44 formed in the member 38 and in which they are disposed. The pawls 40 and 41 extend forwardly away from the member 38 with their forward ends lying in grooves 45 and 46, respectively, formed in a slide member 47. The member 47 is mounted on the rod 13 for sliding movement therealong. A coiled spring 48 is disposed between the plate member 38 and the slide member 47 and reacts between them to constantly urge them apart.

A sleeve 49 is disposed in the tubular casing 18 in front of the slide member 47, being secured at its front end to the casing 18 by rivets 51. Catches 52 and 53 are mounted on the front face of the slide member 47 and are constantly urged apart by springs 54, which are retained on the front face of member 47 by screws 55 about which they are wound and with their ends engaging the catches 52 and 53. The catches 52 and 53 are U-shaped in cross-section and their side legs 56 ride in cross slots 57 formed in the front face of the member 47. The catch legs 56 extend beyond the base 50, the outer extensions 58 being arranged and formed to protrude beyond the periphery of the slide member 47 and abut against the rear end surfaces 59 of the sleeve 49 to lock the member 47 against forward movement. The outer surface 61 of the base 50, of the catches 52 and 53, lies flush with the bottom of the grooves 45 and 46 when the ends of the outer extensions

are in slide member locking position against the rear end surface 59 of the sleeve 49.

The front end of each of the pawls 40 and 41 is provided with an inwardly directed lug 62, and a lug 63 is provided upon the undersurface of each pawl spaced rearwardly from the lug 62 an amount not less than the width of the slide member 47 at the cylindrical portion 64 thereof where it rides on the rod 13. The lugs 62, when moved forwardly by the opening of the door 10, causing movement of the rod 13 and plate member 38 away from the end cap 20, ride over the slide member portion 64 and the lugs 63 engage against the rear surface 65 of the portion 64. A cam surface 66 formed on the outer surface of each pawl 40 and 41 is engaged by the rear end 59 of the sleeve 49, as the pawls are moved forwardly, whereby the pawls are cammed inwardly to force the lugs 62 against the outer surface 61 of the base 50 of the catches 52 and 53 whereby the catches 52 and 53 are pressed toward each other against spring tension and the outer extensions 58 are withdrawn out of engagement with the sleeve end surfaces 59. Simultaneously with the above action on the catches 52 and 53, the lugs 62 are disposed below the bottom of the slots 45 and 46 at the front end of the slide member portion 64 to prevent the slide member 47 moving forwardly on the rod 13 away from the plate member 38. By the engagement of the lugs 63 against the member 47, it is positively moved along the rod 13 with and locked to the member 38 until they reach the position shown in dotted lines in Figure 3, which represents the extreme forward movement of the parts when the door 13 is fully opened, for instance, at ninety degrees to its closed position.

At the same time the above operation is taking place the spring 17, or the hinge spring, is being wound up to tension it. When the door is released, after being opened, the spring 17, or the hinge spring, acts through the rod 13 and casing 18 to close it, the brake shoes controlling the speed of such movement. This door closing movement continues until the door approaches the twenty degree open point whereat the spring pressed catches 52 and 53 raise the pawls 40 and 41 to release the slide member 47 from the locking engagement of the lugs 62, and the catch extensions 58 snap in back of the sleeve end surface 59 to hold the slide member 47 against movement forwardly. The spring 48 then acts in combination with the spring 17 against the plate member 37 to force it, and the rod 13, rearwardly at increased energy to complete the closing and latching of the door 10. In installations where the opening of the door 10 moves the rod 13 in the opposite direction to that shown in Figure 3 the plate member 37, pawls 40 and 41, slide member 47, and sleeve 49, are reversed in the tubular casing 18 as shown in Figure 13. The action as above described, however, is the same and additional energy is supplied by the spring 48 to insure complete closing and latching of the door 10.

In the form shown by Figures 7, 8, 9, and 10 all of the parts of the control device are the same except the plate member 71, pawls 72, 73, 74, and 75, and the slide member which is forward of two parts 76 and 77 acted on by springs 78 to urge them apart transversely in respect to the tubular casing 18. As shown in Figure 7, the pawls 72 and 73 are pivoted to the plate 71 and extend through slots 79 and 81, formed in the outer surface of the slide member parts 76 and 77 respectively, and between lips 82 which extend outwardly from the body portion of the parts 76 and 77, to be disposed in back of, and to engage, the rear end of the sleeve 49 to releasably lock the slide member. When the plate 71 is moved forwardly, the pawls 72 and 73 are cammed inwardly by the rear end of the sleeve 49 engaging a cam lug 83 provided on each pawl. The pawls, being pressed inwardly against the action of the springs 78, engage the bottom surface of the slots 79 and 81 respectively to force the slide member parts 76 and 77 inwardly and release them from the sleeve 49. Transversely directed pins 84, extending between the slide member parts 76 and 77, maintain these parts in aligned position.

The pawls 74 and 75, see Figure 9, are pivoted to the plate member 71 and extend forwardly through slots 85 and 86 formed partly in each of the outer surfaces of the slide member parts where they oppose each other. The forward end of each pawl 85 and 86 is provided with a lug 87 depending from the undersurface of the pawl, and a lug 88, spaced rearwardly from the lug 87. A camming surface 89 is provided on the outer surface of each pawl and is positioned to be engaged by the rear end of the sleeve 49, when the pawls are moved forwardly, to lock the respective slide member to the plate member 71, the lug 87 being disposed in front of the slide member part and the lug 88 being disposed at the rear of the slide member part. When the slide member parts 76 and 77 are pressed together to release them from the sleeve 49, the springs 78 are compressed and upon return of the slide member parts to a position to the rear of the sleeve rear end these slide members parts are forced outwardly by said spring 78 to engage the sleeve end in back of same, whereby the spring 48 will act, as in the previously described form shown in Figures 3, 4, and 5, to completely close and latch the door 10.

In the form shown in Figures 11 and 12 the rear end of a split sleeve 91 is provided with diametrically opposite tongues 92 and 93 which are struck out from the material of the sleeve 91 and are sprung inwardly to present their rear ends 94 in front of a slide member 95, which is slidably mounted on the rod 13. Pawls 96 and 97, pivoted to a plate member 98, extend forwardly therefrom into slots 99 and 100 respectively, which are formed in the slide member 95 at opposite sides thereof. The slots 99 and 100 are maintained in alignment with the tongues 92 and 93 respectively by means of a key 101, fastened to the slide member 95 and extending into a lengthwise slot 102 provided in the sleeve 91, and which extends the entire length thereof. In some instances, only one pawl 96 and one tongue 92 are required.

Each of the pawls 96 and 97 has an inwardly and angularly projecting finger 103 on its forward end, and a lug 104 extending inwardly from its undersurface and spaced rearwardly from the finger 103. Fingers 103 engage the sleeve tongues 92 and 93, pressing them outwardly out of engagement with the front end of the slide member 95 to release it. The fingers 103 also slide downwardly in front of the slide member 95 to lock this member to the plate member 98, the lugs 104 engaging the rear end surface of the slide member. Upon reverse movement of the rod 13, the slide member 95 moves rearwardly until its front end reaches the rear end of the cylindrical portion of sleeve 91 whereupon the tongues 92 and 93 snap inwardly in front of the slide member to lock it against forward movement. The plate member 98 and

the rod 13 continue movement rearwardly under urging of the springs 17 and 48 whereby the door 10 is completely closed and latched.

In Figure 13 the tubular casing 18 is fastened upon the inside surface of the door 10 instead of on the outside surface, as shown in Figure 3, thus the rod 13 will move through the casing in a direction opposite to the rod 13, when the casing 18 is mounted as in Figure 3, when the door is swung upon its hinges. Due to this action of the rod 13, the sleeve 49 is disposed with one of its ends abutting the end cap 20 and the plate member 38 is pinned to the rod 13 by the pin 39 intermediate the end caps 20 and 37. By this arrangement the spring 48 is compressed and locked under tension when the door 10 is swung open about twenty degrees and is released when the door is being closed at the twenty degree open position, the rod 13 moving through the casing 18 as indicated by arrows when the door is opened.

In the form shown in Figures 14 and 15 pawls 108 and 109 are mounted upon the front face of a slide member 110 for transverse movement thereon. A lip 112 is provided on the outer portion of each pawl for disposition in back of the rear end of the sleeve 49 to releasably lock the slide member 110 against forward movement. Springs 113 react between the pawls 108 and 109 to spread them apart transversely. Rods 114 and 115 secured to a plate member 116 extend forwardly therefrom and through holes 117 and 118 respectively in the slide member 110. A coiled spring 119 reacts between the plate member and the slide member to constantly urge them apart lengthwise of the tubular casing 18. The forward end of each rod 114 and 115 is smaller in diameter than the rear portion and its axis is offset upwardly therefrom to provide a camming shoulder 120 on each rod. The camming shoulder 120 is adapted to engage the respective pawl 108, or 109, upon the bottom surface of the hole 117, or 118, therein, to cam the pawls inwardly and draw the lips 112 away from the rear end of the sleeve 49 and release the slide member 110 therefrom. Simultaneously with the release of the slide member 110, the inner edge 121 of each pawl is forced into an annular groove 122 provided in the rod 123, which rod is similar in other respects to the rod 13 of Figures 3, 4 and 5, to lock the slide member 110 to the plate member 116. As in the other previously described forms, the reverse movement of the rod 123 draws the slide member 110 rearwardly and when the pawls reach the rear end of the sleeve 49 they will spring outwardly under urge of the springs 113, the lengthwise urge of the spring 119 assisting by causing the pawls to ride on a beveled surface 124 and out of the annular groove 122, whereby the door 10 will be completely closed and latched by the combined energy of springs 17 and 119. Strips 125 extending across the front end of the slide member 110, over the pawls 108 and 109, and riveted to the slide member hold the pawls in place.

In the forms shown in Figures 3, 7, 14 and 18, the sleeve 49 acts as a part, the stationary part connected to the casing 18, of the catch means for the slide member and also as the means to retain the slide member locked to the plate member. In Figure 11 the sleeve 91, due to the tongues 92 and 93, acts as part, the movable part connected to the casing 18, of the catch means for the slide member, and also as the means to

retain the slide member locked to the plate member.

In the form shown in Figures 16 and 17 a rod 130 is extended from a tubular casing (not shown, but for like use as the casing 18 in Figure 3) and having a brake device similar to that shown in Figure 3, including the shoes 23 and the adjusting screw 25, and is secured to a hub member 131. The hub member 131 is rotatably mounted upon a shaft 132 which extends from one arm 133 to the other arm 134 of a bracket 135 and is secured to the arm 133 by a pin 136. The bracket 135 is adapted to be secured to the door frame. A cup shaped casing 137 is mounted on the shaft 132 and extends upwardly from the bracket arm 134. An inverted cup shaped cover 138 covers the upper open end of the casing 137 with its side peripheral edge 139 seated upon an annular and outwardly directed shoulder 141 provided on the casing 137. The cover 138 is mounted on the shaft 132 and engages the bracket arm 133. The casing 137 is held against rotation by a screw 142 passing through the bracket arm 134 and screwed into the bottom of the casing. The cover 138 is free to rotate on the shaft 132, being secured against lengthwise movement away from the casing 137 by a screw 143. The screw 143 passes through an annular slot 144 provided in the side of the cover 138 and screws into the casing 137. The ends of the slot 144 limit the rotative movement of the cover 138 on the casing 137.

The hub member 131 is retained on the shaft 132 by a collar 145 which is pinned to the shaft 132 by a pin 146. Between the collar 145 and the hub member 131 is a camming dog 147. The camming dog 147 is secured to the hub member 131 by pins 148. Below the hub member 131 is a cup shaped part 149 which is rotatably mounted on the shaft 132 with its open end facing upwardly. The part 149 is retained on the shaft 132 by a collar 151 which is secured to the shaft 132 by a pin 152. A coiled spring 153 having one of its ends 154 attached to the hub member 131 and its other end 155 attached to the part 149 surrounds the shaft 132 and is disposed within the cup shaped part 149. The cup shaped part 149 is free to rotate within the casing 137. Another coiled spring 156 is disposed in the casing 137 between the bottom of the part 149 and the bottom of the casing 137. The spring 156 surrounds the shaft 132 and has one of its ends 150 attached to the part 149 and its other end attached to the casing 137. Both springs 153 and 156 are arranged to wind up to be tensioned when the hub member 131 is swung about the shaft 132 in one direction, for instance, when the door is opened.

The camming dog 147 has peripherally spaced apart tongues 157 and 158 extending outwardly therefrom and, when the hub member 131 is swung the tongue 158 engages a lug 159 extending inwardly from a catch member 161. The catch member 161 is pivotally mounted upon the upper surface of a side of the cup shaped part 149 by means of a screw 162 which passes through the catch 161 and screws into the part 149. A catch lug 163 extends outwardly from the catch member 161 and is adapted to engage an end 164 of an arcuate cam strip 165 fastened by screws 166 upon the upper surface of the side of the casing 137. A catch finger 167 extends inwardly from the catch member 161 and is peripherally spaced from the catch lug 159. When the door is closed the catch parts are in the position shown in Figure 17. Upon opening the door

the locking tongue 157 is swung away from the lug 159 and the tongue 158 moves toward the lug 159. When the tongue 158 engages the lug 159 the catch member 161 is rotated upon the screw 162 to swing the catch lug 163 inwardly out of engagement with the end 164 of the cam strip 165, and to swing the catch finger 167 in back of the tongue 153, as indicated in dotted lines in Figure 17.

The above described action takes place when the door is opened, for instance, about twenty (20) degrees and results in the tensioning of the spring 153. After this amount of opening movement of the door the spring 153 is locked under tension and the spring 156 is tensioned by further opening of the door. The above is possible due to the locking of the part 149 against rotation by the engagement of the catch lug 163 with the end 164 of the cam strip 165 while the spring 153 is being wound up to tension it. When the movement of the hub member 131 when the door is opened causes the tongue 158 to engage the lug 159 to rotate the catch member 161 and the catch lug 163 is removed from engagement with the strip end 164 the catch finger 167 swings in back of the tongue 158 to lock the hub member 131 to the cup shaped part 149 with the spring 153 under tension. The catch member 161 is held in this latter position due to the catch lug 163 riding against the inner peripheral surface 168 of the cam strip 165. During the continuance of the door opening movement the spring 156 is wound up to be tensioned.

Upon release of the door to allow it to close, the tensioned spring 156 acts thereon through the part 149, the screw 162, the catch member 161, the tongue 158, the hub member 131, and the rod 130 to urge the door toward its closed position. When the door is closed to within about twenty degrees of its fully closed positioned the cam member is swung by the urging of the tongue 158 against the catch finger 167 under influence of the tensioned spring 153 to dispose the catch lug 163 into engagement with the strip end 164 and to release the tongue 158 from the catch finger 167. The spring 153 now acts upon the hub member 131 to fully close the door and latch it. When the door is fully closed the tongue 157 engages the lug 159 to lock the hub member against further swinging movement in respect to the part 149.

In the form shown in Figures 18, 19, 20 and 21 the control device comprises a cup shaped member, in this instance composed of a hollow cylindrical part 171 having one of its ends closed by a plate member 172 and secured thereto by a pin 173, which pin passes through the part 171, member 172 and a rod 174. The closed end of the cup shaped member is shown disposed adjacent the end cap 20 and the open end of the member is directed away therefrom along the casing 18. The rod 174 is arranged to slide through the casing 18 and to be slidingly supported by the casing end caps 20 and 37. The rod 174 is supported within the casing 18 by a half bearing 175 held in a disc 176 by a teat 177 formed on the end of a threaded stud 178 extending into the casing from the portion 27 of the connection 19. A friction applying member 179 is adapted to engage the rod 174 directly opposite the bearing 175 and be pressed thereagainst by an adjusting screw 181. The rod 174, in this instance, has a forward portion 183, a beveled rearwardly directed shoulder 184 being provided at the jointure of these rod portions.

A hollow cylindrical slide member 185 is adapted to slide on both rod portions 182 and 183 by having its rear end 186 bored to fit the rod portion 182 and its bore 187 to fit the rod portion 183. The forward end of slide 185 is enlarged in diameter to provide a head 188. A cross slot 189 is formed in the forward end surface of the head 188. Catch members 191 are disposed in the slot 189, one on each side of the rod 174 at its portion 183. An end plate 192 is secured by screws 193 to the end surface of the head 188 over the catch members 191 to hold them in the slot 189. When the door 10 is in closed position the catch members 191 are held laterally extended with their outer ends engaging the rear end of the sleeve 49 thus preventing forward movement of the slide 185 under urge of the spring 48 which reacts between the member 172 and the rear end surface of the slide head 188. Release of the catch members 191 from engagement with the rear end of the sleeve 49 is accomplished by the engagement of the forward edge of the cylindrical part 171 of the cup shaped member with the outer ends of the catch members 191, the contacting surfaces being beveled as at 194 and 195 to facilitate this action.

The assembly is such that when the door 10 is opened substantially twenty degrees from its closed position the rod 174 is moved to the right in Figure 18. This rod movement causes the cup shaped member (part 171 and plate member 172) to move with it to compress the spring 48 between the member 172 and the head 188 of the slide 185, the slide being held stationary with respect to the casing 18 by the engagement of the catch members 191 with the sleeve 49. Substantially simultaneously with the engagement of the internally beveled edge 194 of the part 171 and the externally beveled edge 195 of the catch members 191, the shoulder 184 on the rod 174 between the rod portions 182 and 183 is in position for the inner ends of the catch members to move inwardly against the rod portion 183 and release the slide 185 from its locked position to the rear of the sleeve 49 and to lock it to the rod 174 with the spring 48 under tension. Further forward movement of the rod 174 in the casing 18 carries the locked together cup shaped member 171, 172 and the slide 185 into the position shown in dotted lines in Figure 18, the engagement of the outer ends of the catch members 191 with the internal surface of the sleeve 49 preventing release of the slide 185 from shoulder 184 of the rod 174. When the door is closed and reaches the twenty degree open position, the tension of the spring 48 constantly tending to separate the cup shaped member 171, 172 and the slide 185, the catch members are moved outwardly to be disposed in back of the rear end edge of the sleeve 49 whereby the slide 185 is released from the rod 174 and the tension of spring 48 is released and acts on the door 10 to completely close and latch it.

There has been described above several structures for accomplishing the principal object of this invention whereby additional energy is applied to a door when it is partly closed in order to insure complete and positive closing and latching thereof. In all instances a means for closing the door is provided, with or without braking means. This closing means, in the instances illustrated, all comprise a spring, either mounted on a bracket and acting on the rod 13, or 130, or as part of a door hinge and acting directly upon the door. This closing means is arranged to be tensioned when the door is opened and to lose its tension as the door is closed

thereby. To this arrangement, and in combination therewith, there has been provided, by incorporating the features and principles of this invention in the structure, a supplemental source of energy which is tensioned as the door is opened part way, and locked under this tension for the remainder of the door opening movement. Upon release of the door, it is first given a closing movement by the first spring and, when a desired point in its closing movement has been reached, the supplemental, or second, spring is released to act upon the door and by its tension to increase the closing energy and completely close and latch the door. Preferably, though not always required, the supplemental, or second spring, is of greater strength than the first, or usual, door closing spring or other means. By the provision in a door control of the features and principles of this invention a very efficient and durable swinging door, or like, control device is formed.

While there have been shown and described herein several forms in which the features and principles of this invention may be conveniently and practically embodied, it is to be understood that the same may be embodied in other specific forms without departing from the spirit and essential attributes thereof, and it is therefore desired that the present embodiments be considered in all respects as illustrative and not restrictive, reference being had to the claims rather than to the foregoing description to indicate the scope of the invention.

Having thus disclosed the invention, what is claimed as new and for which it is desired to obtain Letters Patent, is:

1. In a swinging door control, a first means connected to the door and acted upon by the act of swinging the door in one direction, to be placed under tension, said means acting on the door to swing it toward closed position when the door is released after being opened, a second means connected to the door and acted upon by the act of swinging the door toward open position, to be placed under tension, means to lock the second means under tension when the door is partly open, and means to release the second means for it to act on the door to close and latch it, when the door is partly closed by said first means after it has been released from open position.

2. In a swinging door control, a first means adapted to act upon the door to close it and being connected to the door to be tensioned while the door is being partly opened, means to lock the first means under tension at the partly opened door position, a second means adapted to act upon the door to close it and being connected to the door to be tensioned while the door is further opened, and means to release said locked first means when the door is moved to partly closed position by said second means, to cause completely closing of the door.

3. In a swinging door control, a first means adapted to act upon the door to close it and being connected to the door to be tensioned while the door is being moved into a partly open position, means to lock said first means under door closing tension at the partly open position of the door, a second means adapted to act upon the door to move it toward closed position and being connected to the door to be tensioned while the door is further opened, and means to unlock said first means when the door is partly closed to cause simultaneous closing action of both means upon the door to close it.

4. In combination with a first member mounted for movement toward and away from a second member, a first means to move said first member toward the second member, a second means adapted to be acted upon by said first member, as it moves away from the second member, to tension it for action on the first member to move it toward the second member, means to lock the second means under tension when the first member is moved a determined amount away from the second member, and means to release said locking means when the first member is moved toward said second member a determined amount.

5. In a swinging door control, a first spring means adapted to act upon the door to close it, a second spring means adapted to act upon the door to close it, both of said spring means being connected to said door to be tensioned when the door is opened, one of said spring means being tensioned while the door is being partly opened, means to lock the spring means, tensioned while the door is being partly opened, at a determined point, and means to release the locked tensioned spring means when the door, in closing, reaches the aforesaid determined point.

6. A swinging door control, comprising a bracket attachable to a stationary part, a rod hinged to said bracket, a first spring on said bracket and acting on said rod to swing it and close the door, means to connect the rod to the door, a second spring reacting between the rod and said connecting means and adapted to be placed under tension when the door is partly opened, means to lock the second spring to hold it under tension while the door is further opened, and means to release said second spring locking means to apply its tension to the door after said door is partly closed.

7. In a control for a door swingable in a frame, a bracket attachable to the door frame, a tubular casing attachable to the door, a rod hinged to said bracket and extending into said casing, a spring reacting between the bracket and the rod to move the door toward its closed position in said frame, a second spring adapted to react between said rod and said casing to move the door toward its closed position, the second spring being tensioned while the door is being partly opened, means to lock the second spring under this tension, and means to release the second spring locking means when the door is partly closed.

8. In a control for a first member movable in respect to a second member, a bracket attachable to the second member, a first part attachable to the first member, a second part movable lengthwise of the first part and pivoted to said bracket, a third part slidable lengthwise along the second part, means to releasably lock the third part to the first part to prevent lengthwise movement of the third part in respect to the first part, spring means reacting between said bracket and said first part to move the first member in respect to the second member in one direction, a second spring means reacting between the second and third parts and tensioned while the first member is moved away from the second member in the one direction, means to lock the second spring under tension and to substantially simultaneously release the third part locking means when the first member is moved in another direction in respect to the second member.

9. In a control for a door swingable in a door frame, a hollow casing attachable to the door, a spring pressed rod acting on the casing to swing the door into closed position in the door frame, said rod being attachable to the door frame and extending into said casing, a slide movable lengthwise of said casing on said rod, means to releasably lock said slide to said casing, a spring reacting between said rod and said slide and adapted to be tensioned when the rod is moved lengthwise in said casing in one direction, means to lock the rod to said slide when the spring is tensioned and to substantially simultaneously unlock said slide from said casing, said means being adapted to unlock said rod from said slide and to substantially simultaneously lock said slide to said casing when the rod is moved lengthwise in the casing in the other direction.

10. In a control for a door swingable in a door frame, a hollow casing attachable to the door, a spring pressed rod acting on the casing to swing the door into closed position in the door frame, said rod being attachable to the door frame and extending into said casing, a slide movable lengthwise of said casing on said rod, means to releasably lock said slide to said casing, a spring reacting between said rod and said slide and adapted to be tensioned when the rod is moved lengthwise in said casing in one direction, means to lock the rod to said slide and to act on the means locking said slide to said casing to unlock it when the spring is tensioned, said rod-locking means, when the rod is moved in the other direction, unlocking the slide from the rod and acting to release the means to lock the slide to the casing.

11. In a control for a door swingable in a door frame, an elongated first member attachable to the door, a spring pressed second member acting on the first member to swing the door into closed position, said second member being attachable to the door frame and extending along said first member, a slide mounted on said second member, a spring reacting between said slide and said second member, means carried by said slide to lock it to said first member when moved in one direction and to lock it to said second member when moved in an opposite direction, and means carried by the second member to act on said locking means to so operate it when the second member is moved in opposite directions.

12. In a control for a dor swingable in a door frame, an arm having an end connected to the door and pivoted at the other end to swing therewith, a first spring adapted to act on said arm to swing it and the door toward the closed position of the door, a second spring adapted to act on said arm to swing it and the door toward the closed position of the door, both of said springs being tensioned when the door is opened, means to lock said second spring in tensioned condition when the door is partly opened and to release said second spring when the door is partly closed.

13. In a swinging door control, a tubular casing adapted to be mounted to a door, a bracket adapted to be mounted to a door frame, a rod hinged to said bracket and extending into said casing for sliding movement therein, a spring on said bracket acting on said rod to swing it in door closing direction, a slide member in said casing and slidable lengthwise therein, means to releasably catch said slide to prevent its lengthwise movement in said casing, a spring reacting between said rod and said slide, and means carried by said rod and adapted to engage said slide

to lock it to said rod and to release said catch member when the rod is moved in a direction toward said slide to tension said second mentioned spring.

14. In a swinging door control, a tubular casing adapted to be mounted to a door, a bracket adapted to be mounted to a door frame, a rod hinged to said bracket and extending into said casing for sliding movement therein, a spring on said bracket acting on said rod to swing it in door closing direction, a slide member in said casing and slidable lengthwise therein, means mounted on said slide cooperating with means carried by said casing to releasably catch said slide to prevent its lengthwise movement in said casing, a spring reacting between said rod and said slide, and means carried by said rod and adapted to engage said slide to lock it to said rod and to release said catch member when the rod is moved in a direction toward said slide to tension said second mentioned spring.

15. In a swinging door control, a tubular casing adapted to be mounted to a door, a bracket adapted to be mounted to a door frame, a rod hinged to said bracket and extending into said casing for sliding movement therein, a spring on said bracket acting on said rod to swing it in door closing direction, a slide member in said casing and slidable lengthwise therein, means mounted in said casing and cooperating with said slide to releasably catch said slide to prevent its lengthwise movement in said casing, a spring reacting between said rod and said slide, and means carried by said rod and adapted to engage said slide to lock it to said rod and to release said catch member when the rod is moved in a direction toward said slide to tension said second mentioned spring.

16. In a swinging door control, a member adapted to be attached to a door, a bracket adapted to be attached to a door frame, an arm hinged to said bracket and operatively connected to said member, a casing fixedly attached to said bracket, a member rotatably mounted in said casing, a first spring reacting between the arm and the member adapted to be attached to the door, a second spring reacting between said member in said casing and said casing, means to releasably lock the member in said casing to said casing, and means carried by said arm to actuate said means to unlock the member in said casing from said casing and to releasably lock said arm to the member in said casing when the arm is swung in one direction.

17. In a swinging door control, a member adapted to be attached to a door, a bracket adapted to be attached to a door frame, an arm hinged to said bracket and operatively connected to said member, a casing fixedly attached to said bracket, a member rotatably mounted in said casing, a first spring reacting between the arm and the member adapted to be attached to the door, a second spring reacting between said member in said casing and said casing, means to releasably lock the member in said casing to said casing, and means carried by said arm to actuate said means to unlock the member in said casing from said casing and to releasably lock said arm to the member in said casing when the arm is swung in one direction, the means, carried by said arm, engaging the member in said casing and casing locking means to unlock the arm from the member in said casing and lock the member in said casing to the casing when the arm is swung in the other direction.

18. In a swinging door control, a member adapted to be attached to a door, a bracket adapted to be attached to a door frame, an arm hinged to said bracket and operatively connected to said member, a casing fixedly attached to said bracket, a member rotatably mounted in said casing, a first spring reacting between the arm and the member adapted to be attached to the door, a second spring reacting between said member in said casing and said casing, means to releasably lock the member in said casing to said casing, and means carried by said arm to actuate said means to unlock the member in said casing from said casing and to releasably lock said arm to the member in said casing when the arm is swung in one direction a determined amount to tension said second spring and lock it under tension and to tension said first spring.

19. In a swinging door control, a member adapted to be attached to a door, a bracket adapted to be attached to a door frame, an arm hinged to said bracket and operatively connected to said member, a casing fixedly attached to said bracket, a member rotatably mounted in said casing, a first spring reacting between the arm and the member adapted to be attached to the door, a second spring reacting between said member in said casing and said casing, means to releasably lock the member in said casing to said casing, and means carried by said arm to actuate said means to unlock the member in said casing from said casing and to releasably lock said arm to the member in said casing when the arm is swung in one direction a determined amount to tension said second spring and lock it under tension and to tension said first spring, the means, carried by said arm, engaging the member in said casing and casing locking means to unlock the arm from the member in said casing and lock the member in said casing to the casing when the arm is swung in the other direction a determined amount by release of the tension in the first spring, to release the tension in the second spring.

WALTER S. EDWARDS.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,528,195	Bush	Mar. 3, 1925
1,671,614	Smith	May 29, 1928
1,705,820	Lansing	Mar. 19, 1929
2,063,526	Snowdon	Dec. 8, 1936
2,167,409	Schmidt	July 25, 1939
2,411,481	Tykeson	Nov. 19, 1946