June 4, 1940. E. P. GARNER 2,203,086

DISAPPEARING STAIRWAY

Filed July 26, 1939 3 Sheets-Sheet 1

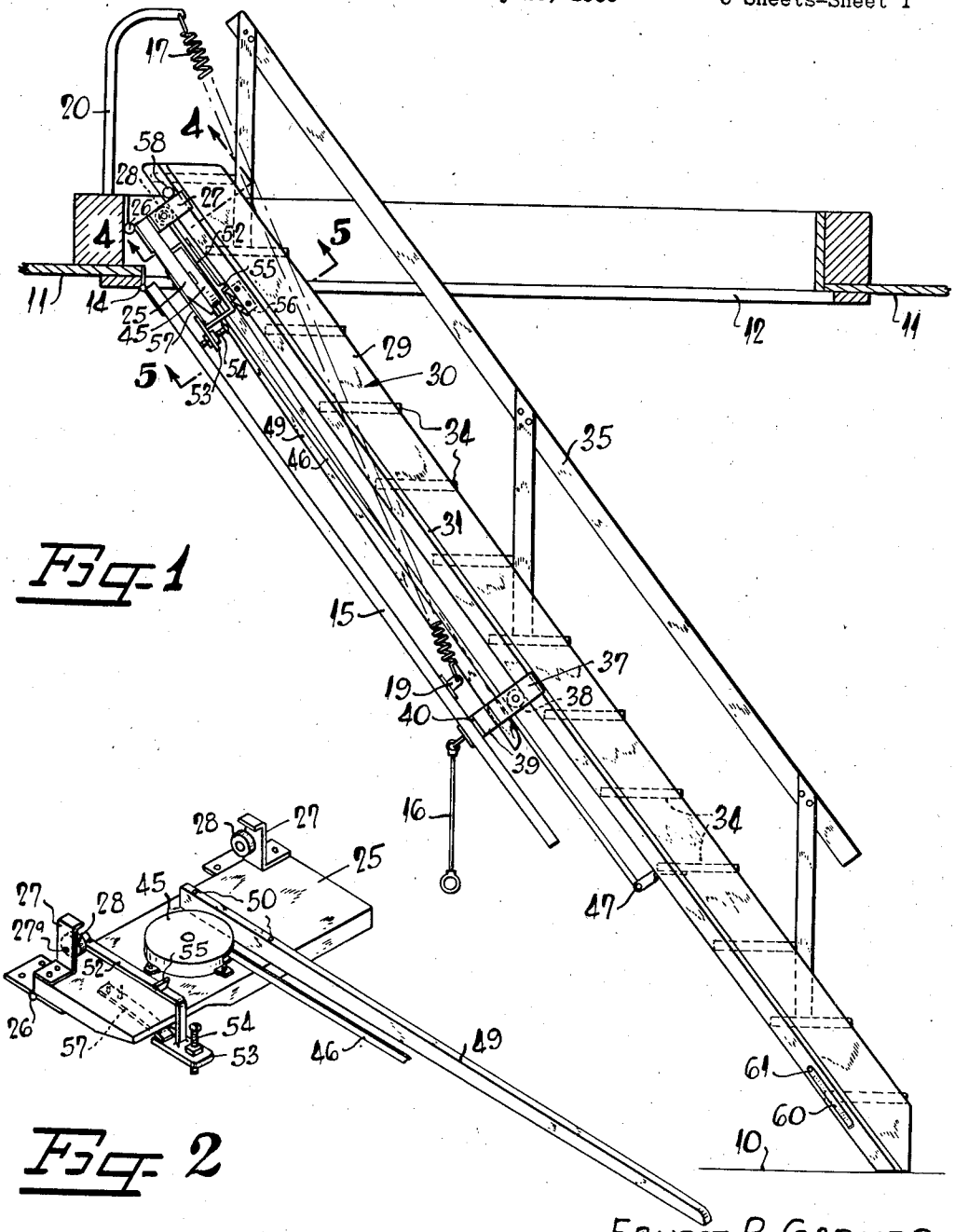


Fig. 1

Fig. 2

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DISAPPEARING STAIRWAY

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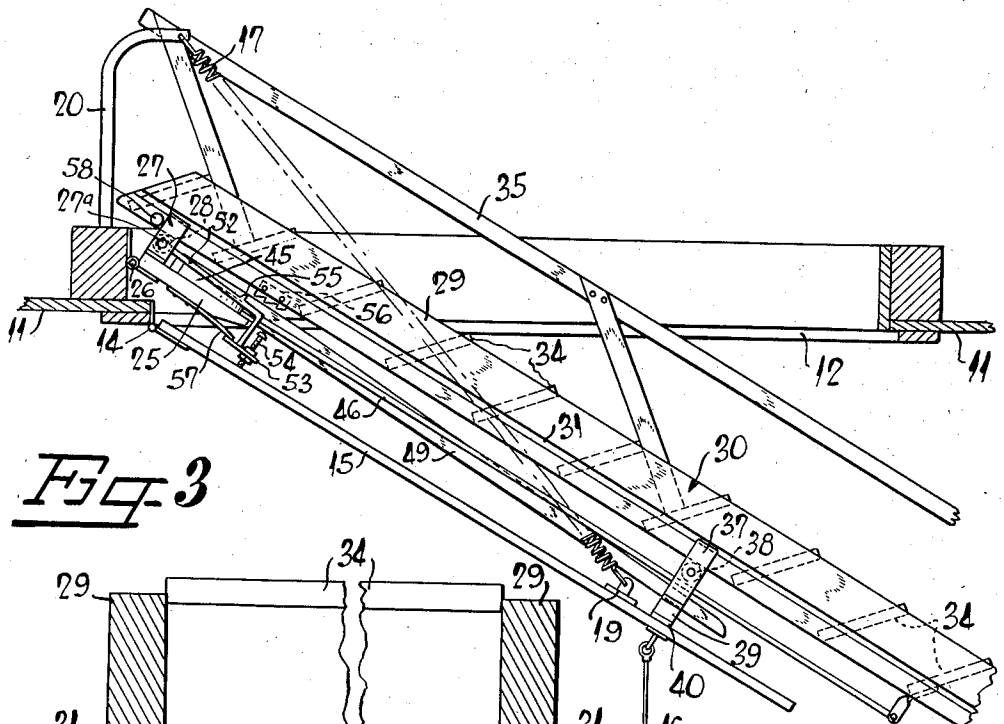


Fig. 3

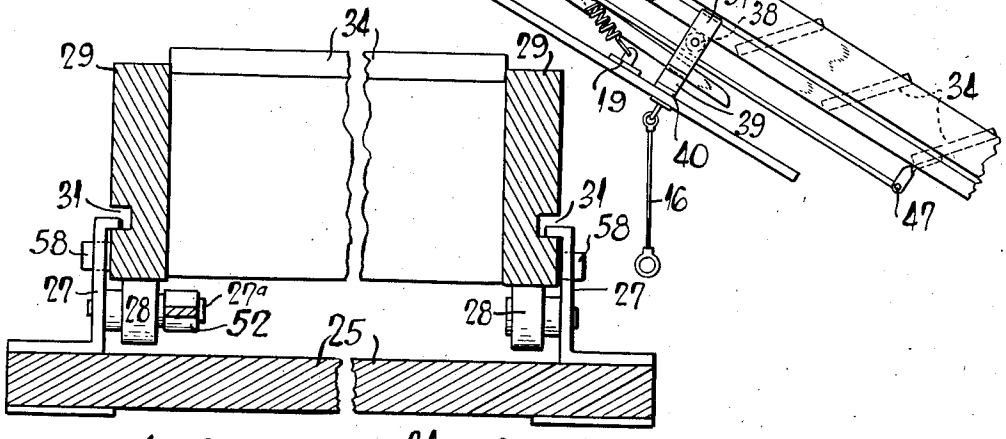


Fig. 4

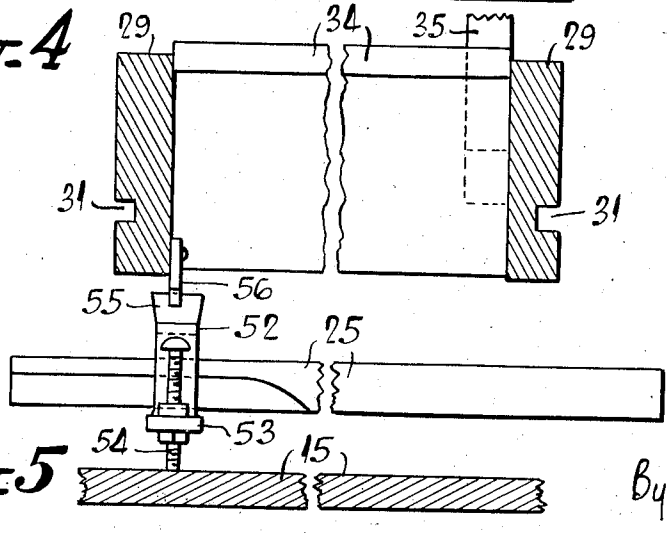


Fig. 5

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DISAPPEARING STAIRWAY

Filed July 26, 1939 3 Sheets-Sheet 3

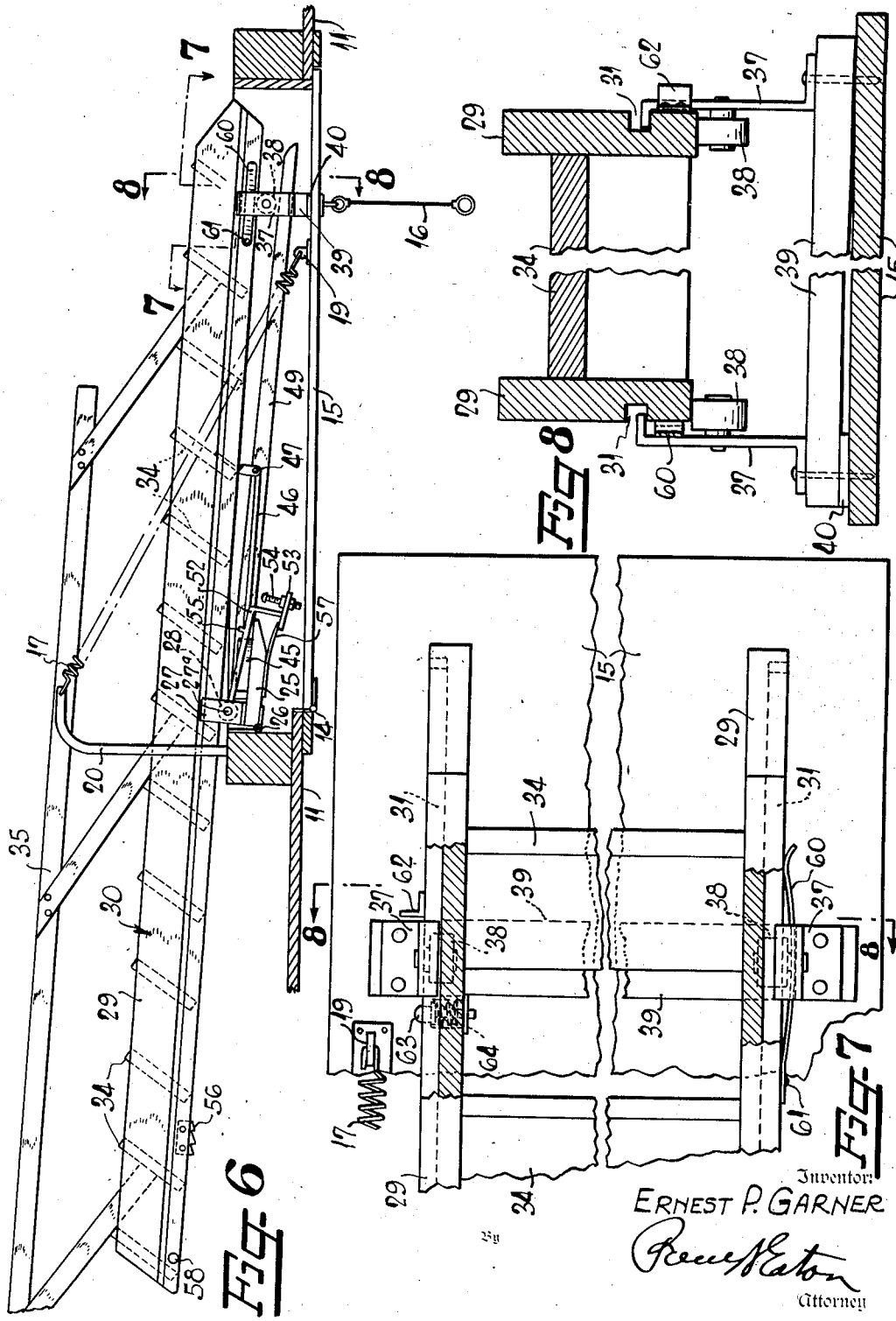


Fig. 6

Fig. 8

Fig. 7

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UNITED STATES PATENT OFFICE

2,203,086

DISAPPEARING STAIRWAY

Ernest P. Garner, Charlotte, N. C.

Application July 26, 1939, Serial No. 286,658

4 Claims. (Cl. 228—50)

This invention relates to a disappearing stairway which provides access to the attic of a building. More specifically it relates to a locking means which will hold the stairway in stationary position when it is lowered.

Heretofore, much difficulty has been encountered due to the lack of ample locking facilities. When these stairways are not properly locked in lowered position, there is a tendency for the lower end thereof to slide away from the user when he begins to apply his weight. This is true, regardless of whether he is ascending or descending the stairway. As a result the user assumes a risk which is greater than that which he assumes when using a well-anchored stairway. Since it is usually desirable to use a stairway of this type, in combination with a pivoted ceiling door with anti-friction means for supporting the stairs in slidable relation thereto and with a coil spring mechanism for normally pulling the stairway upwardly, a locking mechanism is extremely important. Under normal conditions, the strength of the coil mechanism is not sufficient to lift the entire weight of the stair; however, a slight variation in the coil tension and in the weight of the stair, might be sufficient, at times, to cause it to raise upwardly, thereby leaving the lower end floating some distance from the floor level, or causing the lower end to slide along the floor.

It is, therefore, an object of this invention to provide a mechanism which will automatically lock the stairway in stationary position relative to its associated ceiling door upon the lowering of the parts to operative position. Also upon the raising of the parts out of operative position, the locking means will automatically become disengaged to allow the stairway to slide upwardly relative to the ceiling door.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which—

Figure 1 is a sectional view through a ceiling of a building showing my improved stairway associated therewith and disposed in operative position;

Figure 2 is an isometric view of the stairway mount and the means for locking the stairway when in an operative position;

Figure 3 is a view similar to Figure 1, but showing the stairway in a partially lowered position, at which time the locking means is out of operation;

Figure 4 is a sectional view taken along the line 4—4 in Figure 1;

Figure 5 is a sectional view taken along the line 5—5 in Figure 1;

Figure 6 is a sectional view similar to Figures 1 and 3 but showing the stairway moved to a fully retracted position, at which time it is not visible from the floor therebelow;

Figure 7 is a sectional plan view taken along the line 7—7 in Figure 6, showing the means for locking the stairway relative to the pivoted ceiling door when the parts are in fully retracted position;

Figure 8 is a sectional view taken along the lines 8—8 in Figures 6 and 7.

Referring more specifically to the drawings, the numeral 10 denotes the floor line of a building with a ceiling 11 thereabove, said ceiling having an opening 12 therein. Pivoted to one end of the opening 12 as at 14 is a door 15 and this door is adapted to close the opening 12 when its associated stairway is in a retracted position. The door 15 has a cord 16 secured to its free end, which cord is engaged when it is desired to lower the door and the stairway. In order to normally hold the door 15 in the closed position as shown in Figure 6, it is necessary to provide a suitable means such as tension springs 17 on each side of the opening, one end being attached to the doorway 15 as at 19, and the other end being attached to the upper end of a post 20, which post is secured to the framework for supporting the ceiling 11.

A board 25 is pivoted as at 26, a short distance above the pivot point 14. This board has Z-shaped brackets 27 secured to the upper side thereof and these brackets, in turn, have rollers 28 rotatably secured to their proximate faces, which rollers support the side rails 29 of ladder 30. The outer sides of the side rails 29 have grooves 31 cut therein in which the upper inturned proximate ends of Z-shaped members 27 are adapted to fit. It is seen that the rollers 28 provide anti-friction supporting means for the left-hand ends of rails 29, whereas the inturned upper ends of the brackets 27 furnish the guiding means since these ends are disposed in the grooves 31. Rails 29 are spaced apart from each other by suitable treads 34 which are spaced so as to form steps upon which a person ascends or descends the stairway. Also secured to one side of the stairway 30 is a hand rail 35.

The parts 27 and 28 which have been described provide means for supporting the left hand end of the ladder 30. The means for supporting the

right-hand end are similar and comprise a pair of Z-shaped brackets 37 which have inturned proximate end portions fitting into the slots 31 in rails 29. These brackets 37 are equipped with rollers 38 for supporting the lower sides of rails 29. In order to properly mount the brackets 37 upon the ceiling door 15, a cross bar 39 is provided together with a shim 40. These parts are secured to the upper side of the door 15 near the free end thereof. The purpose in providing the shim 40 is to adapt the use of this ladder to warped ceilings. If the ceiling is perfectly level the shim 40 may be dispensed with. It is, therefore, seen that the ladder 30 is mounted upon the top of rollers 28 and 38 using the Z-shaped brackets 27 and 37 as guiding means to prevent any substantial lateral or vertical movement of the ladder relative to the ceiling door 15.

In order to facilitate the use of the stairway 30, it is necessary to provide means for normally pulling it upwardly so that the same will pass through the opening 12 in the ceiling 11 when it is retracted to the position shown in Figure 6. This means for lifting a portion of the weight of the ladder comprises a spring drum 45 having a tape 46 extending therefrom, the outer end of the tape being secured as at 47 to one of the treads 34 of the stairway. The drum 45 is the coil spring type and since the details are conventional, it is not deemed necessary to show the specific structure disposed therein. It is sufficient to add that upon supplementing the upward pressure exerted by the spring in the drum 45 upon the stairway 30 that the stairway may be easily raised. It is usually desirable to have the upward pressure which is exerted by the drum 45 to be slightly less than that which is necessary to raise the ladder or stairway so that a slight lift on the part of the user will be necessary when retracting the same.

Since the upper end of the ladder 30 is supported (Figures 1 and 3) slightly to the right of the pivot point 26 and since the line of tensile force exerted by the tape 46 which emanates from the drum 45, is above this same pivot, there is a tendency to rotate the board 25 in a clockwise manner about the pivot point 26. In order to counteract this clockwise rotation, a bar 49 has been secured to the upper side of the board 25 as at 50. This bar extends substantially parallel to the door 15 as well as to the ladder 30 and its free end normally rests on top of the bar 39 which is secured to the upper side of the door 15. Due to this tendency to rotate the board 25 in a clockwise direction about pivot point 26, the free end of the bar 49 will at all times rest on top of the bar 39 regardless of whether the ladder is in an operative or a retracted position.

Pivoted to one of the brackets 27 as at 27*a* is a bar 52. This bar is L-shaped and has a plate 53 welded to its lower end, said plate having a bolt 54 adjustably secured therein. The upper side of the member 52 has an upwardly extending projection 55 which is adapted to project into the path of a rack 56 on member 29 when the ladder is in operative position as shown in Figure 1. In other words, with the ladder in lowered position the projection 55 will engage the teeth in the rack 56 and thereby prevent the ladder from moving upwardly. The lower end of the bolt 54 serves to cause the locking means to be brought into operation when it contacts the upper side of the door 15 upon the lowering thereof.

By observing Figures 3 and 6, it is seen that the free end of the board 25 is farther away from the top of the ceiling door 15 than it is when the parts are in the position shown in Figure 1. This is due to the fact that the members 25 and 15 are pivoted at two separate points and also due to the fact that both members have been rotated through a substantial angle in the same dirction in Figure 1. Were it not for the fact that the lower end of the ladder 30 prohibits further clockwise movement, the members 25 and 15 would eventually rest one against the other. Therefore, when the ladder is moved from the position as shown in Figure 6 to the position as shown in Figure 1, the member 25 moves closer to the door 15 thereby causing the lower end of the bolt 54 to engage the top side of ceiling door 15. Upon further movement, the bolt 54 will be raised which, in turn, will raise the member 52 and its associated projection 55 upwardly into the path of rack 56. A leaf spring 57 has been secured to the lower side of the board 25 so that its free end will engage the top side of plate member 53 and normally tend to move the plate and its associated bar 52 downwardly. The effect which this spring has upon the pivoted member 52 is clearly shown in Figures 3 and 6. In order to limit the downward movement of the ladder 30, suitable pins or projections 58 have been provided which pins extend from the remote sides of the rails 29 and into the path of brackets 27.

When the ladder is in a retracted position as shown in Figure 6, it is desirable to have a suitable means for locking the same in stationary position relative to the ceiling door 15. This locking means comprises a leaf spring 60 secured as at 61 to one of the rails 29, and an angle stop 62 secured to the rail on the opposite side of the ladder. The stop 62 is adapted to engage a Z-shaped bracket 37 which is secured to the upper side of the door 15 to thereby limit the movement of the ladder towards the left hand side of the door. A spring pressed button 63 is slidably confined in the rail 29 upon which the angle stop 62 is mounted and this button is so spaced from the stop 62 that upon the engagement of the stop with the angle 39, the button 63 will be disposed upon the opposite side of the angle. This button has a spring 64 encircling its intermediate portion which normally tends to press one end of the button past the outer face of the rail 29. When this is done, the angle 39 is confined between members 62 and the projecting end of button 63. The purpose of providing the leaf spring 60 is to normally cause the rail 29 upon which the members 62 and 63 are mounted to be pressed firmly against the confined angle member 39. If it is desired to release this locking means it is only necessary to pull the ladder towards the observer in Figure 7 or to the left in Figure 8. This movement will compress the spring 60 and allow the projecting end of button 63 to pass beneath its associated angle bracket 39.

It is therefore seen that I have provided a simple locking device for operation in conjunction with a disappearing stairway which device will insure that the ladder will be automatically locked immediately upon the lowering of the same to an operative position and which will also become automatically unlocked upon raising the ladder to a partially or completely retracted position.

In some instances, it may be desirable to pro-

vide a suitable stop to limit the clockwise rotation of the ceiling door 15 about the pivot point 14. In such cases, a suitable rope, not shown, may be inserted within the coil spring 17 with the ends of the rope secured to the members 19 and 20. Of course the length of this rope will be such as to cause the same to be taut when the parts are in the position shown in Figure 1.

In the drawings and specification there has been set forth a preferred embodiment of the invention and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being set forth in the appended claims.

I claim:

1. In a disappearing stairway having a ceiling opening, closed by a door pivoted at one end of the opening, a stairway slidably mounted in spaced relation to the upper surface of said door, a rack carried by the stairway, a member pivoted at one end to the end walls of the opening at a point above the pivot point between the door and the end wall of said opening, a dog carried by said pivoted member and means operable upon downward swinging movement of the free end of the door, together with the stairway carried thereby for causing said dog to engage said rack to thereby lock the stairway against upward movement relative to the door.

2. In a disappearing stairway adapted to be attached to a horizontally disposed attic door, the attic door closing a suitable opening, means pivotally connecting one end of the door to one of the end walls of said opening, a stairway slidably mounted in spaced relation to the upper surface of said door, tension means normally moving the stairway upwardly with relation to said door when the door is swung downwardly on its pivot, means for locking the stairway against upward movement when the door is swung downwardly on its pivot and the lower end of the stairway is resting on a floor beneath the opening, said locking means comprising a rack carried by the stairway, a member pivoted at one end to the end walls of the opening at a point above the pivot point of said door, a projection on said member adapted to engage said rack when the door and stairway are in lowered position and means on the free end of said pivoted member for engaging the upper surface of the door as the door and ladder are swung downwardly for causing said dog to engage said rack to lock the stairway against upward movement with relation to said door.

3. In a disappearing stairway having a ceiling opening, closed by a door pivoted at one end of the opening, a stairway slidably mounted in spaced relation to the upper surface of said door, a rack carried by the stairway, a member pivoted at one end to the end walls of the opening at a point above the pivot point between the door and the end wall of said opening, a dog carried by said pivoted member and means operable upon downward swinging movement of the free end of the door together with the stairway carried thereby for causing said dog to engage said rack to thereby lock the stairway against upward movement relative to the door, and means for locking the stairway against downward movement relative to the door when the stairway is slid upwardly with relation to said door.

4. In a disappearing stairway adapted to be attached to a horizontally disposed attic door, the attic door closing a suitable opening, means pivotally connecting one end of the door to one of the end walls of said opening, a stairway slidably mounted in spaced relation to the upper surface of said door, tension means normally moving the stairway upwardly with relation to said door when the door is swung downwardly on its pivot, means for locking the stairway against upward movement when the door is swung downwardly on its pivot and the lower end of the stairway is resting on a floor beneath the opening, said locking means comprising a rack carried by the stairway, a member pivoted at one end to the end walls of the opening at a point above the pivot point of said door, a projection on said member adapted to engage said rack when the door and stairway are in lowered position, and means on the free end of said pivoted member for engaging the upper surface of the door as the door and the ladder are swung downwardly for causing said dog to engage said rack to lock the stairway against upward movement with relation to said door, and means for locking the stairway against downward movement relative to the door when the stairway is slid upwardly with relation to said door.

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