June 30, 1953 A. SCHWARTZ 2,643,420

DOOR ASSEMBLY AND HOLDER MECHANISM

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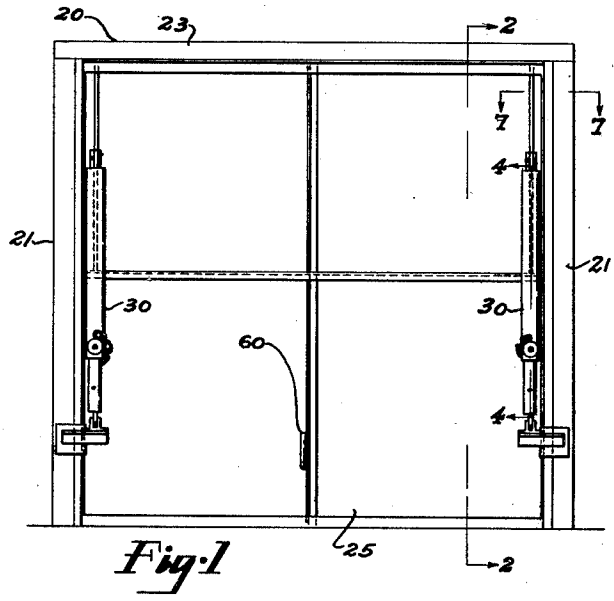
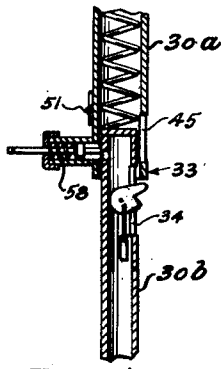
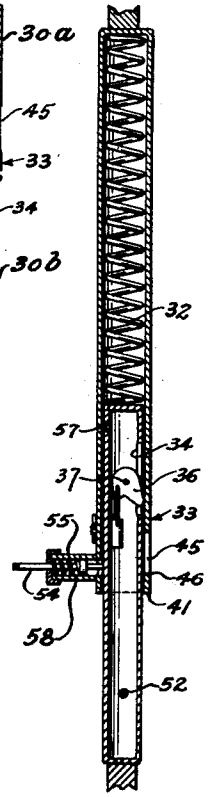


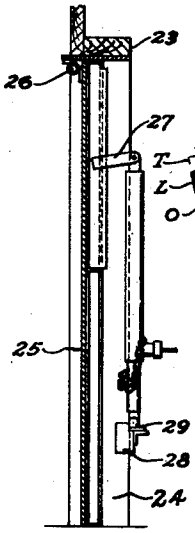
Fig·1



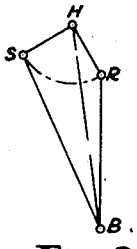
Fig·5



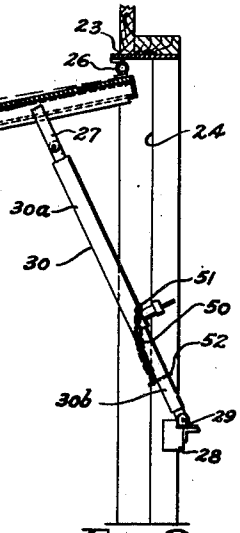
Fig·4



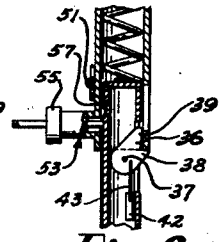
Fig·2



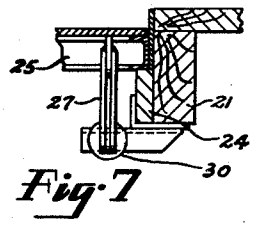
Fig·8



Fig·3



Fig·6



Fig·7

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DOOR ASSEMBLY AND HOLDER MECHANISM

Albert Schwartz, Cleveland, Ohio

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1 Claim. (Cl. 20—16)

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The present invention relates to mechanism for opening a vertically swinging door of the type used for garages and the like, and is a continuation in part of applicant's copending application Serial No. 33,455, now abandoned.

An object of my invention is to provide a door opening and support mechanism capable of holding up a comparatively heavy door by means of an improved compact telescoping strut mechanism that is at once inexpensive and easy to install.

Another object of my invention is to provide door opening means which permit a door to be swung outwardly with the support mechanism being disposed adjacent the sides of the door frame and protected from the weather by the extended door.

Also an object of my invention is the provision of a door opening apparatus that can be easily operated by either man or woman with a minimum of effort.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claim; the annexed drawing and the following description setting forth in detail certain structure embodying the invention, such disclosed structure constituting, however, but one of various forms in which the principle of the invention may be used.

In said annexed drawing:

Fig. 1 is an elevational view of the door from the inside of the door frame;

Fig. 2 is a section taken along lines 2—2 of Fig. 1;

Fig. 3 is similar to Fig. 2, but with the door shown in a raised position;

Fig. 4 is a section of the strut mechanism taken along the lines 4—4 of Fig. 1;

Fig. 5 is a fragmentary view in section of the strut mechanism showing the latching mechanism above the latched position;

Fig. 6 is a fragmentary view showing the latching means when the strut is held in extended position;

Fig. 7 is a fragmentary view along the line 7—7 of Fig. 1; and

Fig. 8 is a diagrammatic showing of the strut position relative to the plane passing through door hinge and frame mounting.

Particularly in those sections of the country where ice and snow are seasonal problems, in recent years the overhead garage door has become increasingly popular and is to a large extent apparently supplanting the old type of vertically hinged, outward opening doors.

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Several varieties of the so-called overhead door have been evolved, among which are the jointed or segmented type and the one-piece kind, both of which operate on a pair of overhead tracks in conjunction with heavy large springs. Many of these inwardly opening overhead door types operate satisfactorily, but most are quite expensive, and the track apparatus, support brackets, springs, etc., constitute cumbersome additions to upper garage space that might otherwise be more profitably used.

To combat the disadvantages of overhead door types heretofore employed, I have invented a compact, simple and reliable door opening mechanism which requires no bulky track apparatus within the garage, yet which opens and supports a door outwardly of the garage in a novel and effective manner.

Referring now to the drawings, I have shown a door frame 20 having vertical jamb members 21 and doorhead member 23. Pivotally hinged to doorhead 23 is a door 25, adapted to be swung outwardly on hinge 26 as shown in Figs. 2 and 3. In the closed position, as indicated in Fig. 2, the door is adapted to seat against an abutting doorstop strip or shoulder 24 in the door frame in conventional manner.

Attached to the door at a point not more than one-quarter of the vertical length of the door measured from the top are a pair of extension arms or bracket members 27 which project inwardly of the door and which are rigidly mounted thereon. These bracket members 27 are preferably mounted so that they will extend at least perpendicularly to the door, and I have found that the angle shown in Fig. 2 is very satisfactory, as will be explained more fully hereinafter. The length of the brackets may vary, of course, but they do have an important relationship with the depth of the vertical frame members of the door, since I find it is advantageous to have the bracket end extend inwardly of the door frame.

Upon the inside of the door frame 21 and spaced inboard of the vertical plane passing through the door hinge which is mounted outboard of the door stop strip is secured a support member 28 and mounted therein is a bracket stand 29. This bracket assembly is preferably positioned about a quarter or shortly less of the way up the frame from the bottom, as is shown in Figs. 1, 2, and 3, but this position may vary, of course, depending for example, upon the weight of the door to be supported, etc.

Pivotally disposed between bracket members 27 and 29 is a pair of telescoping strut members 30 having an upper outer member 30*a* and a lower

inner member 30b which members are preferably tubular with the member 30b being adapted to telescope inside the member 30a. As the door is raised strut 30a will be extended relative to strut 30b and when the door is lowered the struts will be telescoped.

Within the strut 30a and between the ends of the strut members, compression springs 32 are mounted so that the weight of the door may be counterbalanced to facilitate handling of the door.

To hold the door in an open position, I have provided a simple latching mechanism indicated generally at 33. Inner strut 30b is provided with an elongated slot 34 in one side thereof and a latch member 36 is pivotally mounted inside the strut on an angle pin 37 so that a portion of the member may extend through the slot 34 when the latch 36 is rotated to a predetermined position as shown in Fig. 5. Latch 36 has a jaw formation 38 and an abutment portion 39 which extends laterally from the base of the jaw 38 and projects outwardly over the jaw. The jaw and abutment are adapted to extend through the slot 34 so that the jaw will receive lower edge 41 of the outer strut 30a, and at the same time abutment 39 will engage the inner surface of the outer strut and effectively hold the latch in the position shown in Fig. 6 where the outer strut is supported in an extended position.

Latch 36 is preferably biased angularly in a position in which the jaw 38 and abutment 39 project through slot 34, and I have found it desirable to accomplish this by a weight 42 attached to latch 36 by a bail 43.

A slot 45 is provided in outer strut 30a which is adapted to register with slot 34 as the door is moved to the latching position, as may be foreseen in Fig. 5, and the length of the slot 45 is such as to permit swinging of the jaw and abutment of the latch from one side to the other of the center of this slot as the door is moved to an elevated position.

When the door is in the closed position the latch 36 will be in the position shown in Fig. 4 and as the door is elevated toward the latching position, slot 45 will first be moved into registration with slot 34 and the weight 42 will cause the latch 36 to rotate counterclockwise. As the door is elevated further the lower edge 46 of the slot 45 engages the abutment 39 and rotates the member 36 counterclockwise to permit continued outward movement of the strut member 30a. When the lower edge 41 of the strut 30a reaches the level of the jaw 38 weight 42 swings member 36 to position the jaw beneath the edge 41 and the abutment 39 against the inside of strut 30a. The door is then released so that its weight is supported on jaw 38 and member 36 is held in the door supporting position by abutment 39 engaging the inner side of strut 30a.

To release the latch the door is raised so that the lower end of strut 30a is elevated beyond abutment 39 as indicated in Fig. 5 and then weight 42 causes member 36 to rotate clockwise, whereupon the door may be lowered with strut member 30a turning the latch member clockwise. As slot 45 passes slot 34 the upper edge of slot 45 will engage the abutment 39 and rotate the latch member clockwise to prevent latching of the door.

In order that undue strain will not be placed upon the struts, hinge and door when the latter is in an extended position in the event that strong winds should tend to lift the door upwardly, I have provided a safety chain 50 appropriately secured to the upper strut 30a at 51 and being attached to the lower strut 30b by means of a bolt 52 extending through said strut. The length of the chain is preferably such that the door cannot open beyond a predetermined distance beyond the normal extended height when the door is resting on the latch member 36 as described hereinabove.

As a further or alternative safety measure I have provided a spring actuated pin lock indicated generally at 53 having a pin 54 mounted in a casing 55 secured to strut 30a. Through an opening in the wall of strut 30a the inner end of the pin bears normally against the outer wall of strut 30b. Above the normal latched position of the struts as shown in Fig. 6 there is provided an opening 57. When the struts have extended beyond the latched position to the plate where the inner end of the pin 54 comes in register with the opening 57 spring 58 moves lock pin 54 into the opening 57, thus locking the strut members together to prevent further extension. To unlock, the plunger pin 54 is manually retracted.

It will, of course, be appreciated that other means to limit the upper movement of the door may be employed, but I have found that the safety means discussed above are very satisfactory in the strut arrangement that I have devised, although, except in unusual circumstances, only one of these limiting means will be provided for as an additional precautionary safety measure.

The advantages of my improved door opening means are perhaps most clearly explained in terms of operation. It will be observed that in the closed position as seen in Fig. 2, the strut mechanism 30 is substantially parallel to the frame of the door and pivot brackets 27 and 29 are so positioned that the struts 30 are located inside the door frame.

The diagram shown in Fig. 8 will indicate that the line HB, representing the plane passing through door hinge 26 and the lower pivot support 29, illustrates the strut position in a plane common thereto wherein spring 32 is subjected to maximum compression and where the strut members are in the most compacted position. At either side of this plane the spring 32 will tend to rotate the door about the hinge 26.

It will be apparent that in the closed position of the door spring 32 will be exerting upward pressure against the bracket 27 thus tending to rotate the door inwardly. This pressure is sufficient to keep the door tight against stop member 24 in the door frame and to hold the door closed against any wind currents that might otherwise tend to flutter the door open and shut in the lower portion.

As explained above, I have preferably given to bracket 27 a length that will bring its pivot end inside the door frame and into vertical alignment with bracket 29. It will, however, be apparent that the length of bracket 27 may be varied so long as in the door closed position strut 30 will be disposed on a line inwardly of the center line HB so that spring 32 will be "off center" and will tend to hold the door closed. I prefer to have the bracket arm mounted at an angle that is slightly more than 90° to the door and at an angle that will be in substantially parallel alignment with the struts when the latter are in extended position as indicated in Fig. 3.

In order to open the door, a handle is provided on the outside as shown at 60. A slight outward pull is necessary to overcome the holding pressure exerted by spring 32 and to bring the struts past the center line HB. Pressure of the spring will then rotate the door about hinge 26 and bring the door without further manual

effort to the position indicated by the lower broken line O. At this position the weight of the door is balanced by the spring pressure, but the door is not yet in the latched position indicated at L.

To bring the latch mechanism into operation, the outer door end is given a slight upward lift to the position indicated at T and the door is then allowed to settle back into the latched position L on the links as indicated in Fig. 6. In this latched position the weight of the door is greater than the effective spring pressure and hence the excess weight is carried by the latch. The excess weight of the door in the latched position is very advantageous since normal gusts of wind will not be sufficient to lift the door upwardly to either disconnect the latch mechanism or strain the entire apparatus.

Provision against the effect of unusually strong winds is made through the limiting action of the chain **50** and/or through plunger lock **53**, as explained before.

To take the door off the links and to disengage the latch mechanism, the door is lifted slightly permitting latch **36** first to rotate clockwise (Fig. 5) and then to swing inwardly as strut **30***a* moves over **30***b* as in Fig. 4.

Once the door is unlatched, it will settle to the normal balanced open position O. Manual force is then applied downwardly upon the end of the door until the handle can be conveniently reached and then the handle is pushed past the centerline HB to the closed position.

Closing the door against the spring pressure is a comparatively easy maneuver since the distance from the downward effort to the resistance located now at S, or where bracket **27** is attached to the door, is so much greater than the length of the resistance arm which may be identified as HS. The weight of the door itself, being concentrated at the center of gravity located well outward of the resistance, of course, lessens the amount of downward effort that need be applied.

As an example of the relationships which I have used in a door of a particular size, the following structural information may be helpful.

With a 7'6" x 7'6" door weighing approximately 175 pounds, I have used a ¼" flat spring $\frac{5}{32}$" thick with an O. D. of 1⅜" which has 141 coils and a free length of 53½". Bracket **29** is mounted about 15" from the bottom of the frame and bracket **27** is positioned on the door at a point about one fifth of the vertical length of the door measured from the top.

From the closed to the open position of the door on the latch the struts expand about 12". In the open position, as indicated at O, the springs exert about 219 pounds per spring and in the latched position the springs have about 202 pounds pressure each.

In this example the door opens to about 5'8" through spring action to reach position O. The door is manually lifted another 7" or 8" to position T and allowed to settle back to the latched

height L of about 6'1". I have found that the total outward swing of the struts should be about 20° of arc for this size door.

From the foregoing it will be apparent that a principal and difficult problem solved with this invention is the provision of a compact strut assembly that is operable within the positional and practical limitations set forth. The provision of a strut assembly that will hold the door closed on the inward side of the centerline HB and support the door open on the outer side thereof, while at the same time being compactly disposed on the door frame and substantially close to the top of the door and hence out of the way is a very considerable advantage. The utilization in such an arrangement of a spring powerful enough to open a comparatively heavy door yet compressible with the leverage available with relatively slight effort has not before been successfully accomplished in the novel way I have provided.

Although I have described but one form of the invention, it will be understood that other forms might be adopted, all falling within the scope of the claim which follows:

I claim:

In a vertically hanging door assembly and holder apparatus therefor in which the door swings upwardly about a horizontal pivot at its upper edge, the combination comprising a door frame including a frame head and an abutting door stop strip, a door pivoted to said frame head at one side of the door stop strip, a bracket secured to said frame at the other side of said stop strip, an extension arm rigidly mounted on said door at the upper portion thereof and projecting inwardly away from said door pivot to a point inwardly of a plane intersecting said door pivot and bracket, two telescopic members movable relative to one another and having opposite ends connected to the extension arm and to said frame bracket respectively, a compression spring between said telescopic members biasing the telescopic members to extended position, and automatic latch means carried by said telescopic members and operable to latch the telescopic members in extended position to hold the door in open position, said compression spring normally biasing the door to open position when the pivot between the extension arm and telescopic members is on one side of the plane intersecting the door and bracket pivot and biasing said door to closed position when said pivot is on the opposite side of said plane.

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