Oct. 11, 1949. G. BERRY ET AL 2,484,674

GARAGE DOOR

Filed Feb. 14, 1945 2 Sheets-Sheet 1

FIG. 1.

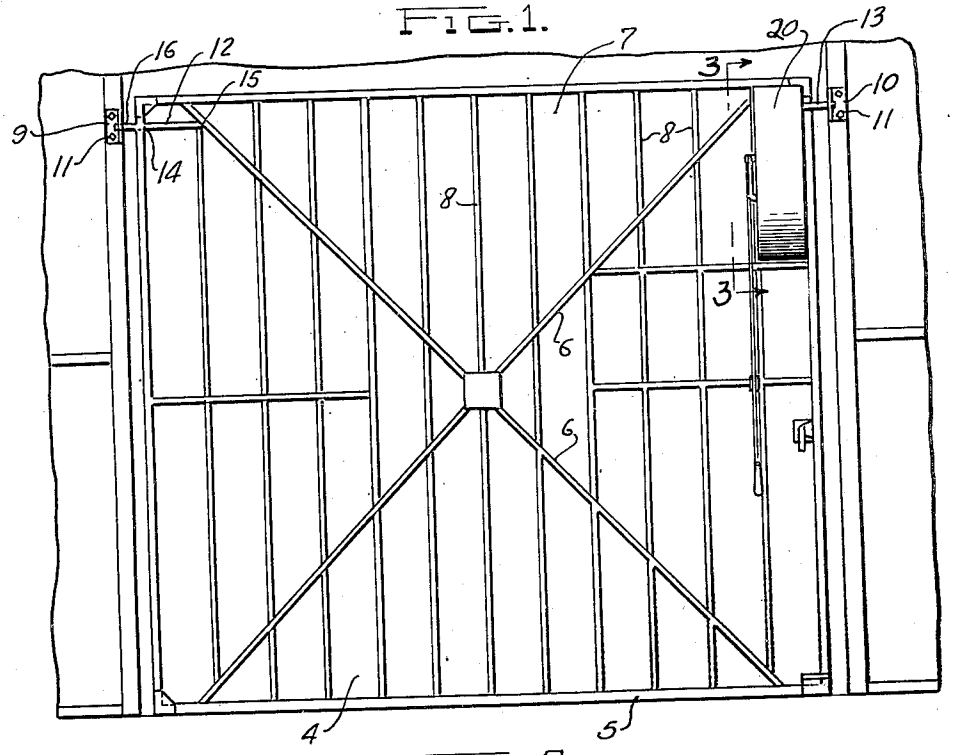
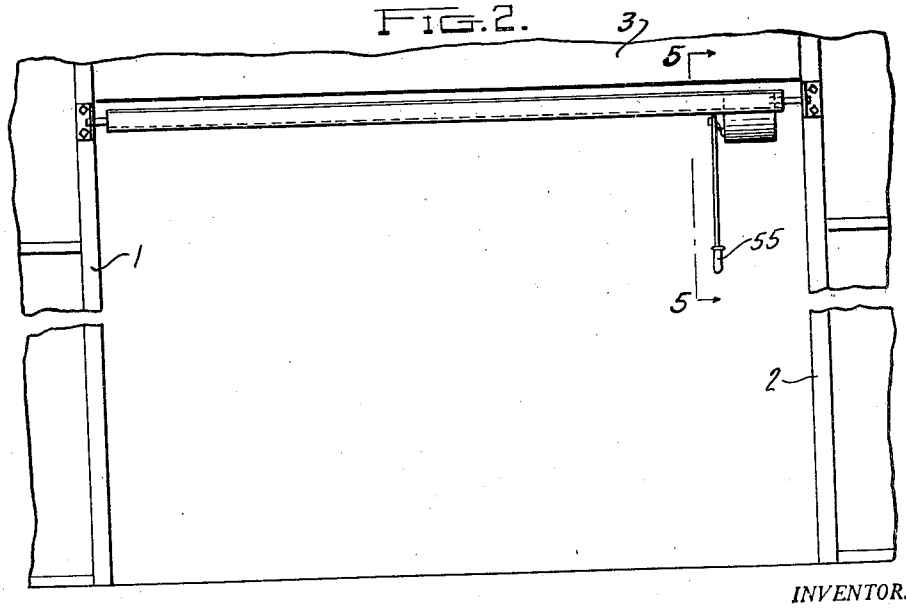


FIG. 2.



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FIG. 3.

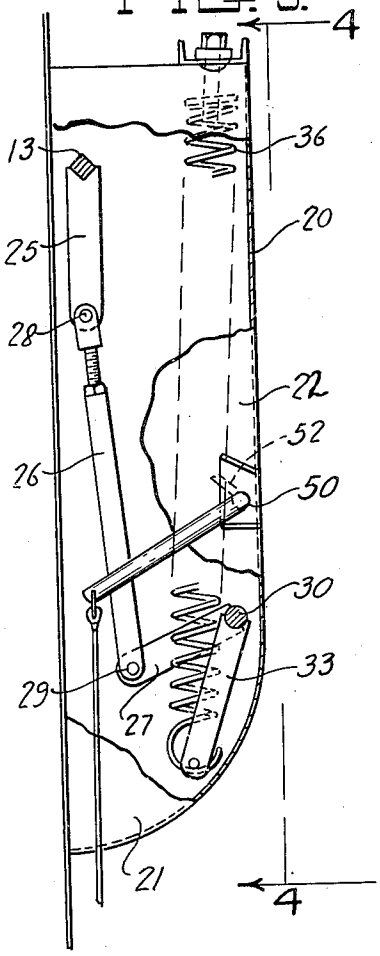


FIG. 4.

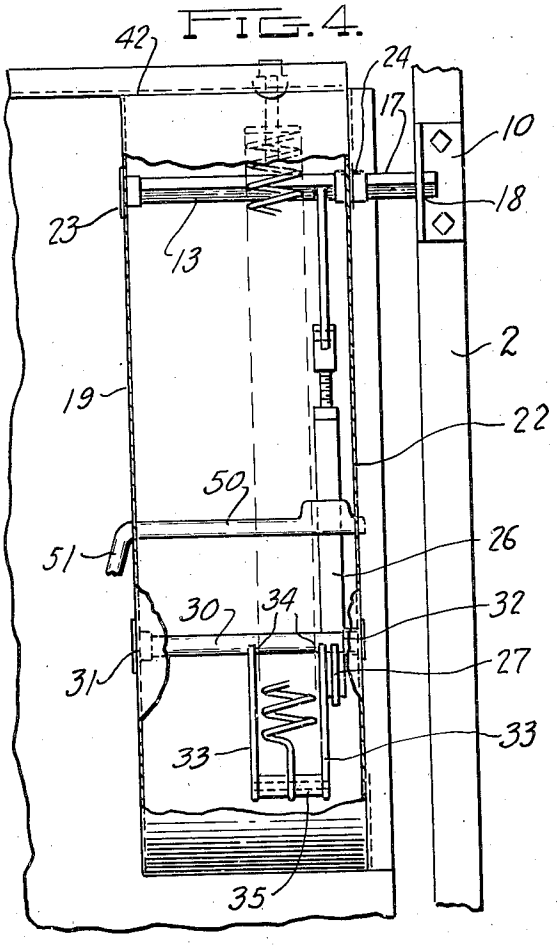
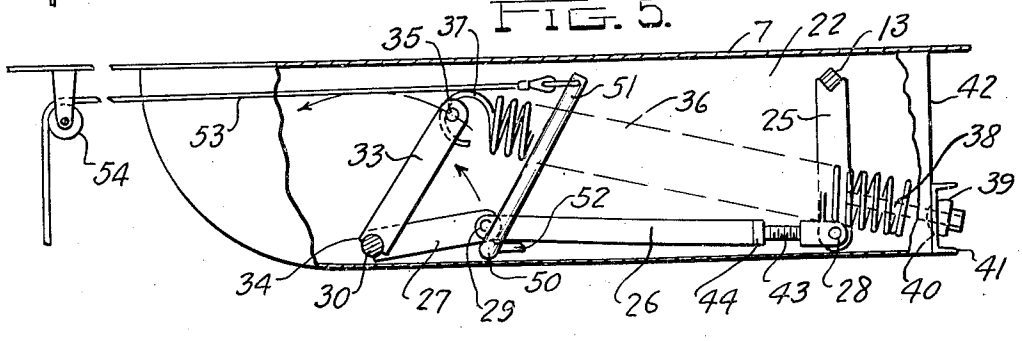


FIG. 5.



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GARAGE DOOR

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Application February 14, 1945, Serial No. 577,839

11 Claims. (Cl. 16—1)

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This invention relates to a garage door.

It is the object of this invention to produce a garage door which is strong, light-weight and very easily opened and closed. This object is accomplished by fabricating the door from light gauge sheet steel or non-ferrous metal such as aluminum, hinging the door adjacent its upper edge to swing about a horizontal axis, and by counter-balancing the door.

It is also an object of this invention to produce a counter-balanced garage door which is simple in structure, easy to install and neat in appearance.

My invention also contemplates a counter-balanced door wherein the counter-balancing mechanism is mounted as a sealed-in, self-contained unit upon the door and assembled and disassembled with the door as a unit in the door opening.

Fig. 1 is a rear elevation of the door taken from within the garage.

Fig. 2 is an elevation viewed from within the garage showing the door in open and raised position.

Fig. 3 is a section along the line 3—3 of Fig. 1 showing the counter-balancing mechanism with the door closed.

Fig. 4 is a view along the line 4—4 of Fig. 3.

Fig. 5 is a section along the line 5—5 of Fig. 2 showing the counter-balancing mechanism with the door open and raised.

Referring more particularly to the drawings it will be seen that the door opening is defined by a frame comprising upright members 1 and 2 and the horizontal cross member 3. The door is generally designated 4 and comprises a rectangular frame 5 reinforced by the crossed braces 6. The door frame is covered with sheet metal 7 provided with parallel corrugations 8 for strength. The frame 5 as well as the sheet 7 are preferably made from a light sheet metal, such as aluminum or aluminum alloy, to thereby decrease the overall weight of the door. However, if desired, the door can be made from thin sheet steel.

The door is supported in the door frame by means of right and left hand brackets 9 and 10 which are secured to the door jambs 1 and 2 by means of screws 11. Door 4 is pivotally supported on brackets 9 and 10 by means of stub shafts 12 and 13. Shaft 12, as shown, is welded or otherwise fixed to the door frame members as at 14 and 15 and is journalled in bracket 9 as at 16. However, if desired, shaft 12 can be a stationary shaft non-rotatably supported on bracket 9 and journalled in the frame members of the door. Although it is immaterial whether shaft 12 rotates with the door and in bracket 9 or is stationary with respect to bracket 9 and the door rotates on shaft 12, it is important that shaft 13 should be a stationary shaft non-rotatably supported at one end in bracket 10. For this purpose the outer end 17 of shaft 13 is polygonal in section and is removably secured in a polygonal opening 18 in bracket 10 so that shaft 13 is stationary with respect to bracket 10.

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The door has fixed thereto a closed housing 19 comprising a top wall 20, side walls 21 and 22. Side walls 21 and 22 support bearings 23 and 24 in which shaft 13 is journalled so that the door pivots about stationary shaft 13. If two counter-balancing arrangements are used, then shaft 12 will be a stationary shaft and mounted in the same manner as shaft 13.

My counter-balancing arrangement comprises two toggle joints. One toggle joint comprises link 25 and link 26. The other toggle joint comprises link 26 and link 27. Link 26 is common to both toggle joints. Link 25 is fixed at one end to stationary shaft 13 and extends in an up and down direction, preferably parallel to the face of door 4 when closed. Link 26 is pivotally connected at one end as at 28 to link 25. The other end of link 26 is pivotally connected as at 29 to link 27. The other end of link 27 is fixed to shaft 30 which is journalled in bearings 31 and 32 mounted in the side walls 21 and 22, respectively, of the housing. A pair of arms 33 are also fixed at one end as at 34 to shaft 30 and are connected together at their other ends by means of cross rod 35. A counter-balancing spring 36 is connected at one end by means of hook 37 with rod 35 and at the other end by means of a bolt 38 and cone 39 with socket 40 in a channel iron 41 welded or otherwise secured to the end face 42 of housing 19. Link 26 is adjustable for length by means of threaded yoke 43 which has a screw fit in nut 44 welded or otherwise fixed to the end of the other link member 26.

A tripping shaft 50 is journalled in the side walls of the housing and provided with a handle 51. Shaft 50 carries a finger or cam 52 which, when handle 51 is rotated counter-clockwise, Fig. 5, breaks the toggle joint 27, 26 upwardly to facilitate lowering or closing of the door. A cord 53 is connected at one end to tripping handle 51 and extends over pulley 54 mounted on the door. The free end of the cord is provided with a handle 55.

The operation of my door is as follows. When the door is in lowered and closed position the relative position of the various elements of the counter-balancing mechanism are shown in Fig.

3. At this time tension spring 36 is under its maximum tension and toggle joint 25, 26 is in nearly straightened position, that is, link 26 is nearly aligned with link 25 and toggle joint 26, 27 is partially collapsed or jack-knifed. Since toggle 25, 26 is slightly over center, the pull of spring 36 is ineffective to raise the door about shaft 13 and actually a small component of the pulling force of spring 36 is holding the door closed. If desired, the length of link 26 can be adjusted to shorten the same slightly so that in lowered position of the door toggle 25, 26 will not pass over center and will be substantially in straightened position.

To open the door the operator pushes outwardly on the same so that it swings clockwise, Fig. 3, about shafts 12 and 13. As soon as pivot 29 passes to the left, Fig. 3, of a straight line running through the center of shaft 13 and pivot 28, spring 36 tends to lift the door about shafts 12 and 13 because the tension of spring 36 acts through arms 33 to turn shaft 30 clockwise in its bearings 31 and thereby tend to straighten toggle 26, 27. Since toggle 26, 27 is carried on door 4 and cannot move toward the straightened position, shown in Fig. 5, unless the door swings clockwise about shafts 12 and 13, therefore the reaction to the pull of spring 36 on arm 33 resolves itself into lifting the door about shafts 12 and 13. The fully raised position of the door is shown in Fig. 5. Tripping shaft 50 is so positioned that toggle 26, 27 does not quite pass over center, that is, pivot 29 does not pass below a line passing through the centers of shaft 30 and pivot 28. However, toggle 26, 27 approaches near enough straightened position so that it releasably locks the door in raised position. The tension of spring 36 is so adjusted or gauged that in the raised position of the door spring 36 assists in holding the door in raised position.

The door may be lowered by exerting a relatively hard pull on the edge thereof which will cause toggle 27, 26 to break upwardly, Fig. 5. For easy door lowering, however, trip lever 51 is actuated through cord 53 to cause trip finger 52 to raise pivot 29 upwardly and thereby break toggle 26, 27 preparatory to lowering the door. As the door lowers about shafts 12 and 13, arm 33 swings counter-clockwise about shaft 30, Fig. 5, and thereby increases the tension of spring 36 which acts to counter-balance the weight of the door.

It should be noted that the entire counter-balancing mechanism for the door is mounted as a unit on the door and is assembled in the door opening as a unit with the door. To assemble the door in the opening the door is first positioned or fitted in the opening, whereupon brackets 9 and 10 are slipped over the ends of shafts 12 and 13, respectively, and then secured in place by screws 11. Another valuable feature of my door is that the counter-balancing mechanism is entirely enclosed in housing 19 where it is protected from dust and the weather and housing 19 also has a safety valve in that it prevents any one from catching his fingers in the counter-balancing mechanism.

We claim:

1. In a swinging door, a stationary pivot member about which the door swings, support mechanism comprising two toggle joints, said toggle joints comprising two outer links and an intermediate link common to both toggle joints, one of said outer links being fixed to the stationary pivot member and the other outer link being pivoted on the door whereby as the door swings about its axis one toggle joint moves toward its open position and the other moves away from its open position toward a jack-knifed position, the opened toggle joint tending to retain the door into the position to which it is swung to open said toggle joint.

2. The combination as set forth in claim 1 including a counter-balancing spring acting between the door and the outer link which is pivoted on the door, said spring tending to open the toggle joint which includes the link pivoted to the door.

3. In a swinging door, a housing mounted on the door, a shaft journalled in said housing and having an end projecting out of said housing, a support for said end of the shaft adapted to be secured on the door jamb, said shaft having a non-rotative connection with its support, said door swinging about said stationary shaft as an axis, mechanism for supporting the door when in raised position, said mechanism being housed within said housing and comprising two toggle joints having a common intermediate link, the outer link of one toggle joint being fixed to the stationary shaft, the outer link of the other toggle joint being pivotally supported in said housing whereby the one toggle joint opens as the door is raised and tends to support the same whereas the other toggle joint jack-knifes.

4. The combination as set forth in claim 3 including a counter-balancing spring having one end secured to the door and the other end secured to the toggle link which is pivotally supported in the housing whereby when the door is swung upwardly the spring counter-balances the weight of the door.

5. In a swinging door, a housing mounted on the door, a shaft journalled in said housing and having an end projecting out of said housing, a support for said end of the shaft adapted to be secured on the door jamb, said shaft having a non-rotative connection with its support, said door swinging about said stationary shaft as an axis, mechanism for supporting the door when in raised position, said mechanism being housed within said housing and comprising two toggle joints having a common intermediate link, the outer link of one toggle joint being fixed to the stationary shaft in substantial parallelism with the outer face of the door, the outer link of the other toggle joint being pivotally supported in said housing at a point further from the outer face of the door than the stationary shaft whereby the toggle joint with the stationary outer link jack-knifes as the door opens and the other toggle joint opens and tends to support the door in raised position.

6. The combination as set forth in claim 5 including resilient means mounted entirely on the door and co-acting with the toggle link which is pivoted in the housing for counter-balancing the weight of the door as it is opened.

7. In a swinging door, a stationary shaft adapted to be mounted on the door jamb, a journal bearing mounted on the door for said shaft whereby the door swings about the stationary shaft as an axis, mechanism for supporting the door when in raised position, said mechanism comprising two toggle joints having a common intermediate link, the outer end of the outer link of one toggle joint being fixed to said stationary shaft and the outer end of the outer link of the other toggle joint being pivotally supported on said door whereby the one toggle joint opens as the door is raised and tends to support the same

and the other toggle joint simultaneously jack-knifes.

8. The combination as set forth in claim 7 including resilient means wholly supported by the door and acting between the door and the outer toggle link which is pivoted on the door for counter-balancing the weight of the door as it is raised.

9. In a swinging door, a stationary shaft adapted to be mounted on the door jamb, a journal bearing mounted on the door for said shaft whereby the door swings about the stationary shaft as an axis, mechanism for supporting the door when in raised position, said mechanism comprising two toggle joints having a common intermediate link, the outer end of the outer link of one toggle joint being fixed to said stationary shaft and the outer end of the outer link of the other toggle joint being pivotally supported on said door whereby the one toggle joint opens as the door is raised and tends to support the same and the other toggle joint simultaneously jack-knifes, and tripping mechanism actuatable when the door is raised for initiating movement of the open toggle joint preparatory to lowering the door.

10. Mechanism for counter-balancing and swingably supporting a door member in a door opening frame member comprising in combination a housing mounted on one of said members, a shaft journalled in said housing and having an end projecting out of said housing, a support for said end of the shaft adapted to be secured on

the other of said members, said shaft having a non-rotative connection with its support whereby the one member swings relative to the other member about said shaft as an axis, mechanism for supporting the door when in raised position and housed within said housing and comprising two toggle joints having a common intermediate link, the outer link of one toggle joint being fixed to the said shaft, the outer link of the other toggle joint being pivotally supported in said housing whereby the one toggle joint opens as the door is raised and tends to support the same whereas the other toggle joint jack-knifes.

11. The combination as set forth in claim 10 including a counter-balancing spring having one end secured to the door and the other end secured to the toggle link which is pivotally supported in the housing whereby when the door is swung upwardly the spring counter-balances the weight of the door.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,027,654	Howard	May 28, 1912
1,073,003	Troyer	Sept. 9, 1913
1,090,697	Eddelman	Mar. 17, 1914
1,790,406	Cooper	Jan. 27, 1931