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H. C. BLODGETT

2,012,336

DOOR CONSTRUCTION

Filed Aug. 4, 1931

3 Sheets-Sheet 1

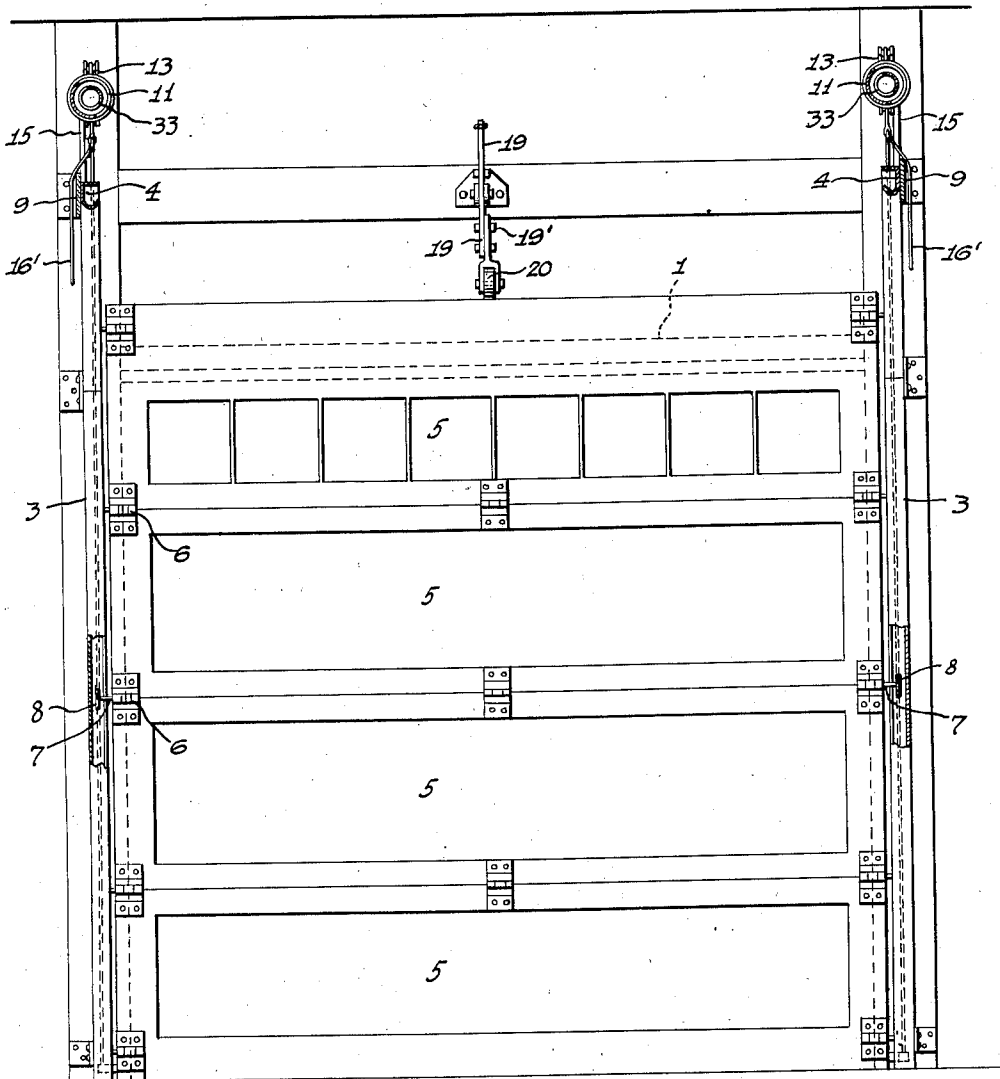


Fig. 1.

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3 Sheets-Sheet 2

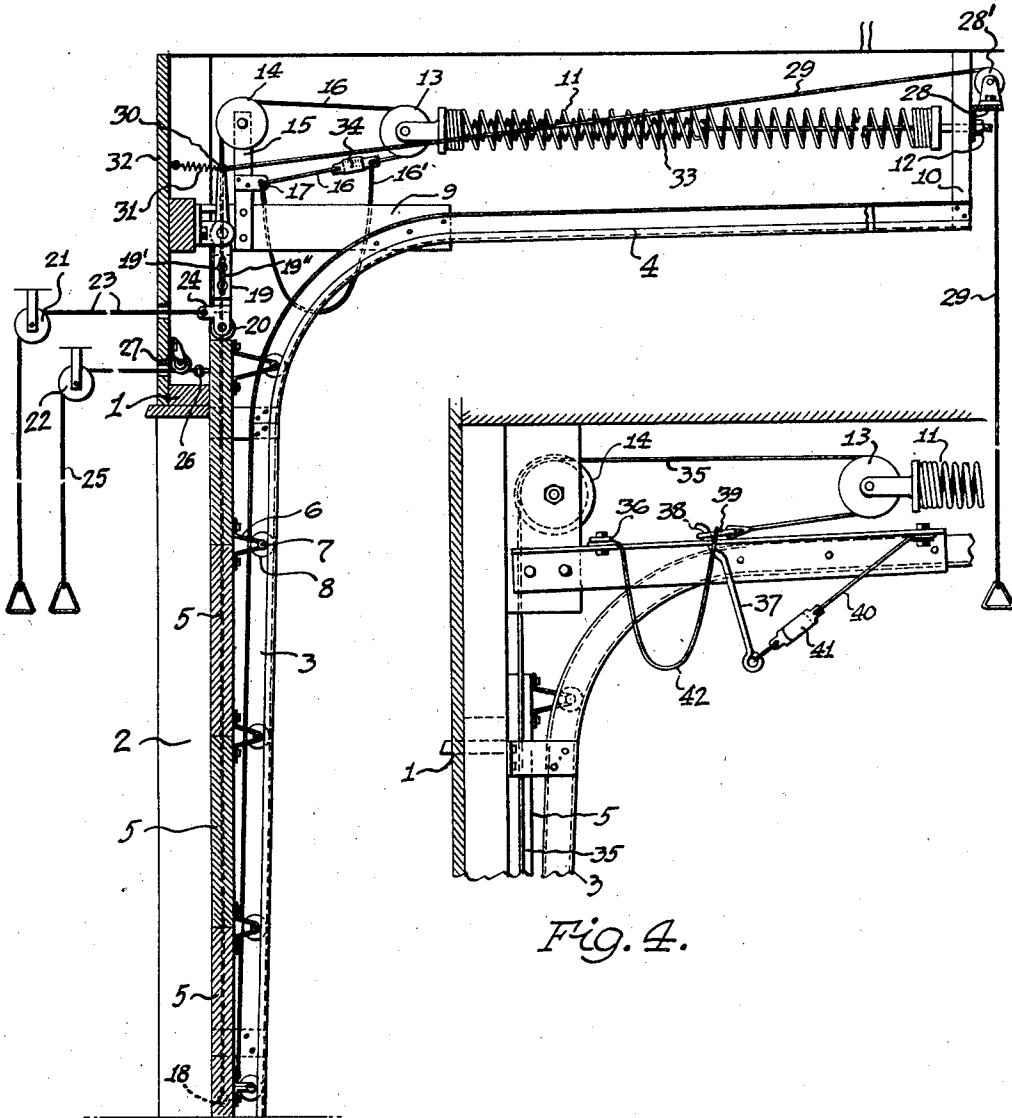


Fig. 4.

Fig. 2.

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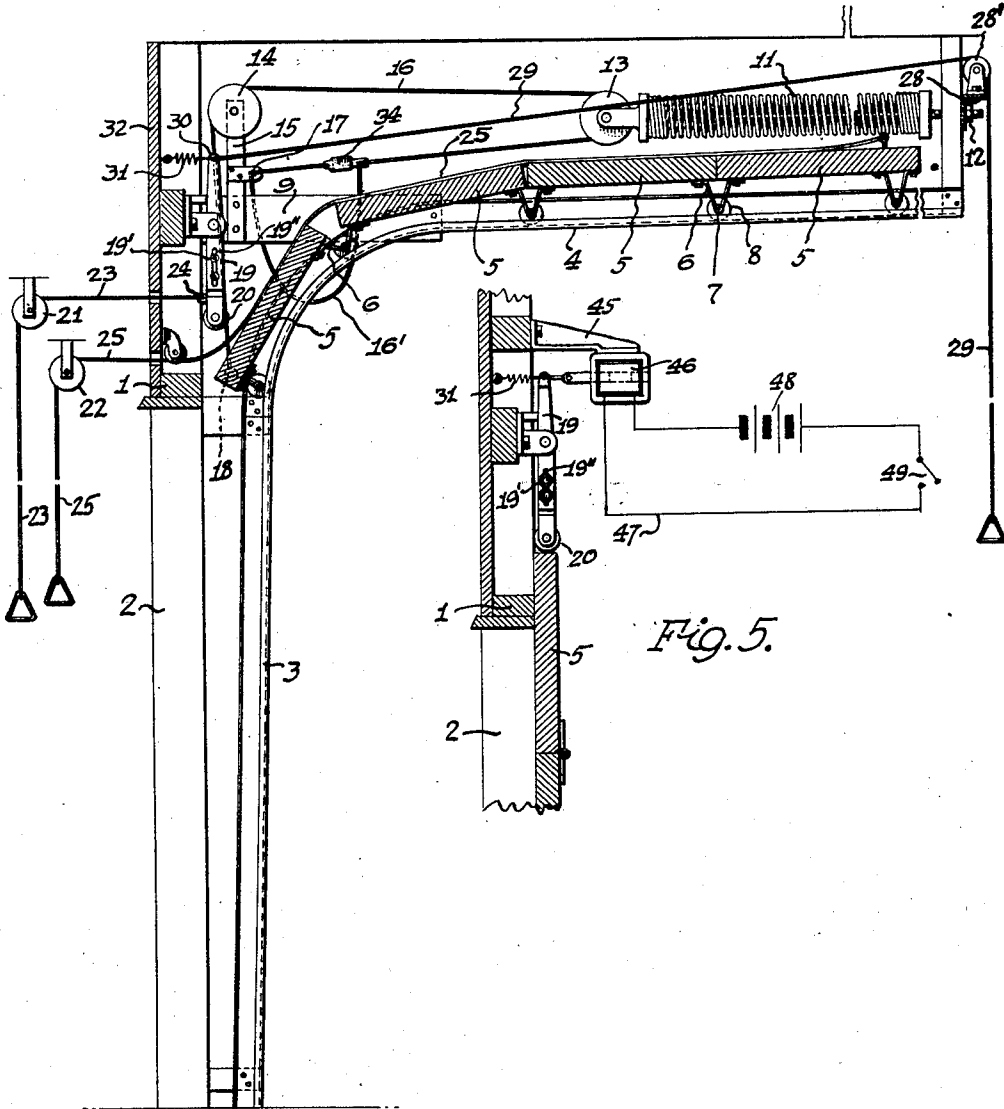


Fig. 3.

Fig. 5.

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# UNITED STATES PATENT OFFICE

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## DOOR CONSTRUCTION

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Application August 4, 1931, Serial No. 555,110

6 Claims. (Cl. 20—20)

The present invention pertains to a novel door construction of the type wherein a door consisting of superimposed panels hinged together is guided from a substantially vertical to a substantially horizontal position in moving from closed to open condition.

The principal object of the invention is to provide a door of this character which can be operated from the seat of a fire truck, ambulance, police patrol or other vehicle automatically operated by an alarm or signal. Another object is to provide a door which may be opened and closed by simple manual movements, preferably from an exterior point, so that a person in a vehicle may perform these movements without alighting. The door is provided with a counterbalancing system adapted to raise the door to open position without the application of additional force. Consequently, a detent is provided for maintaining the door in closed position. The detent has operating means extending therefrom to an exterior point and also to an interior point, so that the detent may be moved out of engagement with the door from the inside or outside of the door structure. There is also provided a cable extending from the upper part of the door to an exterior point and adapted to close the door when pulled. In order to close the door from the interior of the structure, the door may be pulled down manually.

A further object of the invention is to provide a door of this general type for use as an automatic fire door which closes on the occurrence of a fire and thus prevents spreading of the fire. The counterbalancing system which normally holds the door open includes a cable having a slack element held by suitable means in a slack condition throughout the normal operations of the door. The means for maintaining this slack condition includes a fusible link which breaks on the occurrence of a fire and causes the slack to be taken up by initial descent of the door. The counterbalancing spring is so dimensioned that it has insufficient tension to sustain the door after the slack has been taken up, and consequently the door continues to drop to its full closed position.

The invention is fully disclosed by way of example in the following description and in the accompanying drawings, in which—

Figure 1 is a rear elevation of the door structure, partly in section;

Fig. 2 is a transverse section of the door structure in closed position;

Fig. 3 is a similar view showing the door in open position;

Fig. 4 is a similar section of a modified construction; and

Fig. 5 is a detail section showing electrical operating means.

Reference to these views will now be made by use of like characters which are employed to designate corresponding parts throughout.

In the several views is shown a door frame structure 1 defining a door opening 2 which may be closed by a vertically slidable door. At the sides of the opening are mounted rails, each consisting of a substantially vertical portion 3 merging at its upper end into a substantially horizontal portion 4. The door proper consists of superimposed panels 5 joined together by hinges 6 having horizontal axes. The pintles 7 of the end hinges carry rollers 8 which ride in the track constituted by the rails 3, 4. The horizontal sections 4 may be supported at their forward ends by brackets 9 extending from the structure 1 and at their rear ends by hangers 10 suspended from the main structure.

The door is counterbalanced by coil springs 11 preferably disposed over both sides thereof and above the horizontal rail sections 4. The rear ends of the springs are secured as at 12 to the fixed structure, and the forward ends carry each a pulley 13. In line with the pulleys 13 and forwardly thereof are provided idler pulleys 14 mounted in brackets 15. Cables 16 have one end secured as at 17 to the brackets 15, are passed over aligned pulleys 13 and 14, and finally have their remaining ends secured as at 18 to the door near the lower edge thereof.

Over the door, a detent arm 19 is pivotally attached to the fixed structure on a horizontal axis and has one end provided with a roller 20 adapted to engage the upper edge of the door when closed, preferably at the midpoint of said edge, as shown more clearly in Figure 1. The arm 19 consists of two sections held together by bolts 19' passing through slots 19'', whereby adjustment of the length of the arm may be made for variations or manufacturing tolerances in the height of the door. Pulleys 21 and 22 are suitably mounted outside of the structure but preferably near the door opening. A cable 23 is hung over the pulley 21 and secured at 24 to the lower end of the arm 19. Another cable 25 is thrown over the pulley 22 and is secured as at 26 to the upper edge of the door, for a purpose which will presently appear. This cable is guided by an idler pulley 27. An angle iron 28 secured across the rear part of the structure supports a

pulley 28 directly behind the arm 19 and over which is hung a cable 29 having one end connected as at 30 to the upper end of the arm 19. The same end is connected by a spring 31 to the header structure 32 in such a manner as to draw the arm to a vertical position as shown in Figure 2.

The counterbalance spring is so adjusted as to have a tension sufficient to raise the door when the latter is lowered or closed as in Figure 2. The raising of the door is however normally prevented by the engagement of the roller 20 with the upper edge thereof.

When the door is used in a fire station, police car garage or ambulance garage, the cable 29 is within reach of the driver's seat. When an alarm, call or signal comes in, the driver first takes his seat on the vehicle and then pulls the cable in order to open the door.

A person approaching the door in a vehicle may open the same, without stepping out of the vehicle, by merely pulling on the cable 23, whereupon the arm and roller are removed from the path of the door, and the latter is raised by the action of the counterbalance spring. The door is closed from the outside in a somewhat similar manner by pulling on the cable 25 which draws the uppermost panel 5 to its lowest position as shown in Figure 2.

The door is lowered from the inside of the garage by a manual pull thereon and is held in closed position by the movement of the arm 19 to holding position under the action of the spring 31. The door is opened from the interior by pulling on the cable 29, whereupon the arm 19 is swung out of contact with the upper edge of the door.

It will be seen that the counterbalancing system includes an auxiliary spring 33 within the main spring 11. The auxiliary spring is tensioned when the door is lowered as shown in Figure 2, and the tensioning of this spring is necessary to overbalance the door for the purposes previously set forth.

Each of the cables 16 has a slack portion 16' extending from the anchored end 17 to a rearward point. The taut portion has a fusible link 34 inserted therein. If a fire should occur in the structure while the door is open, one or both of the links 34 will break, and the slack portions 16' become effective to slacken the cables 16 throughout. A portion of the slack may be taken up by further contraction of the springs to their limit, but the greater part of the slack permits descent of the door at least until the slack is taken up. At this point, however, the springs are not sufficiently tensioned to prevent the door from continuing its descent, as a result of which the door closes entirely. Thus, the door functions as an automatically closing fire door, preventing spreading of the fire to other parts. It may also be noted that, although the springs are of insufficient tension to prevent closing of the door under the conditions described, they nevertheless offer a slight resistance to the closing, thereby causing it to close slowly and safely rather than to drop abruptly under its own weight.

In the modification shown in Figure 4, the cable 35 passed around the aligned pulleys is continuous and is anchored to the fixed structure as at 36. Behind the point 36 a trip rod 37 is pivoted in the fixed structure and has an upper hooked end 38 received in a link 39 inserted in the cable 35. The lower end of the rod is joined

to a rearward point in the fixed structure by a cord 40, and in the cord is inserted a fusible link 41. The cable 35 is dimensioned so that a slack portion 42 occurs therein between the point 36 and the link 39 when the door is open and when the position of the hooked end 38 and link 39 is fixed by the tautness of the cord 40.

If the link 41 should break under excessive temperature within the structure, the hooked end 38 will be free to swing rearwardly because of the tension of the counterbalance springs on the cable 35. In this manner, the door is free to descend, taking up the slack 42, while the link 39 eventually rides off the hooked end 38. The condition of the counterbalance springs is such as to permit complete closing of the door in the manner already set forth.

Figure 5 shows an electrical device for moving the detent arm 19 away from the upper edge of the door. To the header structure is secured a bracket 45 which supports a solenoid 46. The core 47 of the solenoid is connected to the upper end of the arm in a manner to pull rearwardly thereon when the solenoid is energized. The solenoid is embodied in a circuit comprising a source of current 48 and a switch 49. The switch represents any means for closing the circuit, such, for example, as a relay operated by an incoming fire alarm, ambulance call, police call or by means of a push button.

Although specific embodiments of the invention have been illustrated and described it will be understood that various alterations in the details of construction may be made without departing from the scope of the invention, as indicated by the appended claims.

What I claim is:—

1. In a door structure having a door opening, a vertically slidable door mounted therein, a counterbalancing spring adapted normally to overbalance and raise said door from closed position, a cable connecting said spring to said door, one end of said cable being anchored, a slack cable section suspended from two points of said first named cable, and a fusible link inserted in said first named cable between said points, said spring being so dimensioned that it has insufficient tension to overbalance said door when said slack portion is taken up on breaking of said link.

2. In a door structure, guides extending vertically and horizontally, a door formed of a plurality of hinged sections and adapted to be moved in the vertical and horizontal portions of said guides, counterbalancing means connected to said door and serving to assist upward movement thereof and retard downward movement thereof, auxiliary counterbalancing means connected to said door and causing an overbalanced condition during the initial vertical movement of said door, and fusible means connected to said auxiliary counterbalancing means and adapted upon destruction thereof to render said auxiliary counterbalancing means inoperative.

3. In a door structure, guides extending vertically and horizontally, a door formed of a plurality of sections and received in said guides whereby vertical movement of the door causes sections thereof to move to a supported position in the horizontal portions of the guides, counterbalancing means connected to said door to assist movement thereof from its fully closed to its fully open position and for resisting movement in the reverse direction, and auxiliary counterbalancing means connected to said door and func-

tioning to assist opening movement and retard closing movement of said door when it is at its fully closed position and when it is within a predetermined short distance from its fully closed position.

4. In a door structure, guides having vertical and horizontal portions, a door formed of a plurality of hinged sections and slidably mounted in said guides, coiled springs connected to said door and adapted to counterbalance the same during movement of the door in said guides, and coiled springs connected to said door and overbalancing the same during a fraction of the movement of said door to and from its fully closed position.

5. In a door structure, guides extending vertically and horizontally, a door formed of a plurality of sections and received in said guides whereby vertical movement of the door causes sections thereof to move to a supported position in the horizontal portions of the guides, counterbalancing means connected to said door to assist movement thereof from its fully closed to its fully open position and for resisting movement

in the reverse direction, auxiliary counterbalancing means connected to said door and functioning to assist opening movement and retard closing movement of said door when it is at fully closed position and when it is within a predetermined short distance from its fully closed position, and means for holding said door against the urge of said auxiliary counterbalancing means.

6. Counterbalancing means for a vertically and horizontally slidable door, said counterbalancing means comprising a spring connected to said door and resiliently urging the same toward an open position, said spring being connected to exert sufficient pressure on said door to provide a counterbalanced condition during all stages of its vertical and horizontal sliding movement, a second spring, and means connecting said second spring to said door whereby said spring resiliently urges said door toward its open position to provide an overbalanced condition while said door is at or in close proximity to its fully closed position.

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