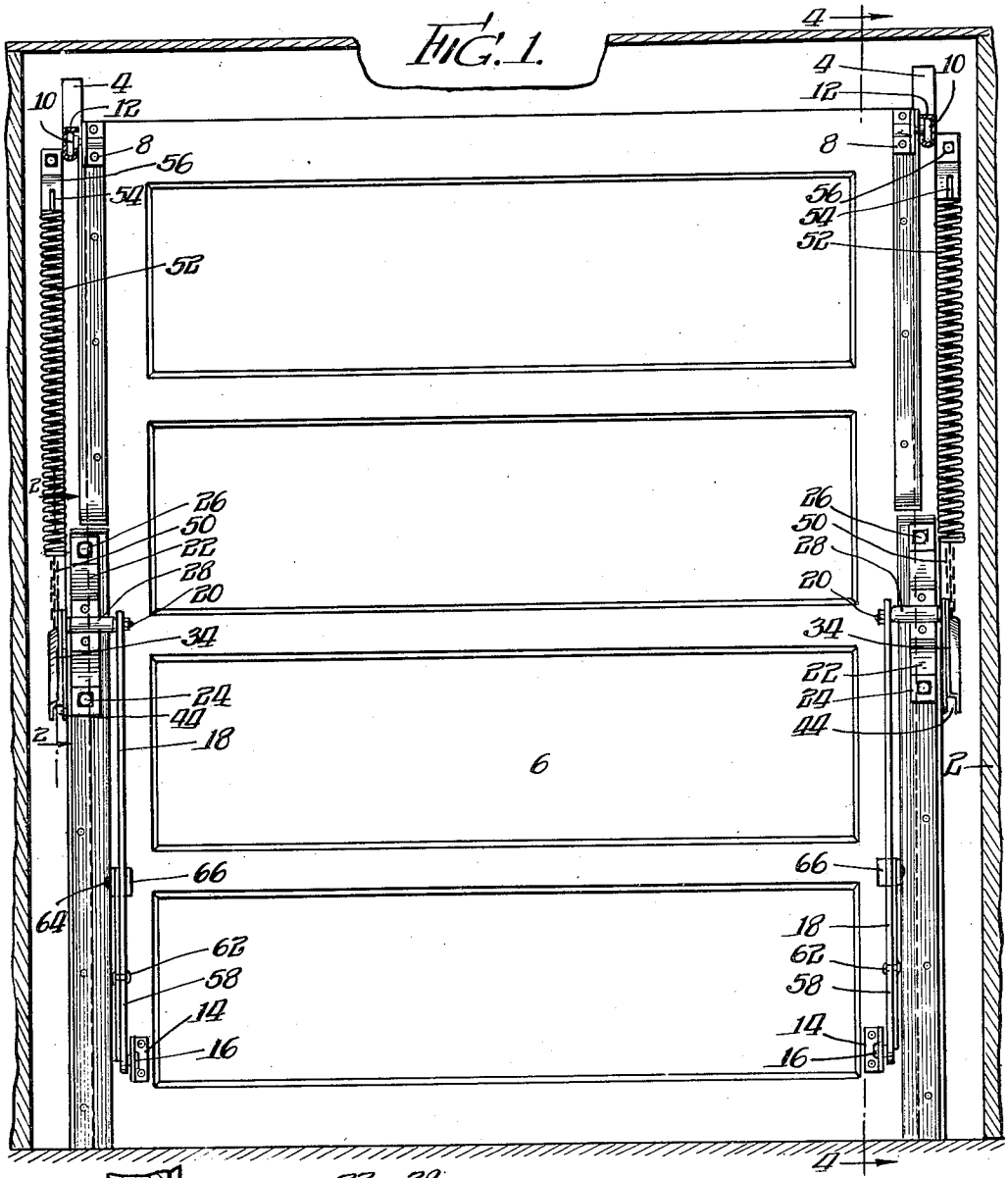
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GARAGE DOOR

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FIG. 1.



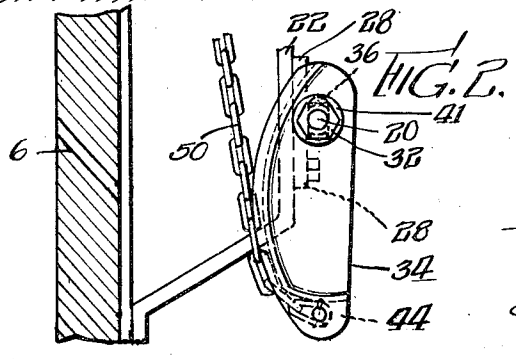


FIG. 2.

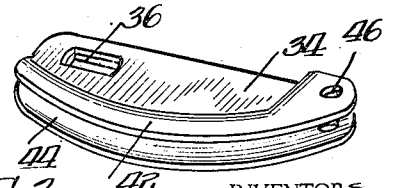


FIG. 3.

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FIG. 4.

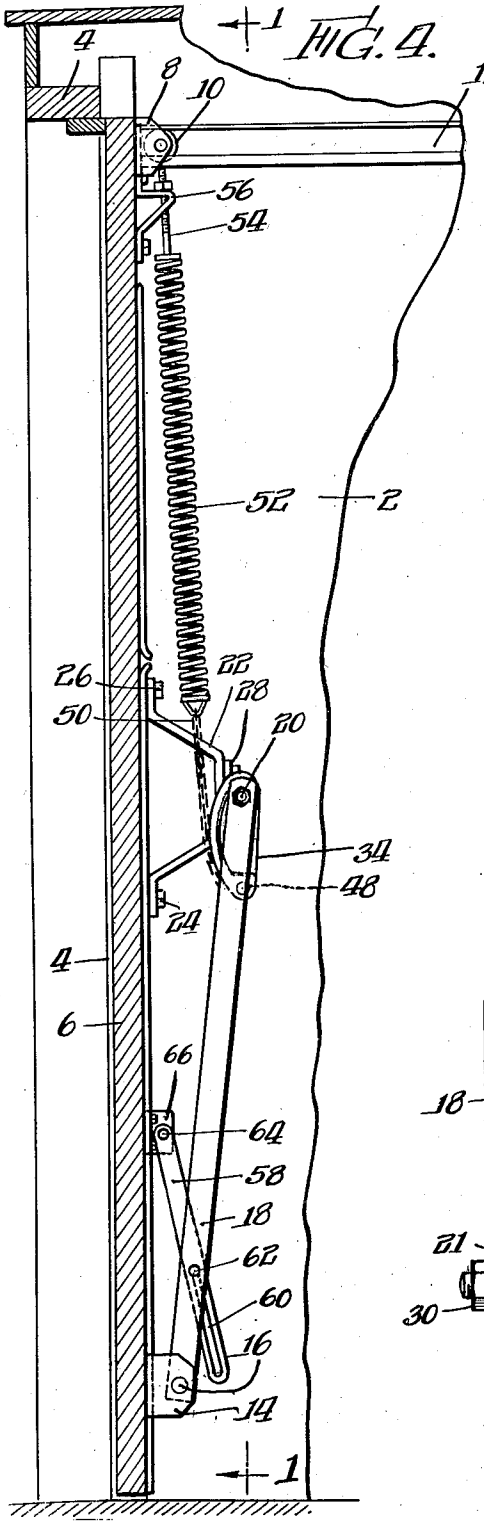


FIG. 5.

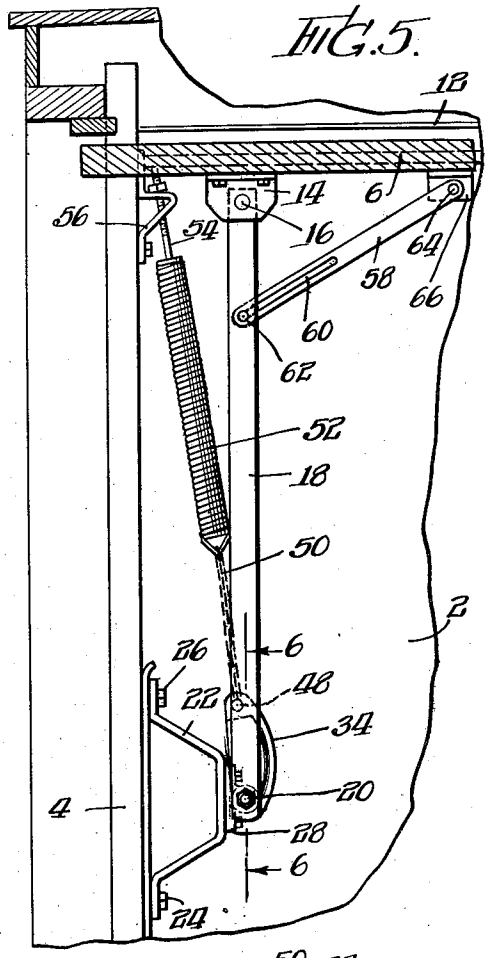
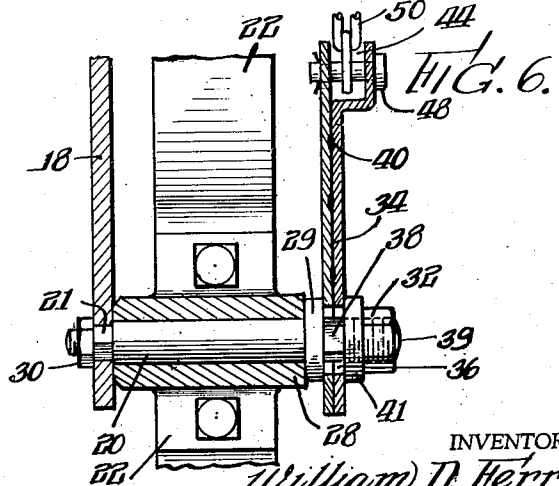


FIG. 6.



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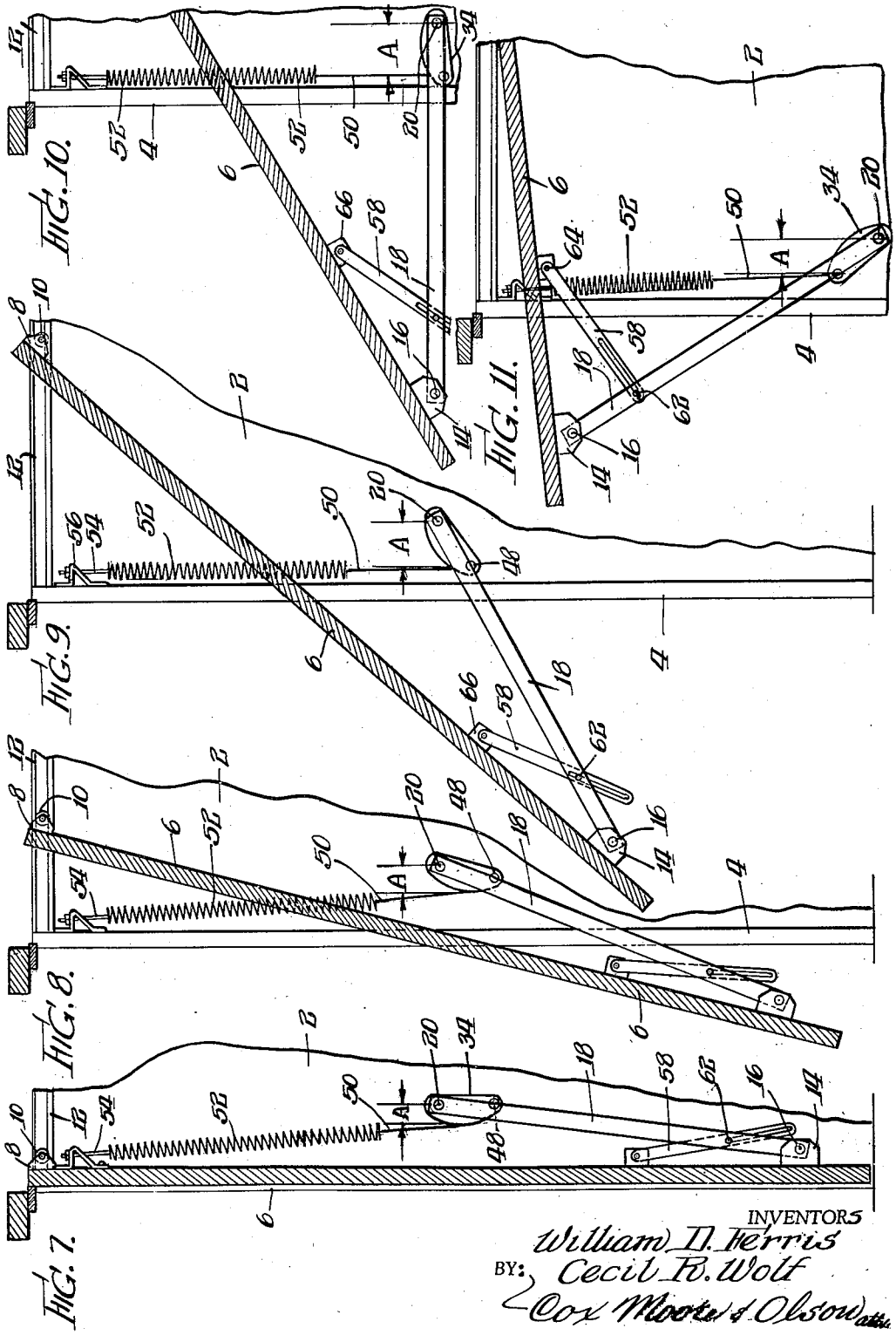


FIG. 10.

FIG. 11.

FIG. 9.

FIG. 8.

FIG. 7.

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UNITED STATES PATENT OFFICE

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GARAGE DOOR

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Application December 31, 1941, Serial No. 425,020

2 Claims. (Cl. 20—19)

This invention relates to overhead doors and particularly to overhead doors of the rigid one-piece type, the upper ends of which are adapted to be guided along a substantially horizontal track disposed in more or less horizontal position adjacent the top of the door frame and wherein lever means pivoted to the door and to a fixed support located to the rear of the door frame is provided, so that when the door is closed it is disposed in a substantially vertical position with respect to the door frame and when open is in a substantially horizontal overhead position with respect to the door frame.

Among the objects of the present invention is to provide in association with the foregoing, spring power means interconnecting the door and the lever for affording a source of power adapted immediately to raise the door as soon as the door is unlatched and independently of any manual preliminary lifting of the door; to provide spring power means for automatically power lifting the door initially relatively slowly, and thereafter relatively faster; to provide an automatic power opening of the door relatively slowly initially, followed by an acceleration of such opening movement of the door; to provide a progressively decelerated final opening movement of the door; to provide spring means acting on the door when fully opened, which tends to maintain the door in fully opened position; to provide means furnishing a positive stop for the fully open position of the door, which stop means eliminates strain on the lever mechanism which swings the door; to provide power spring means in association with a lever pivoted to the door and to a stationary support, wherein the spring provides an initial power lift to the door followed by an accelerated movement of the door up to a predetermined open position of the door, accompanied by a spring action tending to maintain the door in fully open position; to provide in association with a door of the foregoing characteristics, cam means connected to the inner pivotal axis of the lever, and providing in association with a spring and connected flexible member, a controlled power opening of the door; to provide lever means in association with such spring and its connected flexible member; cam means arranged to provide a shifting point of application of the force of the spring upon the longer arm of the lever, the arrangement being such that various shapes of preformed cams may be substituted one for the other to provide variant lifting effects for variations in doors and springs; to provide means for adjustably changing the effective length of the cam means to correspond with variable spring tensions and to care for slight door variations in weight; to provide in association with a door of the foregoing character, mechanism for controlling the speed of opening of the door; to provide the cam mechanism with means for guiding the flexible member relatively thereto during the winding and unwinding movements of the flexible member; to provide spring means to preclude tendency of the door to rebound when in the open position; to provide stop means interconnecting the door and its lever for limiting the opening movement of the door and which prevents the strain being carried by the mounting for the inner pivotal axis of the lever; to provide in association with a door of the foregoing character, a coil spring having initial tension built thereinto and interconnecting an anchorage and a lever having its inner end pivoted to a fixed support and its outer end fixed to the lower portion of the door, the connection between the spring and the lever including a cam providing a shifting point of connection between the spring and the lever, whereby to accomplish the various functions hereinbefore set forth; to provide these and other objects of the invention as will be apparent from a perusal of the following specification when taken in connection with the accompanying drawings, wherein:

Figure 1 is a view of a one-piece rigid door in closed position taken from the inside of the structure, the view being a section on line 1—1 of Figure 4.

Figure 2 is a detailed view of a cam mechanism hereinafter set forth.

Figure 3 is a perspective view of the cam.

Figure 4 is a vertical sectional view on line 4—4 of Figure 1, showing the door in closed position.

Figure 5 is a similar view in open position.

Figure 6 is a fragmentary sectional view taken on the line 6—6 of Figure 5.

Figures 7 to 11, inclusive, show various positions of the door in closed and open position, illustrating the relation of the cam to the spring and to the pivoted lever.

Referring now to the drawings in detail, the invention is illustrated in connection with a structure 2 having a door frame 4 providing an opening adapted to be closed by a door 6, which in closed position is substantially vertical, as shown in Figure 4, and which in open position is substantially horizontal, as shown in Figure 5. The door is of the one-piece rigid type and is preferably provided with a bracket 8 carrying a

roller 10 at the upper corners of the door, which rollers are adapted to roll in tracks 12 extending within the structure at the top thereof and being substantially horizontal more or less, or slightly rearwardly downwardly inclined.

At its lower end the door is provided with a bracket 14 to which is pivoted as at 16 the outer end of a lever 18, the inner end of which is pivoted on a pin 20 on a bracket 22 fixed as at 24 and 26 to the frame 4. As shown in Figure 6, the bracket 22 is provided with a bearing 28 in which the pin rotates with the lever 18. The pin is rigidly connected to the lever by means of the nut 30 and by means of the squared end 21 of the pivot pin 20. The other end of the pin has integrally formed therewith, a shoulder 29, an adjacent keyed portion 38 having parallel sides corresponding in width to the width of slot 36 of a cam hereafter mentioned. In addition, the keyed portion of the pin terminates in a threaded end 39.

A cam 34 is provided with an elongated rectangular aperture 36 adapted to fit over the keyed, angularly shaped portion 38 of the pin 20 and rests against shoulder 29 and a nut 32 threads on the threaded end 39 of the pin and presses a washer 41 against cam 34 whereby such cam rotates or turns with pin 20. The slot 36 and key 38 provide adjustment of the cam to vary the distance between the axis of pin 20 and the connection of the cam with the flexible member hereinafter described. This adjustment permits changing this distance to suit variable spring tensions and to care for slight door variations in weight. Commercial spring tolerances are ten per cent over, ten per cent under average load specified. This cam 34 is preferably formed of two sheet metal sections suitably stamped and welded together as at 40 to make a rigid structure. One of the sections of the cam is provided with a laterally extending peripheral wall 42 providing a groove 44 for guiding the flexible member. In one end of the groove there is provided an opening 46 through which passes a pin 48 forming an anchorage for an elongated flexible member 50, which is connected to the cam. The opposite end of this flexible member, which may be a chain, is connected to the outer end of a spring 52, the other end of which is provided with an anchorage bolt 54 in turn connected to a bracket 56 mounted on the door opening frame 4.

The spring is a coil spring having an initial tension built and wound into it and arranged so that when the door is in completely open position, the spring will tend to maintain a tension on the lever 18 pivotally connected with the door, whereby to hold the door completely open and to prevent it from rebounding when adjusted properly and when it hits the stop to pull the door back in again.

In addition, by winding the initial tension into the spring as herein set forth, when the door is in closed position, as shown in Figure 4, immediately the door latching mechanism is released the spring will automatically act to power lift the door to open position.

The present invention includes the provision of cams of the foregoing type which have variant peripheral contours designed to give various opening movements to the door. In the form illustrated, as shown in Figures 7 to 11, inclusive, it will be noted that since the connection of the chain 50 to the cam is as indicated, in the closed position of the door, shown in Figure 7, the point of application of the spring on the cam is shown by the distance between the two arrows marked "A."

Figure 8 shows the door in slightly more open position and shows the point of application of the spring relatively to the cam 34 and lever 18 at a point further removed from the pivot pin 20 of the lever, which tends to speed up the opening movement of the door.

Figure 9 shows the point of application still further removed from the pivot pin 20 so that at this point of opening the door is still accelerating.

Figure 10 shows the maximum accelerated movement of the door and from then on the point of application of the force upon the cam 34 and lever 18 commences to decrease so that the movement of the door decelerates, whereby a progressively slower approach of the door to its complete open position is attained, until finally the door reaches a position such that when completely open the initial tension of the spring continues to maintain a tension on the door which will prevent it from rebounding but does not act as a positive stop.

It will be noted that by forming the cam 34 in the manner illustrated in Figures 2 and 3, the chain is provided with a guideway so that it will not slip out of position with respect to the cam and will at the same time provide a shifting point of application of the power with respect to the lever 18 pivoted to the door. In addition, by forming the cam of two welded sections a very cheap, economical and light construction is provided.

In addition, means is provided forming a positive stop for limiting the full open position of the door and in a manner which will not put strain upon the lever 18 nor upon the bracket 22 which supports the bearing for the pin 20 of the lever 18. In accomplishing this a slotted link 58 is provided having a slot 60 adapted to receive a pin 62 rigidly connected to an outer portion of the lever 18. The opposite end of the link 58 is pivoted as at 64 to a bracket 66 on the part of the door 66 located above the bracket 14 when the door is in closed position, as shown in Figure 4. This slot and pin connection permits the pin 62 to ride freely in the slot 60 during the opening and closing movement, the pin allowing for the complete closing movement, but being arranged so that when the pin strikes the opposite end of the slot 60 it will provide a positive stop determining the full open movement of the door.

It is to be noted particularly that the stop mechanism is disposed so that no strain in this stopping action is borne by the bracket 22 forming the bearing for the pin 20 and due to the pivotal connection 64 and 62 between the link 58, the lever 18 and the door 6, the door itself is free to flex slightly during its checked action in its full open position.

It will be appreciated that the present construction gives a controlled speed and movement of the door. Specifically, the initial urge of the spring on the door will be relatively slow but will act positively to open the door instantly the door is unlocked without any preliminary urge to the door and thereafter the speed of opening of the door will accelerate to a predetermined point and will then tend to slow down in the speed of opening to the complete open position of the door. Hence, the door is acting under controlled power from the moment it opens until its final closed position has been attained.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is as follows:

1. An overhead door construction comprising a frame having an opening to be closed, a rigid one-piece door adapted to be moved from a substantially vertical position closing said opening to an open substantially horizontal position adjacent the upper part of said opening, counterbalancing means for said door comprising a spring and a connected elongated flexible member, lever means, a stationary bracket on the door frame, a bearing thereon, a pivotal pin turnably mounted in said bearing, said lever means being rigidly connected to said pivotal pin, and means connecting said elongated flexible member to said lever, said connecting means comprising an elongated cam composed of a plurality of sheets of metal rigidly interconnected, said sheets of metal at one end of the cam having an elongated slot formed therein and overlying one end of said pivotal pin, and means for rigidly and adjustably fastening said end of the cam to said pivotal pin, peripheral portions of said sheets of material being relatively spaced apart to provide a peripheral cam groove, variant portions of said groove lying at different distances from the axis of turning of the cam, means connecting said elongated flexible member with the other end of said cam in a manner to cause said flexible member to wrap upon and unwrap from said cam within said groove during various opening and closing positions of the door.

2. An overhead door construction comprising a frame having an opening to be closed, a rigid one-piece door adapted to be moved from a substantially vertical position closing said opening to an open substantially horizontal position adjacent the upper portion of said opening, brackets on said door frame providing a bearing, a pivotal pin in said bearing, a lever having one arm rigidly connected to one end of said pivotal pin and the other end of said lever being pivotally connected to the lower portion of said door, an elongated cam connected to the other end of said pivotal pin to turn therewith, a flexible member connected to the other end of said elongated cam, said cam having a peripheral portion providing a groove in which said flexible member is adapted to wrap, a spring connected to the other end of said flexible member and to the upper portion of said frame, a substantially horizontal track to the rear of said door opening, the upper portion of said door having rollers pivotally connected thereto to move in said track, and a link pivotally connected to the lower portion of said door substantially above the pivotal connection between said lever and said door, the outer end of said link being slotted, and a pin on the outer end of said lever adapted to shift along said link during the opening movements of said door, the end of said link in the open position of said door striking said pin to limit said open position of said door.

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