A door control mechanism for controlling the movement of a sectional door between the closed position and the open position thereof wherein the door is biased towards the closed position thereof, the mechanism accommodating manual movement of the door to the open position followed by an automatic movement of the door to the closed position followed by an automatic movement of the door to the open position and then followed by manual movement of the door to the closed position, the mechanism including a first latch having a door-holding condition for holding the door in its open position and having a door-releasing condition for releasing the door and allowing it to move to the closed position thereof, a second latch mechanism having a device-connecting condition for connecting an energy-storing device to the door thereby automatically to move the door to the open position thereof, and having a device-holding condition for maintaining the energy-storing device out of operative connection with the door, a trigger for selectively operating the first and second latch mechanisms, and a selector for selectively rendering the trigger operable to change the condition of only one of the first and second latch mechanisms at one time.
DOOR CONTROL MECHANISM

This invention is directed to a door control mechanism of the type useful with garage doors and the like, and particularly useful in combination with sectional overhead doors.

It is an important object of the present invention to provide an improved combination for use with an associated building having a door-receiving opening therein, the combination comprising first and second tracks for attachment to the associated building respectively adjacent to the sides of the door-receiving opening, a sectional door having a plurality of rollers mounted thereon and engageable in the tracks for movement of the door between a first position with respect to the opening and a second position with respect to the opening, counterbalance mechanism for mounting on the associated building adjacent to the door-receiving opening to counterbalance the door so that the door is biased toward the second position thereof, and door control mechanism for mounting on the associated building and operatively connected to the door for accomplishing manual movement of the door from the first position to the second position followed by automatic movement of the door from the second position to the first position followed by an automatic movement of the door from the first position to the second position and then followed by a manual movement of the door from the second position to the first position.

It is another object of the present invention to provide an improved combination of the type set forth in which the door control mechanism therefor includes first latch mechanism operatively associated with the drive connection and having a door-holding condition for holding the door against the biasing means subsequent to a manual movement of the door to the second position and having a door-releasing condition permitting movement of the door to the first position, a door-driving device for the control mechanism and operative when connected to the drive connection automatically to move the door from the first position thereof to the second position thereof, second latch mechanism having a device-connecting condition for connecting the door-driving device to the associated door to effect automatic operation thereof from the first to the second position thereof and having a device-holding condition for maintaining the door-driving device out of operative connection with the door, whereby selective operation of the second latch mechanism to the device-connecting condition thereof effects automatic movement of the door to the second position thereof and selective operation of the first latch mechanism to the door-releasing condition thereof and the second latch mechanism to the device-holding condition thereof effects automatic movement of the door to the first position thereof.

Another object of the present invention is to provide an improved door control mechanism and an improved combination of the type set forth, in which the door control mechanism includes a drive connection operatively connected to the door, a carrier mounted for movement with respect to the opening and having thereon for movement therewith a first latch member and a drive element, a door-driving device for the door control mechanism and operatively connected to the drive element and having an energy-storing condition and a door-driving condition, a second latch member mounted adjacent to the carrier for engagement with the first latch member, engagement of the first and second latch members holding the door-driving device in the energy-storing condition thereof and disengagement of the first and second latch members placing the door-driving device in the door-driving condition thereof, a third latch member mounted on the drive connection and movable therewith and a fourth latch member mounted adjacent to the carrier for selective engagement with the third latch member, engagement of the third and fourth latch members holding the door in the second position thereof and disengagement of the third and fourth latch members releasing the door for movement to the first position thereof.

Another object of the present invention is to provide an improved combination of the type set forth in which the counterbalance mechanism includes a torsion bar operatively connected to the door.
closed position of the door accommodating both manual opening of the door and automatic opening of the door by actuation of the control element the door control mechanism in the open position of the door accommodating both manual closing of the door and automatic closing of the door by actuation of the control element after manual opening of the door.

A further object of the present invention is to provide an improved combination of the type set forth in which the counterbalance mechanism includes a torsion bar and member journaled thereon for free rotation with respect thereto, a torsion spring surrounding the torsion bar and fixed at one end thereof to the associated building and fixed at the other end thereof the member, drive means mounted to the torsion bar for rotation therewith and adjustment with respect thereto and operatively connected to the member adjustment of the drive means with respect to the torsion bar rotating the member with respect to the torsion bar to adjust the tension in the torsion spring.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying drawings in which:

FIG. 1 illustrates an automobile in front of a garage having therein a garage door in a door opening therein and including a door control mechanism incorporating the features of the invention;

FIG. 2 is a rear elevational view of the garage door of FIG. 1 as seen in the direction of the arrows along the line 2-2 thereof;

FIG. 3 is a view partly in section of the garage door of FIG. 2 in a closed position taken along line 3-3 thereof;

FIG. 4 is a view partly in section of the garage door shown in FIG. 3 with the door in an open position;

FIG. 5 is an enlarged rear elevational view of the torsion bar and door-opening and closing mechanism shown in FIG. 2;

FIG. 6 is a side elevational view of the torsion spring and worm drive therefor of FIG. 5 as seen in the direction of the arrows along line 6-6 thereof;

FIG. 7 is a sectional view of the torsion spring and worm drive therefor of FIG. 6 taken along line 7-7 thereof;

FIG. 8 is a side elevational view with portions in section of the door disc, the latch assembly therefor, the trigger associated therewith and the hydraulic system for moving the trigger of FIG. 5 as seen in the direction of the arrows along the line 8-8 thereof;

FIG. 9 is a side elevational view of the counterbalance disc and latch therefor of FIG. 5 as seen in the direction of the arrows along the line 9-9 thereof;

FIG. 10 is a perspective view of the door disc latch particularly showing the cam opening therein;

FIG. 11 is a perspective view of the trigger device particularly showing the placement of the latch cams and including a phantom view of the door disc latch showing the spatial relationship between the latch and the trigger;

FIG. 12 is a view in section of the counterbalance disc having a catch thereon in engagement position with the associated latch;

FIGS. 13 to 15 are diagrammatic views showing the relative positions of the door disc, the counterbalance disc, the associated catches, pins and lugs thereon, the trigger and the cam openings in the associated latches when the garage door is closed prior to a manual opening thereof;

FIGS. 16 to 18 are diagrammatic views showing the relative positions of the discs, trigger and latches after the door has been manually opened;

FIGS. 19 to 21 are diagrammatic views showing the relative positions of the discs, trigger and latches when the rear wheels of the automobile are on the actuator;

FIGS. 22 to 24 are diagrammatic views showing the relative position of the discs, trigger and latches when the rear wheels of the automobile clear the actuator;

FIGS. 25 to 27 are diagrammatic views showing the relative positions of the discs, trigger and latches when the front wheels of the automobile clear the actuator and the door is in the automatically closed position thereof;

FIGS. 28 to 30 are diagrammatic views showing the relative positions of the discs, trigger and latches when the front wheels of the automobile clear the actuator and the door is in the automatically closed position thereof;

FIGS. 31 to 33 are diagrammatic views showing the relative positions of the discs, trigger and latches when the front wheels of the automobile clear the actuator and the door is in the automatically closed position thereof;

FIGS. 34 to 36 are diagrammatic views showing the relative positions of the discs, trigger and latches when the front wheels of the automobile clear the actuator and the door is in an automatically opened position thereof;

FIGS. 37 to 39 are diagrammatic views showing the relative positions of the discs, trigger and latches when the door has been manually closed; and

FIG. 40 is a perspective view of an alternate embodiment for maintaining the door in an unlatched position after the door has been automatically opened.

There is illustrated herein a garage door 110 and door control mechanism 200 therefor which accommodates movement of the door 110 between the first and second positions thereof, certain of such movements being manually effected and others being automatically effected. As illustrated, the garage door 110 is counterbalanced so that it is urged to the first or closed position thereof, the door control mechanism 200 accommodating manual movement of the door 110 from the first (closed) position to the second (open) position followed by automatic movement thereof from the second (open) to the first (closed) position followed by an automatic movement of the door 110 from the first (closed) to the second (open) position and then followed by a manual movement of the door 110 from the second (open) to the first (closed) position.

With reference to the drawings and particularly FIGS. 1 to 4 thereof, there is shown an automobile 100 having two spaced-apart front wheels and two spaced-apart rear wheels 102, the car 100 being positioned on the ground or driveway 103 in front of a garage 105. The garage 105 includes two spaced-apart upstanding side walls 106, a slanted roof or top wall 107, a front wall 108 interconnecting the two side walls 106 and a backwall (not shown). The front wall 108 has centrally located therein a door-receiving opening 109, the door opening 109 being of sufficient height and width to receive therein an appropriate sectional door 110.

The sectional door 110 consists of a plurality of sections 111, four sections 111 being illustrated herein, the sections 111 being identical in dimension and hinged fastened one to another by means of a plurality of hinges 112, each of the hinges 112 including two attachment flanges 113 interconnected by a hinge pin 114, each attachment flange 113 of every hinge 112 is connected to an adjacent section 111 of the door 110, thereby to hingedly connect the sections 111 of the garage door 110 one to another. As particularly shown, each section 111 of the door 110 is fastened to the adjacent section 111 by three hinges 112, the hinges 112 being positioned one at each outer edge of the sections 111 and one midway between the outermost hinges 112. The door 110 is further pivoted on each of the outer edges thereof adjacent to the bottom of the door with two cable pins 116, the cable pins 116 being for a purpose hereinafter explained; the door 110 further is provided with a handle 117, the handle 117 being positioned in the center of the second section 111 from the bottom of the door 110 only for purposes of illustration. As is well known in the art, a handle may be positioned on the inside of the door 110, but is not herein shown.

Adjacent to the outer edges of the door-receiving opening 109 in the front wall 108 of the garage 105 are two tracks 120, the tracks 120 being spaced apart a distance slightly in excess of the width of the door-receiving opening 109, the tracks 120 each being channel shaped in cross section and including two spaced-apart sidewalks 121 interconnected by a web 122. The
tracks 120 each include a substantially vertically extending flight 123 and a substantially horizontally extending flight 124, the two flights 123 and the two flights 124 of the two tracks 120 being generally parallel one to another, each of the flights 123 and 124 being interconnected by an arcuate flight 125. The tracks 120 are connected to the front wall 108 adjacent the bottom of the garage by the usual means (not shown) and the tracks 120 are connected at the rearmost part of the substantially horizontal flight 124 to the garage roof 107 by means of struts 126, each of the tracks 120 being provided with an attachment strut 126. The substantially vertical flights 123 are somewhat diagonally inclined toward the rear of the garage 105, i.e., away from the front wall 108, and the substantially horizontal flights 124 of the tracks 120 are inclined upwardly toward the top 107 of the garage 105, all to facilitate movement of the door 110 in the tracks 120.

The door 110 is provided with a plurality of roller assemblies 130, the roller assemblies 130 each being shown by way of illustration associated with a hinge 112, it being understood that the roller assemblies 130 may be independently placed, if so desired. Each of the roller assemblies 130 includes an L-shaped flange 131 having an abutment portion 132 fixedly connected to one of the attachment flanges 113 of the associated hinge 112, the abutment portion 132 being preferably connected to the flange 113 connected to the upper adjacent section 111 of the door 110, the L-shaped flange 131 further including a transverse portion 133 extending outwardly from the section 111 thereof to the open position thereof along the tracks 120. As may be seen from the drawings, the four-section door 110 is provided with a total of 10 roller assemblies 130, the roller assemblies 130 providing for rolling action of the door 110 from the closed position thereof to the open position thereof along the tracks 120.

The door 110 is counterbalanced to the closed position, a substantial portion of the weight of the door 110 being counterbalanced by means of a torsion bar 140 and the hardware associated therewith, the torsion bar 140 being a hollow steel tube positioned above the door-receiving opening 109 in the front wall 108 and extending laterally across the opening 109 and spaced slightly above the door 110, as particularly shown in FIGS. 2 and 5 of the drawings. The torsion bar 140 is secured to the front wall 108 of the garage 105 by means of a left-hand mounting bracket 141, the bracket 141 including an abutment portion 142 extending parallel and fixedly secured to the front wall 108 by means of bolts 143, the bracket 141 further including a transverse portion 144 extending outwardly from the front wall 108 and carrying a bushing 146 therein to facilitate rotation of the torsion bar 140 with respect thereto. Abutting the bushing 146 is a cable drum 147 fixedly secured to the torsion bar 140 for rotation therewith, the cable drum 147 having thereabout a plurality of spiral grooves 148 and a flange 149 at the inner end of the drum 147. The drum 147 receives in the spiral grooves 148 a cable 150, the cable 150 being fixedly secured at one end to the flange 149 of the drum 147 and on the other end to the left-hand cable pin 116 fastened adjacent to the bottom of the garage door 110.

The torsion bar 140 is further secured to the front wall 108 of the garage 105 by means of a right-hand mounting bracket 151, the bracket 151 including an abutment portion 152 extending parallel and fixedly secured to the front wall 108 by means of bolts 153, the bracket 151 further including at one end thereof a transverse portion 155 extending outwardly from the front wall 108 and carrying a bushing 156 therein to facilitate rotation of the torsion bar 140 with respect thereto. Abutting the bushing 156 is a cable drum 157 fixedly secured to the torsion bar 140 for rotation therewith, the cable drum 157 having thereabout a plurality of spiral grooves 158 and a flange 159 at the inner end of the drum 157. The drum 157 receives in the spiral grooves 158 a cable 160, the cable 160 being fixedly secured at one end to the flange 159 of the drum 157 and on the other end to the right-hand cable pin 116 fastened adjacent to the bottom of the garage door 110. The cables 150 and 160 provide the necessary connection between the door 110 and the torsion bar 140, thereby to translate rotation of the bar 140 into movement of the door 110 along the tracks 120 between the open position and the closed position.

If the sectional door 110 is for a two-car garage, then the torsion bar 140 will be provided with two torsion springs 165 positioned thereabout and spaced therealongs; however, for the sake of brevity and simplicity, only one of the torsion springs 165 is herein illustrated. The torsion spring 165 is positioned about the torsion bar 140 and has at the right end thereof, as seen in FIG. 5, a hook 166. An L-shaped bearing bracket 170 includes an abutment portion 171 extending parallel to and fixedly secured to the front wall 108 of the garage 105 by means of bolts 172, the bracket 170 further including a transverse portion 173 extending outwardly from the front wall 108 toward the rear of the garage 105. The transverse portion 173 has therein an aperture 174 for receiving therein the hook 166 of the torsion spring 165, thereby to secure one end of the torsion spring 165 to the garage 105. A bushing 177 extends through the transverse portion 173 of the bearing bracket 170 to facilitate rotation of the torsion bar 140 with respect to the bracket 170 and to prevent contact between the torsion bar 140 and the torsion spring 165.

At the left-hand end of the torsion spring 165, as particularly seen in FIGS. 5 to 7, there is provided on the internal ends thereof a shoulder 182, the housing 180 being fixedly secured to the torsion bar 140 by setscrews 183, thereby to provide for rotation of the housing 180 with the torsion bar 140. Adjacent to the end of the offset portion 181 of the housing 180 is a circular groove 184, the groove 184 being for a purpose hereinafter explained, and journaled to the housing 180 is a member or worm gear 185, the worm gear 185 in the form of a wheel 186 carrying about the periphery thereof a plurality of gear teeth 187. The wheel 186 is integral with and extends outwardly from a collar 188, the collar 188 being cylindrical and journaled to the offset body portion 181 of the worm housing 180 for rotation with respect thereto, the collar 188 abutting the shoulder 182 at one end and being held against axial movement along the housing 180 by a retaining ring 194 positioned in the circular groove 184 in the offset portion 181 in the housing 180. The worm gear 185 is provided with a spring retainer or indent 189 in the wheel 186 adjacent to the collar 188, the indent 189 being a hook (not shown) at the other end of the torsion spring 165, thereby to prevent rotation of the spring 165 with respect to the worm gear 185. There is further provided a worm drive in the form of a hollow shaft 195, the shaft 195 having extending therethrough a square socket hole 196 and having extending therearound spiral flanges 197. The shaft 195 is positioned so that the gear teeth 187 are intermediate the spiral flanges 197 and retained in the aforesaid position by a retention flange 191 including a transverse wall 192 extending from the worm housing 180 and having positioned at either end thereof spaced-apart end flanges 193, the end flanges 193 providing radial and axial support for the shaft 195. It is thereby seen that the torsion spring 165 is fixed at one end thereof with respect to the garage 105 at one end by the hook 166 and bearing bracket 170 and at the other end the torsion spring 165 is prevented against rotation thereof with respect to the worm gear 185 by the indent 189 in the worm gear 185. The usual problems of varying the tension in the torsion spring 165 above the novel adjustment structure hereinbefore described. The tension of the torsion spring 165 is simply varied by adjustment, either manually or by machine, of the shaft 195 thereby to rotate the worm gear 185 and wind or unwind the spring 165 fixedly connected thereto, the tension in the torsion spring 165 being easily adjusted so as to counterbalance the door 110 slightly less than the total effective.
weight of the door 110 so that the door 110 will be biased to the closed position by the action of gravity if the door 110 is released at any point along the tracks 120 and 120a and attached upon by other forces. It being understood that the counterbalance force of the torsion spring 165 is transmitted to the door 110 by the torsion bar 140, the worm housing 180, the worm gear 185, the drums 147 and 157, the cables 150 and 160 and the cable pins 116.

With reference to FIGS. 5, 8-12 and 40 there is shown the door control mechanism 200. The right-hand end of the torsion bar 140 is provided with a drive connection or drive sprocket 210; however, while the drive sprocket 210 is located on the right-hand end of the torsion bar 140, as shown in FIG. 5, the sprocket 210 may be also located on the left-hand side, it being a mere matter of preference, the drive sprocket 210 being provided with teeth 211 about the periphery thereof and suitably mounted on a jack shaft 212. The jack shaft 212 is received within a countersunk portion (not shown) of the torsion bar 140 and held in place for rotation therewith by a clamping collar 213 fixedly secured thereto by bolts 214.

Disposed below the drive sprocket 210 is a disc enclosure 220, the disc enclosure 220 being mounted on the front wall 108 of the garage 105 and including an upstanding left-hand sidewall 221 and an upstanding right-hand sidewall 222, the sidewalls 221 and 222 being spaced apart and joined by a rear wall 223, each of the sidewalls 221 and 222 having a downwardly extending top edge 226 and a forwardly extending rear edge 227 and a horizontal portion extending bottom edge 228. The sidewalls 221 and 222 are of similar shape and parallel to each other, each having therein an aperture (not shown) in registry one with the other, each of the apertures being surrounded by a support flange 229, the support flanges 229 supporting therein a jack shaft 235, the jack shaft 235 preferably being made of brass or bronze thereby to avoid the necessity of bushings in the apertures.

Freely rotatable around the jack shaft 235 is a carrier or a disc 240, the disc 240 being positioned with the plane of rotation thereof perpendicular to the front wall 108 of the garage 105 and including a hub 241 positioned about the jack shaft 235 thereby to position the disc 240 against excessive lateral movement along the shaft 235. The disc 240 has around the periphery thereof a plurality of teeth 242, the number of teeth 242 being about six times the number of teeth 211 on the drive sprocket 210, the ratio of 6 to 1 being for a purpose hereinafter explained, and interconnecting the disc 240 and the drive sprocket 210 is a link chain 243, the link chain 243 engaging the teeth 242 on the disc 240 and the teeth 211 on the drive sprocket 210, as will be seen therefore that rotation of the torsion bar 140 upon movement of the door 110 along the tracks 120 produces similar rotation of the drive sprocket 210. The number of revolutions of the disc 240 per one complete opening or closing of the door 110 is controlled by the ratio of the teeth 211 on the sprocket 210 to the teeth 242 on the disc 240, the ratio being so chosen as to limit the disc 240 to less than one complete revolution per each complete opening or closing of the door 110, preferably the disc 240 rotating about 270°.

On the inside of the disc 240, or on the right-hand side thereof as viewed in FIG. 5 there is positioned a catch 245, the catch 245 being positioned radially outwardly adjacent to the teeth 242 of the disc 240 and having an attaching surface 246 connected to the disc 240 by means of bolts 247 and having an offset portion 248 spaced from the disc 240. The offset portion 248 has a camming surface 249 on the end of the catch 245 away from the attaching surface 246 and also an abutment surface 250 extending along a radius of the disc 240. There is also provided on the inside of the disc 240 a release lug 252, the release lug 252 being radially positioned away from the periphery of the disc 240 toward the center of the disc 240 so as not to interfere with other structure hereinafter explained, the lug 252 having an abutment surface 252a, the abutment surface 252a being formed by an edge of the lug 252 extending along a radius of the disc 240, the angle between the abutment surface 250 of the catch 245 and the abutment surface 252a of the lug 252 being less than 270° for the constructional example hereinafter set forth. Positioned between the catch 245 and the lug 252 is a lug 253, the lug 253 being radially positioned from the center of the disc 240 and having an abutment surface 253a formed by an edge of the lug 253 extending along a radius of the disc 240, the abutment surface 252a and the abutment surface 253a forming a selector selectively to operate certain parts as hereinafter explained. Radially outwardly of the lug 253 and secured to the disc 240 is a drive lug 255, the drive lug 255 being positioned between the lug 252 and the catch 245 so as not to interfere with other structure hereinafter defined and being spaced radially outwardly from the lugs 252 and 253 so as not to interfere with their operation. As hereinbefore stated, since the disc 240 rotates less than one complete revolution for each door opening or door closing, the drive lug 255 also rotates through less than one complete revolution, thereby, in the particular constructional example illustrated in the drawings, the drive lug 255 rotates through a 270° arc between a door-closed position and a door-open position, so as not to interfere with the operation of the structure cooperating with the catch 245.

Movement of the door 110 along the tracks 120 results in rotation of the disc 240 and in contact with the drive sprocket 210. The disc 240 is connected to the drive sprocket 210 by means of the chain 243 operatively associated with the teeth 242 on the drive sprocket 210 and the teeth 242 on the disc 240, thereby to translate rotation of the torsion bar 140 into rotation of the disc 240, the ratio of the number of teeth 242 on the disc 240 to the number of teeth 211 on the drive sprocket 210 being sufficiently large so as to provide for less than one complete revolution of the disc 240 for each complete opening or closing of the door 110.

There is further provided a door-driving device or a counterbalance disc 260 fixedly secured to the jack shaft 235, such as by set screws (not shown), the counterbalance disc 260 being positioned parallel to the door disc 240 and rotatable about a common axis, the disc 260 including a hub 261 positioned at the center of the counterbalance disc 260 about the jack shaft 235, or to the left of the disc 260 as seen in FIG. 5, the hub 261 preventing excessive lateral movement of the disc 260 along the jack shaft 235. There is further provided, at the periphery of the counterbalance disc 260 on the right-hand side thereof, a flange 262 having a camming surface 263 fixedly secured to the counterbalance disc 260 and an offset portion 264 forming a cable groove between the offset portion 264 and the counterbalance disc 260, the flange 262 thereby providing a groove for a cable for a purpose hereinafter explained. The counterbalance disc 260 further includes a catch 265 positioned on the inside of the disc 260 opposite to the flange 262, the catch 265 being radially spaced from the center of rotation of the counterbalance disc 260 the same distance as the catch 245. The catch 265 includes an attaching surface 266 fixedly secured to the counterbalance disc 260 by bolts 267 and an offset portion 268 spaced from the counterbalance disc 260, the offset portion 268 having a camming surface 269 and an abutment surface 270, the abutment surface 270 being formed by an edge of the disc 265 extending along a radius of the disc 260. The counterbalance disc 260 is further provided with a stop pin 273 adjacent to the periphery of the disc 260 at a predetermined angular location, as will hereinafter be explained, and with a latch cam pin 274 attached thereto in FIG. 5, for a purpose hereinafter explained, the latch cam pin 274 being positioned adjacent to the periphery of the counterbalance disc 260 and at a predetermined angle counterclockwise from the abutment surface 270 of the catch 265, for a purpose hereinafter explained. The counterbalance disc 260 further includes a drive lug 275, the drive lug 275 being radially positioned from the
center of the counterbalance disc 260 so as to contact the drive lug 255 on the door disc 240 when the drive pin 275 and the drive lug 255 are operatively connected, the drive pin 275 extending transversely of the counterbalance disc 260 for a distance sufficient to contact the drive lug 255 when the lug 255 and the pin 275 are in operative association.

The counterbalance disc 260 is further provided with an energy-storing device in the form of a spring 276, the spring 276 being connected at one end to a cable 277 fitting in the cable groove 264 and secured to the counterbalance disc 260; at the other end, the spring 276 is connected to the front wall 108 of the garage 105 as at 278, as seen in FIG. 4. The force exerted by the spring 276 on the counterbalance disc 260 biases the disc 260 to rotate in the clockwise direction as seen in FIG. 9, the force exerted by the spring 276 being sufficient when added to the force exerted on the door 110 by the torsion bar 140 and spring 165 to drive the door 110 from the closed position to the open position thereof. It may be seen therefore that when the spring 276 is out of operative connection with the door 110, the door 110 is biased toward the closed position thereof due to the fact that the force exerted thereby by the torsion bar 140 and spring 165 is slightly less than the effective weight of the door 110, but when the spring 276 is operatively connected to the door 110, then the combined forces of the spring 276, the torsion bar 140 and spring 165 are sufficient to overcome the effective weight of the door 110, thereby to raise the door 110 from the closed position to the open position thereof and to maintain the door 110 in the open position.

As best seen in FIGS. 8 to 12, there is provided a door disc latch 280, the door disc latch 280 being generally channel-shaped and having an outer sidewalk 301 adjacent to the counterbalance disc 260 and an inner sidewalk 302 spaced from and parallel to the outer sidewalk 301; interconnecting the sidewalks 301 and 302 is a web 303, the web 303 being disposed generally horizontally. Toward the front of the counterbalance disc latch 300, that is to the left as viewed in FIG. 9, there is an aperture 304 in each of the sidewalks 301 and 302, the apertures 304 being aligned to receive a pivot 306 to provide for up and down movement of the latch 300, the pivot 306 being connected to the right-hand wall 222 of the door enclosure 220. Toward the rear of the latch 300, there is a latch pin 305 freely rotatably mounted on a pivot between the sidewalks 301 and 302, the latch pin 305 being normally positioned in alignment with latch pin 285 when the latch 280 and the latch 300 are horizontally disposed. The latch 300 is biased to a horizontal position by a spring 307, the spring 307 being connected at one end to a tongue 308 extending from the rear wall 223 of the disc enclosure 220 and at the other end, the spring 307 is connected to the latch 300. There is further provided on the wall 222 a stop lug 309, the stop lug 309 cooperating in its operative position with the stop pin 273 on the counterbalance disc 260, thereby to halt clockwise rotation of the counterbalance disc 260 before the catch 245 on the door disc 240 latches with the pin 285 on the door disc latch 280, thereby to lock the door 110 into an open position after an automatic opening thereof, all as hereinafter explained.

The door disc latch 280 further includes a cam opening 295, the cam opening 295 being positioned toward the rear of the latch 280, that is to the left as seen in FIG. 8, the cam opening 295 being generally L-shaped and having an abutment surface 296, a lower leg 297 and a forwardly extending leg 298. Positioned adjacent to the forwardly extending leg 298 of the cam opening 295 is a pawl 320, the pawl 320 being pivotally mounted on the inner wall 282 of the latch 280 as by a pivot 321, the pawl 320 having an end abutment surface 322 extending into the forward leg 298 of the cam opening 295, the pawl 320 having associated therewith a rest pin 323 positioned below the pawl 320, thereby normally to maintain the pawl 320 in the horizontal position, the pin 323 being fixedly secured to the wall 282 of the latch 280.

Parallel to and spaced from the door disc latch 280 is a counterbalance disc latch 300, the counterbalance disc latch 300 being generally channel-shaped and having an outer sidewalk 301 adjacent to the counterbalance disc 260 and an inner sidewalk 302 spaced from and parallel to the outer sidewalk 301; interconnecting the sidewalks 301 and 302 is a web 303, the web 303 being disposed horizontally. Toward the front of the counterbalance disc latch 300, that is to the left as viewed in FIG. 9, there is an aperture 304 in each of the sidewalks 301 and 302, the apertures 304 being aligned to receive a pivot 306 to provide for up and down movement of the latch 300, the pivot 306 being connected to the right-hand wall 222 of the disc enclosure 220. Toward the rear of the latch 300, there is a latch pin 305 freely rotatably mounted on a pivot between the sidewalks 301 and 302, the latch pin 305 being normally positioned in alignment with latch pin 285 when the latch 280 and the latch 300 are horizontally disposed. The latch 300 is biased to a horizontal position by a spring 307, the spring 307 being connected at one end to a tongue 308 extending from the rear wall 223 of the disc enclosure 220 and at the other end, the spring 307 is connected to the latch 300. There is further provided on the wall 222 a stop lug 309, the stop lug 309 cooperating in its operative position with the stop pin 273 on the counterbalance disc 260, thereby to halt clockwise rotation of the counterbalance disc 260 before the catch 245 on the door disc 240 latches with the pin 285 on the door disc latch 280, thereby to lock the door 110 into an open position after an automatic opening thereof, all as hereinafter explained. The stop pin 273 and the stop lug 309 are not required if the alternate embodiment of the latch 280 shown in FIG. 40 is employed.

The wall 302 of the latch 300 is a cam opening 315, the cam opening 315 being generally spaced across from the cam opening 295 in the door disc latch 280, the cam opening 315 being positioned differently as hereinafter explained. The cam opening 315 in the latch 300 is generally L-shaped and has an abutment surface 316, a lower leg 317 and a rearwardly extending leg 318. It is here noted that the cam opening 315 has a leg 318 extending to the rear of the latch 300, that is away from the front wall 108 of the garage 105, while the door disc latch 280 has a cam opening 295 therein which has a leg 298 extending toward the front of the latch 280, that is toward the front wall 108 of the garage 105, the two cam openings 295 and 315 being so positioned and aligned for a purpose hereinafter explained.

As stated before, the door disc latch 280 is generally parallel to and spaced apart from the counterbalance latch 300, and there is provided therebetween an actuator or a trigger 325, the trigger 325 selectively operating the latches 280 and 300 and being disposed also between the door disc 240 and the door 110, the trigger 325 including a vertically extending body portion 327 in the form of a slab disposed generally parallel to the sidewalks of the latches 280 and 300. At the bottom end of the body portion 327 is a pivot hole 326 and at the top of the body portion 327 of the trigger 325 is a leaf spring 328 extending upwardly from the body portion 327, the leaf spring 328 terminating at its upper end in
rounded by a suitable fitting 361 exterior of the cylinder 351 and sealably connected to an elbow 362, thereby to provide a sealed connection between the cam follower 330 and the elbow 362. Connected to the elbow 362 is a flexible hose 363, the hose 363 extending downwardly from the hydraulic cylinder 351 and out of the garage 105, as shown in FIG. 1, to a control element or an actuator 365 extending transversely across the driveway 103, thereby to be contacted by the front wheels 101 and the rear wheels 102 of the automobile 100 as it proceeds into or out of the garage 105. It being seen that the introduction of hydraulic fluid into the cylinder 351 by depression of the actuator 365 will force the piston 352 downwardly thereby carrying therewith the trigger 325 and hence the associated cams 335 and 340. Upon release of the actuator 365 by removal of the wheels 101 or 102 of the automobile 100, hydraulic fluid 366 is forced out of the cylinder 351 by the action of the spring 353 and against the piston 352 thereby raising the trigger 325 to its normal position and thereby also the cam follower 330 and the lugs 335 and 340.

The operation of the door 110 through a complete cycle consisting of a manual door opening, followed by an automatic door closing, followed by an automatic door opening, followed by a manual door closing can be more fully explained. As an example of the structure described above the door 110 may be 7 feet in height and the disc 240 be adapted to rotate through 270° for a complete door-opening or a complete door-closing by making the number of teeth 242 on the disc 240 six times greater than the number of teeth 211 on the sprocket 210. The angular and radial position of the lugs 252, 253 and 255 depend on the degree of rotation of the disc 240, the position of the catch 245 and the cam follower 330. It being understood that certain angles, such as the 90° angle between the abutment surfaces 252a and 253a and others hereinafter described are variable depending upon the angle through which the door disc 240 rotates for one complete opening or closing operation. In the particular example, there is about a 7° angular difference between the abutment surface 250 of the catch 245 and the camming surface 249 of the catch 245. This 7° difference is important in preventing the door disc 240 from being latched when the door 110 has been automatically opened. As hereinafter stated there are shown two structures to prevent the door disc 240 from being latched when the door 110 is being automatically opened. With the first embodiment, the stop pin 273 on the counterbalance disc 260 is located about 263° in the counterclockwise direction from the abutment surface of the stop 309, that is when the counterbalance disc 260 has rotated 263° in the clockwise direction, as viewed in FIG. 9, the stop pin 273 contacts the stop 309 (hereinafter described) to prevent further rotation of the counterbalance disc 260. The drive pin 275 is so located on the counterbalance disc 260 that when the door 110 is to be automatically opened by release, as hereinafter explained, by rotation of the counterbalance disc 260, the drive pin 275 immediately contacts the drive lug 255 on the door disc 240 and carries the door disc 240 with the counterbalance disc 260. It may be seen therefore, that when the stop pin 273 has rotated through an angle of 263° it contacts the stop lug 309 to halt rotation of the counterbalance disc 260 and since the door disc 240 has also rotated through an angle of 263°, the catch 245 will also have been rotated through an angle of 263°, thereby to position the camming surface 249 of the catch 245 on the latch pin 285 rather than having the catch 245 pass the pin 285 and having the abutment surface 250 positioned against the latch pin 285, as in FIG. 13.

The alternate embodiment shown in FIG. 40 also provides for the catch 245 to be unlatched when the door 110 has been automatically opened. In this embodiment, the camming surfaces 322 on the flange 291 is contacted by the latch pin 274 when the door is rotating through 263° of rotation, thereby to depress the latch 280 and to prevent contact of the abutment surface 250 of the catch 245 with the latch pin 285 carried by the latch 280 and to prevent latching of the door disc 240 thereby. In the first example, the door...
110 is stopped before it is in the fully opened position during an automatic opening operation while in the second example or embodiment the door 110 is fully opened, but the latch 205 is depressed during the last 7° of rotation of the door disc 240 to prevent contact of the abutment surface 250 of the catch 245 with the latch pin 285 of the latch 280, the latter embodiment is preferred.

With reference to the diagrammatic views shown in FIGS. 13 to 39, inclusive, FIGS. 13, 16, 19, 22, 25, 28, 31, 34 and 37 show the angular relationship between the lugs 252 and 253 and the cam follower 320 connected to the drive disc 240, with the counterbalance disc 260 at various times in the door opening and closing cycles, the discs 240 and 260 are viewed from the left of the disc enclosure 220 as seen in FIG. 5. Therefore, the door disc 240 is viewed from one side in the above-mentioned series of figures and it is viewed from the other side in FIG. 8, thereby rotation of the disc 240 in a clockwise direction being shown in FIG. 8. The disc 260 is viewed from the same side in the aforementioned diagrammatic views as in FIG. 9, and thereby clockwise rotation in the aforementioned diagrammatic views corresponds to clockwise rotation in FIG. 9. FIGS. 14, 17, 20, 23, 26, 29, 32, 35 and 38 in the diagrammatic views show the angular relationship between the lugs 252 and 253 and the cam follower 320 connected to the drive disc 240, as seen from the left-hand side as seen in FIG. 5 in the last above mentioned diagrammatic views and the door disc 240 as viewed from the right-hand side as seen in FIG. 8, the positions of the lugs are reversed, the views being no more than a mirror image, thereby clockwise rotation of the disc 240 in the diagrammatic views corresponds to counterclockwise rotation of the disc 240 in FIG. 8. FIGS. 15, 18, 21, 24, 29, 30, 33, 36 and 39 in the diagrammatic views show the relationship of the cam openings 295 and 315 in the latches 280 and 300, respectively, with the cam lugs 335 and 340 connected to the trigger 325, the cam opening 295 being viewed from the left side of the disc enclosure 220 as is the door disc 240 in the diagrammatic views, thereby the forwardly extending leg 298 of the cam opening 295 points to the left in the diagrammatic views whereas the leg 298 points to the right in FIG. 8. The cam opening 315 shown in phantom in the diagrammatic views has the rearward extending leg 318 extending to the right in the diagrammatic views corresponding to the direction thereof in FIG. 9.

FIGS. 13, 14 and 15 show the angular and spatial relationships between the door disc 240, the counterbalance disc 260, the trigger 325, the latch 280 and the latch 300 after the door 110 has been manually closed and before the door 110 is manually opened. In these diagrammatic views, the biasing of the cam follower 330 to the right, as shown in FIG. 14, corresponds to biasing the cam follower 330 toward the rear of the garage 105, that is away from the front wall 108 as shown in FIG. 24. The diagrammatic positions of the disc 240 and 260 in FIGS. 8 and 9 correspond to the angular positions of the discs 240 and 260 in the diagrammatic view 13, whereby it is seen that the biasing of the lugs 335 and 340 to the right as seen in FIG. 15 corresponds to a biasing of the lug 335 and 340 toward the rear of the garage 105 as shown in FIG. 8. When the door 110 is in the closed position, the catch 245 is disengaged from the latch 285 and the abutment surface 252 of the disc 240 connects the cam follower 330 and biases the trigger 325 to the right as shown in the diagrammatic views. The catch 265 on the counterbalance disc 260 is positioned so that abutment surface 270 of the catch 265 contacts the latch pin 305 of the latch 300, thereby to prevent rotation of the counterbalance disc 260 in the clockwise direction due to the spring 277 being connected to the disc 260. The trigger 325 is in its uppermost position thereby to position the lugs 335 and 340 in substantially the vertical center of the lug openings 295 and 315, respectively, and slightly above the abutment surfaces 296 and 316, respectively.

With reference to FIGS. 16 to 18, inclusive, upon a manual opening of the garage door 110, rotation of the torsion bar 140 and thereby the drive sprocket 210 rotates the disc 240 through 270° until the camming surface 249 of the catch 245 contacts the latch pin 285, thereby to depress the latch 280 so that the catch 245 may pass thereby. After the camming surface 249 has passed the latch pin 285, the latch 280 returns to its biased position due to the spring 287, thereby to contact the abutment surface 250 of the catch 245 and to prevent rotation of the drive disc 240 in the clockwise direction and thereby to latch the door 110 in the open position, it being remembered that the door disc 240 is always operatively connected to the door 110 and rotation of the disc 240 always corresponds to movement of the door 110 in the tracks 120. The counterbalance disc 260 is maintained in the position shown in FIG. 13 due to the latch pin 305 being in contact with the abutment surface 270 of the catch 265, thereby to prevent clockwise rotation of the disc 260, the rotation of the door disc 240 not affecting the counterbalance disc 260 because the disc 240 is journaled for free rotation about the jack shaft 235 and the drive lug 255 on the disc 240 rotates away from the drive pin 275 thereby not to contact the cam 252. Rotation of the disc 240 through 270° causing the lug 253 and 252 to assume the positions shown in FIG. 17, wherein the abutment surface 253a of the lug 253 contacts the cam follower 330 of the trigger 325 thereby to bias the trigger 325 to the left as seen in FIG. 17. Due to the angular position of the lug 253 and abutment surface 253a thereon, the latch pin 335 abuts the abutment surface 322 of the pawl 320 and is prevented from further movement to the left of the cam opening 295, as seen in FIG. 18, by the pawl 320, it being noted that the cams 335 and 340 are in the approximate vertical center of the cam openings 295 and 315 respectively, but above the abutment surfaces 266 and 316, due to the fact that the trigger 325 is in its uppermost position. When the door 110 has been manually opened, the abutment surface 250 of the catch 245 is in contact with the latch pin 285 and serves to prevent the door 110 from closing due to the action of gravity as it normally would, the door 110 being biased to the closed position thereof because the tension in the torsion spring 165 is adjusted to produce a force slightly less than the effective weight of the door 110 thereby to cause the door 110 to close upon the release thereof, however, the operative condition of the latch mechanism including the abutment surface 250 of the catch 245 with the latch pin 285 prevents the closing of the door 110 because the door 110 is operatively connected through the torsion bar 140, the drive sprocket 210 and chain 243 to the door disc 240.

With reference to FIGS. 19 to 21, as the automobile 100 is backed out of the garage 105, the rear wheels 102 back onto the actuator 365 thereby causing hydraulic fluid 366 to force the piston 352 downwardly in the cylinder 351, and to carry the trigger 325 downwardly to the position shown in FIG. 20; however, since the latch cams 335 and 340 are positioned so that they are pulled down into the lower legs 297 and 317 of the cam openings 295 and 315, respectively, the downward movement of the trigger 325 has no effect on the position of the door disc 240 and the counterbalance disc 260 and thereby no effect on the position of the door 110.

With reference to FIGS. 22 to 24, as the rear wheels 102 of the automobile 100 clear the actuator 365, the spring 353 in the cylinder 351 forces the piston 352 upwardly thereby to move the trigger 325 upwardly to the position it occupied in FIG. 20. Since the lug 253 is in the same position in FIG. 23 as it is in FIG. 20 the cam 330 and thereby the trigger 325 will be biased to the left as the trigger 325 rises to its upward position and the door disc latch cam 335 will rise underneath the pawl 320, thereby pivoted on the catch 245, and thereby the door disc latch cam 335 will be positioned on the abutment surface 296 of the cam opening 295. It is seen, therefore, that the difference in the positions of the door disc latch cam 335 between FIGS. 18 and 24 is due not to a difference in the angular position of the door disc 240 or the vertical position of...
the trigger 325, but due to the fact that a trigger action has intervened which allows the door disc latch cam 335 to approach the pawl 320 from the underside thereof, thereby to pivot the pawl 320 about the pivot 321 and position the door disc latch cam 335 on the abutment surface 296 of the cam opening 295.

With reference to FIGS. 25 to 27, when the front wheels 101 of the automobile 100 back onto the actuator 365, the trigger 325 is moved downwardly as hereinafore described, and because the door disc latch cam 335 is not positioned on the abutment surface 296, the door disc latch 280 is pivoted downwardly out of the horizontal position against the biasing of the spring 287. When the door disc latch 280 has been pivoted downwardly due to the action of the trigger 325, in response to the action of the actuator 365, the latch pin 285 is carried away from the abutment surface 250 of the catch 245 and the door 110 which is biased to the closed position now being free to move in the tracks 120 because the disc 240 can rotate, will close, thereby causing the door disc 240 to rotate through 270° to assume the angular position shown in FIG. 13 and FIG. 8. The counterbalance disc 260 does not move from the position it has heretofore assumed because depression of the trigger 325 has no effect on the counterbalance disc latch 300 due to the fact that the counterbalance disc latch cam 340 is positioned in the lower leg 317 of the cam opening 315 in the latch 300 and thereby, the latch pin 305 remaining in contact with the abutment surface 270 of the catch 265 to prevent rotation of the counterbalance disc 260 in a clockwise direction.

With reference to FIGS. 28 to 30, when the front wheels 101 of the automobile 100 clear the actuator 365, the trigger 325 is moved upwardly to its normal position, thereby to position the cam follower 330 so as to be biased to the right by the abutment surface 252a of the lug 252 on the door disc 240 as shown in FIG. 29, and also in FIG. 13, thereby to move the door disc latch cam 335 and the counterbalance disc latch cam 340 to the right, as shown in FIG. 30, so that the counterbalance disc latch cam 240 rests on the abutment surface 316 of the cam opening 315, all as shown in FIG. 13. It is here noted that the position of the disc 240 and 260, and the cams 335 and 340 are the same when the door 110 is closed, whether by a manual operation or an automatic operation.

With reference to FIGS. 31 to 33, when the automobile 100 approaches the garage 105, the front wheels 101 hit the actuator 365, thereby moving the trigger 325 downwardly, as shown in FIGS. 32 and 33. Since the counterbalance disc latch cam 340 is positioned on the abutment surface 316, downward movement of the trigger 325 results in pivotal movement of the latch 300 about the pin 306, thereby causing disengagement of the abutment surface 270 of the catch 265 with the latch pin 305 to permit rotation of the counterbalance disc 260 in the clockwise direction due to the force exerted thereon by the spring 276 which has been under tension. With the drive pin 275, the drive lug 255 and the stop pin 273 angularly positioned as shown in FIGS. 8 and 9, as the counterbalance disc 260 rotates in the clockwise direction, the drive pin 275 contacts the drive lug 255, thereby to carry the door disc 240 and thereby the door 110 operatively connected thereto in a clockwork direction through 263° of rotation before the stop pin 273 hits the stop lug 309. If, as explained hereinbefore, the alternate embodiment of FIG. 40 is employed, the discs 240 and 260 will rotate a full 270° to the automatically opened position because the latch 280 will be depressed due to the flange 291, cam surface 292 and latch cam pin 274 to prevent the latch roller 285 from engaging the cam 282.

It is here noted that when the door 110 has been automatically opened there is no need to latch the door 110 in the open position to prevent the closing thereof due to gravity, as is needed after a manual opening because the added force of spring 276 is sufficient with the torsion bar 140 and spring 165 to maintain the door 110 open. Actually it is desirable to latch the door 110 after an automatic opening thereof to allow a manual closing thereof without the necessity of releasing the latch 280 and catch 245, there being shown herein two embodiments for preventing such latching, that shown in FIGS. 8, 9 and the diagrammatic views and that shown in FIG. 40.

Therefore, as shown in FIG. 31, after an automatic door opening, the door disc 240 is positioned with the camming surface 249 of the catch 245 in contact with, or close to, the latch pin 285 of the latch 280, thereby preventing latching of the door 110 in the open position while the counterbalance disc 260 has rotated through an angle somewhat less than 270°, thereby to position the catch 265 in the position shown. The lugs 253 and 252 have rotated with the door disc 240 to the position shown, the position of lug 253 being several degrees away from the position it would assume if the door had been manually opened with the catch 245 locked against the latch 285 as seen in FIG. 13.

With reference to FIGS. 34 to 36, when the front wheels 101 of the automobile 100 clear the actuator 365, the piston 352 in the cylinder 351 is moved upwardly by action of the spring 353 to position the cam follower 330 in the position shown in FIG. 35. As will be noted, due to the displacement of cam 353, the spring 328 and cam follower 330 is not biased to the right as shown in FIG. 17 when the door has been manually opened, but rather the trigger 325 is unbiased and the cams 335 and 340 assume the position as shown. There is no movement of either the door disc 240 or the counterbalance disc 260 during the upward movement of the trigger 325 as the front wheels 101 clear the actuator 365.

The door 110 is thereafter manually closed and in so doing, the door disc 240 and the counterbalance disc 260 are rotated in a counterclockwise direction to a final position shown in FIG. 37 due to the movement of the door 110 to the closed position and the transmittal of that movement through the torsion bar 140 and drive sprocket 210 to the door disc 240, the counterbalance disc 260 being carried in the counterclockwise direction by the contact between the drive lug 255 and the drive pin 275. It is seen, therefore, that it is necessary to have the drive pin 275 and the drive lug 255 abutting when the door 110 is in the closed position, so that during a manual closing of the door, the drive lug 255 moves the counterbalance disc 260 in the counterclockwise direction to extend the spring 276 and to position the abutment 270 of the catch 265 in latching position with the latch pin 305 of the latch 300. The latch 300 being depressed when the camming surface 269 of the catch 265 contacts the latch pin 305 and the latch 300 being raised to the normal or horizontal position by the spring 307 after the catch 265 has passed thereby to assume the latching position with the latch pin 305 in contact with the abutment surface 270 of the catch 265. After this operation, the door disc 240 and the counterbalance disc 260 are in the same positions as shown in FIG. 13, and the door 110 is ready for a manual opening thereof as hereinbefore explained.

The invention hereinbefore set forth is readily adaptable to be manufactured in a kit form, the kit including, for instance, all the mechanism carrying a reference numeral 200 or greater.

In view of the foregoing, it is apparent that there has been provided an improved door control mechanism wherein an improved combination for use with an associated building having a door-receiving opening therein for shaftably and pivotally operating a sectional door between the closed position and the open position thereof. While there has been described what is at present considered to be the preferred embodiment of the invention, it will be understood that various modifications may be made therein and it is intended to claim all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. The combination for use with an associated building having a door-receiving opening therein, said combination comprising: first and second tracks for attachment to the associated building respectively adjacent to the sides of the
door-receiving opening, a sectional door having a plurality of rollers mounted thereon and engageable in said tracks for movement of said door between a first position with respect to the opening and a second position with respect to the opening, counterbalance mechanism for mounting on the associated building adjacent to the door-receiving opening to counterbalance said door so that said door is biased toward the first position thereof, and door control mechanism for mounting on the associated building and operatively connected to said door, said door mechanism including means selectively operable between a door-holding condition for holding said door against the biased first position thereof and a door-releasing condition permitting movement of said door to the first position thereof for accommodating manual movement of said door from said first position to said second position followed by automatic movement of said door from said second position to said first position followed by an automatic movement of said door from said first position to said second position and then followed by a manual movement of said door from said second position to said first position.

2. The combination set forth in claim 1, wherein said second position of said door is an open position with respect to the opening and said first position of said door is a closed position with respect to the opening.

3. The combination for use with an associated building having a door-receiving opening therein, said combination comprising first and second tracks for attachment to the associated building respectively adjacent to the sides of the door-receiving opening, a sectional door having a plurality of rollers mounted thereon and engageable in said tracks for movement of said door between a first position and a second position with respect to the opening, counterbalance mechanism for mounting on the associated building adjacent to the door-receiving opening to counterbalance said door so that said door is biased toward the first position thereof, a door control mechanism for mounting on the associated building and including a drive connection operatively connected to said door, first latch mechanism operatively associated with said drive connection and having a door-holding condition for holding said door against said biasing means subsequent to a manual movement of said door to said second position and having a door-releasing condition permitting movement of said door to said first position, a door-driving device for said control mechanism and operable when connected to said drive connection automatically to move said door from the first position thereof to the second position thereof, second latch mechanism having a device-connecting condition for connecting said door-driving device to the associated door to effect automatic movement of said door from the second position thereof to the first position thereof and having a device-holding condition for maintaining said door-driving device out of operative connection with the door, whereby selective operation of said second latch mechanism to the device-connecting condition thereof effects automatic movement of said door to the second position thereof and selective operation of said first latch mechanism to the device-holding condition thereof and said second latch mechanism to the device-holding condition thereof effects automatic movement of said door to the first position thereof.

4. The combination set forth in claim 3, wherein said first position of said door is a closed position with respect to the opening and said second position is an open position with respect to the opening.

5. The combination for use with an associated building having a door-receiving opening therein, said combination comprising first and second tracks for attachment to the associated building respectively adjacent to the sides of the door-receiving opening, a sectional door having a plurality of rollers mounted thereon and engageable in said tracks for movement of said door between a first position and a second position with respect to the opening, counterbalance mechanism for mounting on the associated building adjacent to the door-receiving opening to counterbalance said door so that said door is biased toward the first position thereof, a door control mechanism for mounting on the associated building and including a drive connection operatively connected to said door, a carrier mounted for movement with respect to the opening and having thereon for movement therewith a first latch member and a drive element, a door-driving device for said door control mechanism and operatively connected to said drive element and having an energy-storing condition and a door-driving condition, a second latch member mounted adjacent to said carrier for engagement with said first latch member, engagement of said first and second latch members holding said door-driving device in the energy-storing condition thereof and disengagement of said first and second latch members placing said door-driving device in the door-driving condition thereof, a third latch member mounted on said drive connection and movable therewith and a fourth latch member mounted adjacent to said carrier for selective engagement with said third latch member, engagement of said third and fourth latch members holding said door in the second position thereof and disengagement of said third and fourth latch members releasing said door for movement to the first position thereof, whereby disengagement of said first and second latch members effecting automatic movement of said door to said second position and engagement of said first and second latch members together with disengagement of said third and fourth latch members effecting automatic movement of said door to said first position thereof and engagement of said third and fourth latch members holding said door in the second position thereof.

6. The combination set forth in claim 5, wherein said first position of said door is a closed position with respect to the opening and said second position of said door is an open position with respect to the opening.

7. The combination for use with an associated building having a door-receiving opening therein, said combination comprising first and second tracks for attachment to the associated building respectively adjacent to the sides of the door-receiving opening, a sectional door having a plurality of rollers mounted thereon and engageable in said tracks for movement of said door between a first position and a second position with respect to the opening, counterbalance mechanism for mounting on the associated building adjacent to the door-receiving opening and including a torsion bar operatively connected to said door, said counterbalance mechanism serving to counterbalance said door so that said door is biased toward the second position thereof, and door control mechanism for mounting on the associated building adjacent to one of said tracks and operatively connected to said torsion bar, said door control mechanism including means selectively operable between a door-holding condition for holding the door against the biased second position thereof and a door-releasing condition permitting movement of said door to the second position thereof for accomplishing selective automatic movement of said door from the first position to the second position thereof subsequent to manual operation of the door from the second position to the first position thereof and automatic movement of said door from said second position to said first position thereof followed by manual movement of said door from the first position to the second position thereof.

8. The combination set forth in claim 7, wherein said first position of said door is an open position with respect to the opening and said second position of said door is a closed position with respect to the opening.

9. The combination for use with an associated building having a door-receiving opening therein, said combination comprising first and second tracks for attachment to the associated building respectively adjacent to the sides of the door-receiving opening, a sectional door having a plurality of rollers mounted thereon and engageable in said tracks for movement of said door between a first position and a second position with respect to the opening, counterbalance mechanism for mounting on the associated building adjacent to the door-receiving opening and including a torsion bar operatively con-
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19. The combination set forth in claim 10, wherein said door disc and said counterbalance disc are mounted for rotation about a common axis, and wherein the disc rotates less than one revolution when said door moves between said open position and said closed position thereof.

20. The combination set forth in claim 10, wherein said door disc and said counterbalance disc are journeled on a common shaft, said door disc being journeled for free rotation about said shaft, said counterbalance disc being fixedly journeled to said shaft for rotation therewith.

13. The combination set forth in claim 10, wherein said door disc and said counterbalance disc are mounted for rotation about a common axis, and wherein the disc rotates less than one revolution when said door moves between said open position and said closed position thereof.

14. The combination set forth in claim 10, wherein said door disc and said counterbalance disc are journeled on a common shaft, said door disc being journeled for free rotation about said shaft, said counterbalance disc being fixedly journeled to said shaft for rotation therewith.
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21. The combination set forth in claim 15, wherein said energy-storing device is a spring.

22. The combination for use with an associated building having a door-receiving opening therein, said combination comprising first and second tracks for attachment to the associated building respectively adjacent to the sides of the door-receiving opening, a sectional door having a plurality of rollers mounted thereon and engageable in said tracks for movement of said door between a closed position and an open position with respect to the opening, counterbalance mechanism for mounting on the associated building adjacent to the door-receiving opening to counterbalance said door so that said door is biased toward the closed position thereof under the urging of gravity, a door control mechanism for mounting on the associated building and including a drive connection operatively connected to said door and having a door-closed position and a door-opened position, first latch mechanism operatively associated with said drive connection and having a door-holding condition for holding said door connection in the door-opened position thereof against the urging of gravity and having a door-releasing condition, a door-opening device for said door control mechanism and operative when connected to said drive connection automatically to move said drive connection from the door-closed position to the door-opened position, second latch mechanism having a device connecting condition for connecting said door-opening device to said drive connection to effect automatic opening of said door and having a device-holding condition for maintaining said door-opening device out of operative connection with said drive connection, and a trigger selectively operable on said first latch mechanism for operating said first latch mechanism between the door-holding condition and the door-releasing condition thereof and selectively operable on said second latch mechanism for operating said second latch mechanism between the device-holding condition and the device-connecting condition thereof, whereby selective operation of said second latch mechanism to the device-connecting condition thereof effects automatic opening of said door and selective operation of said second latch mechanism to the device-holding condition thereof effects automatic closing of said door.
door in the open position thereof and a door-releasing condition, said second latch member being normally biased to said door-holding condition and engageable in said door-holding condition with said first latch member, said second latch member in said door-releasing condition being out of operative contact with said first latch member carried by said door disc thereby to permit free rotation thereof, a counterbalance disc for said door and having associated therewith an energy-storing device, said counterbalance disc being operative when connected to said door automatically to move said door from the closed position to the open position thereof, a third latch member fixedly connected to said counterbalance disc for rotating therewith, a fourth latch member pivotable between a counterbalance-disc-connecting condition for connecting said counterbalance disc to said door to effect automatic opening thereof and a counterbalance-disc-holding condition for maintaining said counterbalance disc out of operative connection with said door, said fourth latch member in said counterbalance-disc-holding condition thereof being in operative contact with said third latch member to prevent rotation of said counterbalance disc and said fourth latch member in the counterbalance-disc-connecting condition thereof being out of operative contact with said third latch member thereby to permit rotation of said counterbalance disc, a trigger selectively operable on said second latch member for pivoting said second latch member between the door-holding condition and the door-releasing condition thereof and selectively operable on said fourth latch member for pivoting said fourth latch member between said counterbalance-disc-connecting condition and said counterbalance-disc-holding condition, a plurality of angularly spaced lugs on said door disc for selectively rendering said trigger operable to change the condition of only one of said second and forth latch member at one time to cause positive operation of the selected one of said latch members by said trigger, and a control element disposed adjacent to the associated building and operatively connected to said trigger to activate said trigger in response to operation of said control element upon the entering of or the exiting from the associated building by a wheeled vehicle, whereby selective operation of said fourth latch member to the counterbalance-disc-connecting condition thereof effects automatic opening of said door and selective operation of said second latch member to the door disc-releasing condition and fourth latch member to the counterbalance-disc-holding condition thereof effects automatic closing of said door.

32. The combination set forth in claim 28, wherein said control element moves said trigger downwardly in response to operation of said control element.

33. The combination set forth in claim 28, wherein said control element is hydraulically operated thereby to activate said trigger in response to movement of hydraulic fluid in said control element.

34. The combination set forth in claim 28, wherein said control element is disposed in front of the associated building and across the door-receiving opening therein.

35. The combination for use with an associated building having a door-receiving opening therein, said combination comprising first and second tracks for attachment to the associated building respectively adjacent to the sides of the door-receiving opening, a sectional door having a plurality of rollers mounted thereon and engageable in said tracks for movement of said door between a closed position and an open position with respect to the opening, counterbalance mechanism for mounting on the associated building adjacent to the door-receiving opening to counterbalance said door member that said door is biased toward one of said positions, and door control mechanism for mounting on the associated building and including a controlling element therefor disposed in front of the door-receiving opening, said door-control mechanism being operatively connected to said door, said door control mechanism including means selectively operable between a door-holding condition for holding the door against the biased position thereof and a door-releasing condition permitting movement of said door to the biased position thereof for accomplishing selective automatic movement thereof between said closed and open positions of said door, said door control mechanism in the closed position of said door accommodating both manual opening of said door and automatic opening of said door by actuation of said control element, said door control mechanism in the open position of said door accommodating both manual closing of said door and automatic closing of said door by actuation of said control element after manual opening of said door.

36. The combination set forth in claim 32, wherein said door is biased toward the closed position thereof.
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37. The door control mechanism set forth in claim 36, wherein the first position of the door is a closed position thereof and the second position of the door is an open position thereof.

38. A door control mechanism for use with a door mounted in an associated building door-receiving opening to accommodate a manual movement of the door from a first position to a second position thereof followed by an automatic movement of the door from the second position thereof to the first position thereof, said door control mechanism comprising a first latch mechanism operatively connected to the biasing means and having a door-holding condition for holding the door in the second position thereof, and having a door-releasing condition, a door-driving device for the door and operative when connected thereto automatically to move the door from the first position to the second position thereof, second latch mechanism having a device-connecting condition for connecting said door-driving device to the door to effect automatic movement thereof to the second position and having a device-holding condition for maintaining said door-driving device out of operative connection with the door, whereby selective operation of said second latch mechanism to the device-connecting condition thereof effects automatic movement of the door to the second position thereof and selective operation of said first latch mechanism to the door-releasing condition thereof and said second latch mechanism to the device-holding condition thereof effects automatic movement of the door to the first position thereof.

39. A door control mechanism for use with a door mounted in an associated building door-receiving opening to accommodate a manual movement of the door from a first position to a second position thereof followed by an automatic movement of the door from the second position thereof to the first position thereof under the urging of a biasing means and then by an automatic movement of said door from the first position thereof to the second position thereof and then by a manual movement of the door from the second position thereof to the first position thereof, said door control mechanism comprising a first latch mechanism operatively connected to the biasing means and having a door-holding condition for holding the door in the second position thereof, and having a door-releasing condition, a door-driving device for the door and operative when connected thereto automatically to move the door from the first position to the second position thereof, second latch mechanism having a device-connecting condition for connecting said door-driving device to the door to effect automatic movement thereof to the second position and having a device-holding condition for maintaining said door-driving device out of operative connection with the door, whereby selective operation of said second latch mechanism to the device-connecting condition thereof effects automatic movement of the door to the second position thereof and selective operation of said first latch mechanism to the door-releasing condition thereof and said second latch mechanism to the device-holding condition thereof effects automatic movement of the door to the first position thereof.

40. A door control mechanism for use with a door mounted in an associated building door-receiving opening to accommodate a manual movement of the door from a first position to a second position thereof followed by an automatic movement of the door from the second position to the first position thereof under the urging of a biasing means and then by an automatic movement of the door from the first position to the second position thereof and then by a manual movement of the door from the second position thereof to the first position thereof, said door control mechanism comprising a door disc operatively connected to the biasing means to rotate therewith in response to movement of the door, a first latch member fixedly connected to said door disc for rotation therewith, a second latch member pivotable between a door-holding condition for holding the door in the second position thereof and a door-releasing condition, said second latch member being normally biased to said door-holding condition and engageable in said door-holding condition with said first latch member, said second latch member in said door-releasing condition being out of operative contact with said first latch member carried by said door disc thereby to permit free rotation thereof, a counterbalance disc for the door and having associated therewith an energy-storing device, said counterbalance disc being operative when connected to the door automatically to move the door from the first position to the second position thereof, a third latch member fixedly connected to said counterbalance disc for rotation therewith, a fourth latch member pivotable between a counterbalance-disc-connecting condition for connecting said counterbalance disc to the door to effect automatic movement thereof from the first to the second position thereof and a counterbalance-disc-holding condition for maintaining said counterbalance disc out of operative connection with the door, said fourth latch member in said counterbalance-disc-holding condition thereof being in operative contact with said third latch member to prevent rotation of said counterbalance disc, said fourth latch member in the counterbalance-disc-connecting condition thereof being out of operative contact with said third latch member thereby to permit rotation of said counterbalance disc, whereby selective operation of said fourth latch member to the counterbalance-disc-connecting condition thereof effects automatic movement of the door from the first to the second position thereof and said selective operation of said second latch member to the door-disc-releasing condition and fourth latch member to the counterbalance-disc-holding condition thereof effects automatic movement of the door from the second position to the first position thereof.

41. A door control mechanism for use with a door mounted in an associated building door-receiving opening to accommodate a manual movement of the door from a first position to the second position thereof and then by a manual movement of the door from the second position thereof to the first position thereof, said door control mechanism comprising a drive connection operatively connected to the door and having a first position and a second position, first latch mechanism operatively associated with said drive connection and having a door-holding condition for holding said drive connection in the second position thereof and having a door-releasing condition, a door-driving device for said door control mechanism and operative when connected to said drive connection automatically to move said drive connection from the first position to the second position thereof, second latch mechanism having a device-connecting condition for connecting said door-driving device to said drive connection to effect automatic movement of the door from the first position to the second position thereof and having a device-holding condition for maintaining said door-driving device out of operative connection with said drive connection, and a trigger selectively operable on said first latch mechanism for operating said first latch mechanism
between the door-holding condition and the door-releasing condition thereof and selectively operable on said second latch mechanism for operating said second latch mechanism between the device-holding condition and the device-connecting condition thereof, whereby selective operation of said second latch mechanism to the device-connecting condition thereof effects automatic movement of the door from the first position to the second position thereof and selective operation of said first latch mechanism to the door-releasing condition thereof and said second latch mechanism to the device-holding condition thereof effects automatic movement of the door from the second position to the first position thereof.

43. A door control mechanism for use with a door mounted in an associated building door-receiving opening to accommodate a manual movement of the door from the first position to the second position thereof under the urging of a biasing means and then by an automatic movement of the door from the first position to the second position thereof and then by a manual movement of the door from the second position thereof to the first position thereof, said door control mechanism comprising a door disc operatively connected to the biasing means to rotate therewith in response to movement of the door, a first latch member fixedly connected to said door disc for rotation therewith, a second latch member pivotable between a door-holding condition for holding the door in the second position thereof and a door-releasing condition, said second latch member being normally biased to said door-holding condition and engageable in said door-holding condition with said first latch member, second latch member in said door-releasing condition being out of operative contact with said first latch member carried by said door disc whereby to permit free rotation thereof, a counterbalance disc for the door and having associated therewith an energy-storing device, said counterbalance disc being operative when connected to the door automatically to move the door from the first position to the second position thereof and a counterbalance-disc-connecting condition for connecting said counterbalance disc to the door to effect automatic movement thereof from the first position to the second position thereof and a counterbalance-disc-holding condition for maintaining said counterbalance disc out of operative connection with the door, said fourth latch member in said counterbalance-disc-holding condition thereof being in operative contact with said third latch member to prevent rotation of said counterbalance disc and said fourth latch member in the counterbalance-disc-connecting condition thereof being out of operative contact with said third latch member for pivoting said second latch member between said counterbalance-disc-connecting condition and said counterbalance-disc-holding condition, and a plurality of angularly spaced lugs on said door disc for selectively rendering said trigger operable to change the condition of only one of said second and fourth latch members at one time to cause positive operation of the selective one of said latch members by said trigger, whereby selective operation of said fourth latch member to the counterbalance-disc-connecting condition thereof effects automatic movement of the door from the first position to the second position thereof and selective operation of said second latch member to the door disc-releasing condition and fourth latch member to the counterbalance-disc-holding condition thereof effects automatic movement of the door from the second position to the first position thereof.