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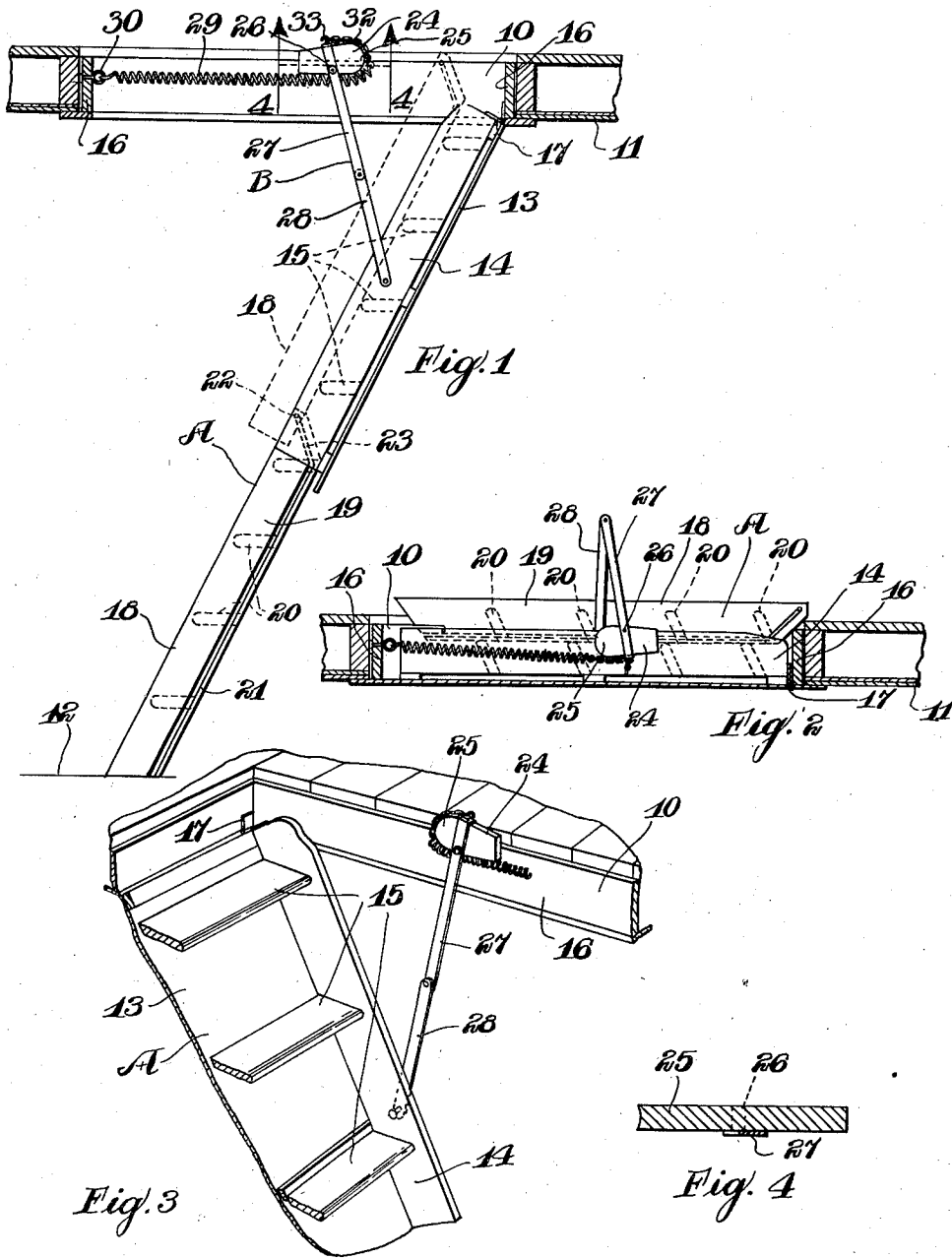
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2,095,392

STAIR OPERATING DEVICE

Filed April 5, 1935

2 Sheets-Sheet 1



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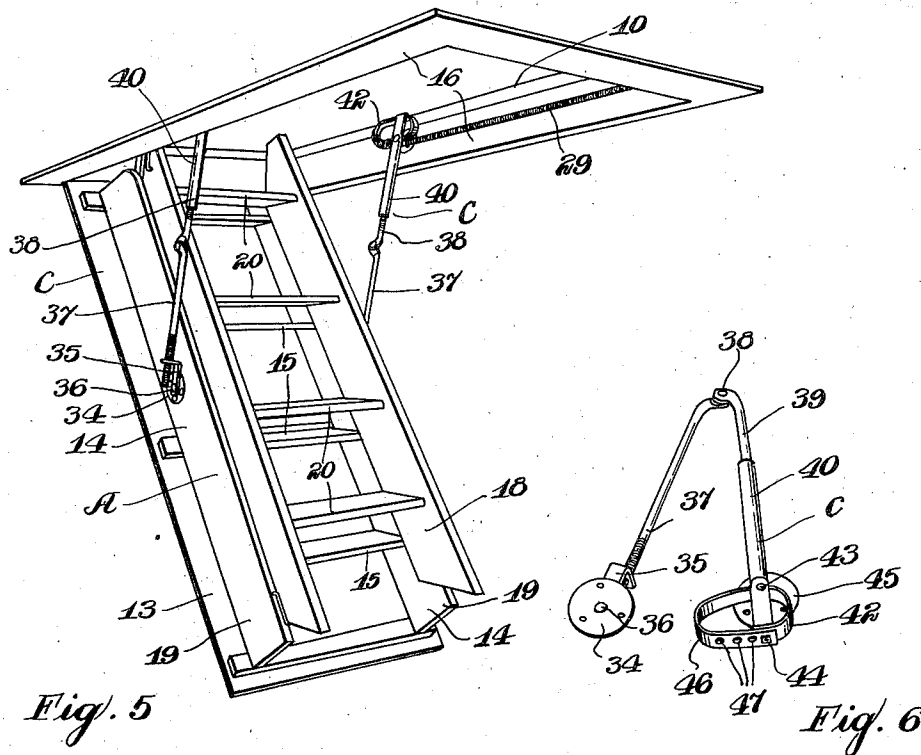
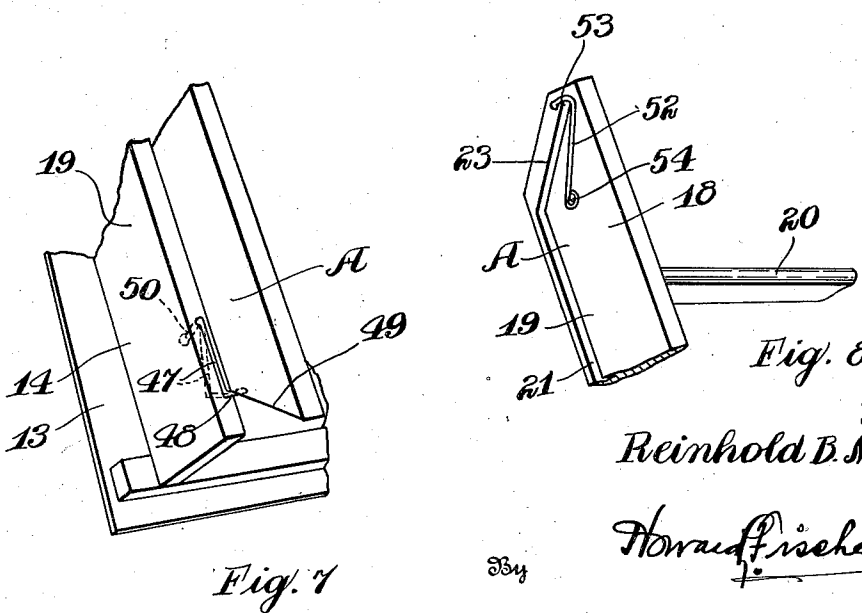
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2 Sheets-Sheet 2



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2,095,392

STAIR OPERATING DEVICE

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8 Claims. (Cl. 228—48)

My invention relates to an improvement in stair operating devices particularly adaptable for folding or collapsing stairs of the type which may be moved into and out of operating position. The device is operable to assist the moving of the stairs into and out of operating position.

It is a feature of my device that the stairs to which my device is applied is actuated by spring or resilient means in such a manner that a minimum of effort is necessary to move the stairs from open to closed position and vice versa. My stair operating means acts to hold the stairs in either extreme position, in such a manner that with a slight push or pull they may be moved into the other extreme position.

It is an object of my invention to provide a stair actuating means which acts upon the stairs with the least leverage when the stairs are in either extreme position, and which acts to increase the leverage tending to actuate the stairs in intermediate positions of the stairs. By this means the stairs will remain in either extreme position, but will not readily remain at any position between the two extreme positions.

It is a feature of my stair operating device that as the spring or resilient means shortens in length, or the tensile strain on this resilient member becomes less, the leverage of the spring upon the stair actuating means increases to compensate for this loss in tensile strain. Furthermore, as the force tending to lower the stairs increases, the leverage of the spring increases, thus compensating for this increased load.

It is a further object of my invention to provide a means of supporting said stairs in folded or telescoped position at all times when it is desired to have the parts in this relationship. This means is simply and effectively applied to the stairs on one portion thereof, and engages the other portion of the stairs to hold the two portions against relative movement.

In the construction of my telescoping stairs, I provide a pair of longitudinally extending cam slots in one section of the stairs which engage projections on the other stair section. These cam slots act to move the stair sections from longitudinal alignment to position one upon the other. The end of each cam slot is reinforced by means of a metal hook member extending about the end of the slot to prevent the cam projections from engaging and wearing directly against the ends of the slots.

These and other objects and novel features of my invention will be more clearly and fully set forth in the following specification and claims.

In the drawings forming a part of my specification:

Figure 1 is a longitudinal section through a stair opening, disclosing a side view of my telescoping stairs and the actuating means therefor.

Figure 2 is a sectional view similar to that shown in Figure 1, illustrating the stairs in folded position in the stair opening.

Figure 3 is a perspective view of a section of the stairs, illustrating one of the operating means therefor.

Figure 4 is a cross-sectional view on the line 4—4 of Figure 1.

Figure 5 illustrates in perspective, telescoping stairs having applied thereto an operating mechanism of slightly different form from that illustrated in Figures 1, 2 and 3.

Figure 6 is a perspective view of one of my stair operating mechanisms in detail.

Figure 7 illustrates my means for holding the sections of my telescoping stairs in telescoped relation.

Figure 8 illustrates my means for reinforcing the ends of the cam slots in one of the telescoping stair sections.

My stairs A are of the type adapted to swing into an opening 10 in the ceiling 11 of a room, and to swing and telescope down into contact with the floor 12 for operation. The stairs A comprise a closure panel 13 to which is secured a longitudinally extending spaced pair of side members 14 between which are secured stairs 15. The panel 13 and stair section comprised of the members 14 and 15 are hinged to the frame 16 about the opening 10 by the hinges 17.

A lower stair section 18 is made up of a pair of side members 19 connected in spaced relation by stairs 20. The lower section is narrower than the upper stair section, the side members 19 extending just within the side members 14. The lower stair section is connected to the upper stair section by means of a pair of cam projections 22 which extend inwardly from the inner opposed sides of the side members 14 to engage in cam slots 21 in the outer opposed sides of the side members 19 of the lower stair section 18. The cam slots are shaped with an offset angular portion 23 at the upper extremity of each slot to bring the lower stair section down into alignment with the upper stair section when the sections are in elongated position, as shown in Figure 1. The angular portion 23 guides the lower stair section up and over the front edges of the various stairs 15 of the upper stair section.

In order to assist in the operation of the stairs

in pivoting the sections into the opening 10, I provide the stair operating device B. This device comprises a block 24 which is rounded at one end, and which is pivoted at a point 26 adjacent one side thereof, and at a point spaced considerably from the rounded end 25, to the frame 16 of the opening 10. To this block is secured an arm 27, which also pivots at 26 and which rotates with the block 24. A second arm 28 is pivotally secured to the end of the arm 27, and the other end of the arm 28 is pivoted to the upper stair section side member 14. Preferably one of the stair operating devices B is secured to each side member 14, and to opposite sides of the frame 16 of the opening 10. A spring 29 or other resilient member is secured to the block 24 on the side thereof opposite that adjacent which the block is pivoted; and the spring 29 is anchored to the frame 16 by a suitable anchoring bolt 30 in the manner illustrated in Figures 1 and 2.

When the stairs A are pivoted down into operating position in the manner illustrated in Figure 1 of the drawings, the arms 27 and 28 are pivoted into alignment, and form a direct pull between the upper stair section side member 14 and the pivot 26, thus limiting the swinging of the upper stair section on the hinges 17. The spring 29 tends to rotate the blocks 24 in a manner to raise the stairs A. This force is more than counterbalanced by the weight of the stairs, particularly since the lower section is extended to increase the downward force tending to resist folding of the stairs.

When it is desired to fold the stairs into the opening 10, the lower section 18 is telescoped over the upper section in the manner described previously, and a slight upward force is exerted on the stairs. This movement causes the block 24 to rotate on its pivot 26. Pivoting of the block 24, however, spaces the spring 29 a greater distance from the pivot 26, thus increasing the leverage of the spring force on the block. This increased leverage acts to overbalance the weight force acting downwardly, or to virtually balance the stairs. As the stairs A move into the position illustrated in Figure 2, this leverage decreases somewhat; but the force exerted by the spring 29 is still sufficient to hold the stairs A in the folded position of Figure 2.

It may be seen that the increased leverage provided when the stairs A are in the position illustrated in Figure 2 by the spacing of the spring 29 from the pivot 26 compensates for the shortening of the spring 29 and for the additional downward force when the stairs approach folded position as in Figure 2. The tension of the spring 29 may be adjusted by means of the chain 32 which is secured to the end of the spring 29 contacting the block 24, and which may be adjustably secured to the hook 33. The block 24 is grooved along its rounded end, as illustrated in Figure 4 of the drawings to accommodate the spring 29 and chain 32 and to hold these elements in position.

The stair operating device C illustrated in Figures 5 and 6 is similar to that illustrated in Figures 1 through 4 in operation, but is somewhat different in construction. In this type of construction the unit C comprises a plate 34 secured to the side member 14 of the upper stair section, and an L-shaped bracket 35 pivotally secured at 36 thereto. A threaded aperture in the bracket 35 accommodates the threaded arm 37, which is flattened at its free end to accommodate a pivot 38. The pivot 38 connects the arm 37 to a second arm 39, which is threadably secured in a

tubular socket 40. The end of the socket 40 is flattened, and is secured to the cam loop 42 by means of bolts 43 and 44. The bolt 43 acts as a pivot to connect the loop 42 and the arm 39 pivotally to an anchoring plate 45 which is to be secured to the frame 16 of the opening 10. The loop 42 is substantially the same shape as the outer surface of the block 24 in the operating means B, and is provided with a rounded end 46 about which the spring 29 engages. Openings 47 in the loop 42 provide a means of adjustment for the end of the spring 29, or for the chain 32 on the end thereof.

It is obvious that with this type of stair operating means, adjustment of the length of the arms may be made by screwing the arms 37 and 39 more or less into the bracket 35 or the socket 40, to provide the desired operation, and to cause the stair A to assume the proper angle to reach the floor when in lowered position. With the type of operating member shown in Figures 1 through 4, the stairs A had to be of the proper length for each ceiling height, and in practice were made slightly long and were cut off to fit when installed.

In Figure 7, I illustrate the hook means for holding the sections of the stairs in telescoped relation. This hook consists in an L-shaped hook 47, one portion 48 of which engages beneath the lower end 49 of the lower stair section 18 as shown in Figure 7. An anchoring end 50 projects at right angles to the plane of the hook 47 to extend into the wood forming the side member 14 of the upper stair section. The extreme end of the anchoring end 50 is widened slightly by flattening, so that when the end 50 has been driven into the wood, and pivoted down into operating position, the widened end prevents the end 50 from readily loosening from the wood. When the hook 47 is moved into the dotted position of Figure 7, the lower stair section is released and may slide down into operating position.

In Figure 8 I have illustrated a reinforcing means for the upper end of the cam slots 21, one of which is shown in the figure. This reinforcement comprises a hook-shaped member 52 extending about the end of the slot or groove 21. One end of the member 52 is anchored by driving an anchoring end 53 into the wood forming the side member 19 on one side of the slot 21, and by inserting a screw through the eye 54 on the other end of the hook 52. If desired, the anchoring end 53 of the member 52 is enlarged or widened at the extreme end so that it will not readily pull out. Extending the hook 52 across the end of the slot 21 provides a bearing for the cam projections 22 at the end of the angular portions 23 of the slots 21, and prevents these projections from wearing against the wood at the end of these slots.

My stair operating means acts to move the stairs with a minimum of effort either into raised or lowered position. The stairs A are held in either position by the operating means B or C but will move from one position to another with a slight assistance.

In accordance with the patent statutes, I have described the principles of operation of my stair operating means, and while I have endeavored to set forth the best embodiment thereof, I desire to have it understood that this is only illustrative of a means of carrying out my invention, and that obvious changes may be made within the scope of the following claims without departing from the spirit of my invention.

I claim:

1. In combination with a pivoted stairway, a rotatable cam, a resilient means connected to one side of said cam and windable about said cam for actuating said cam, said cam having a shape suitable for changing the effective leverage of said resilient means, and means connecting said stairway with said cam to actuate said stairway by the force of said resilient means.
2. In combination with a pivoted stair, a rotatable cam, a resilient means engageable around said cam for actuating said cam, said cam having a shape to increase the effective leverage of said resilient means in the rotation thereof and means connecting said cam with said stair to actuate the same in unison.
3. In combination with a stairway pivoted in a frame, a cam pivotally mounted upon said frame, a resilient means for actuating said cam engageable around said cam, said cam acting to increase the leverage of said resilient means upon said cam in the rotation thereof, and pivoted link arms connecting said cam with said stairway to resiliently actuate the same.
4. In combination with a stairway pivoted in a frame, a cam pivotally mounted on the frame, means connecting said cam with said stairway, a resilient means connected to said cam for actuating the same and windable about said cam in the pivoting thereof, said cam decreasing the effective leverage of said resilient means when said stair is in lowered position to permit said stairway to remain in lowered position, and increasing the effective leverage of said resilient means when said stairway is in raised position to hold said stairway in this raised position.

5. A stair operating mechanism comprising a pair of pivoted levers, a cam mounted to turn with one of said levers, and a resilient means windable about said cam for urging said cam in one direction of rotation, said cam having a shape to increase the effective leverage of said resilient means upon rotation thereof.

6. A stair operating mechanism comprising a pair of adjustable levers, means pivotally connecting said levers, a cam mounted to the end of one of said levers to rotate therewith, and a resilient means windable about said cam urging said cam in one direction of rotation, said cam being of proper shape to increase the effective leverage of said resilient means upon rotation thereof.

7. A stair operating mechanism in combination with a pivotally supported stairway comprising a cam mounted for rotation, means connecting said cam with said stairway so that rotation of said cam raises and lowers said stairway, and resilient means windable about said cam for actuating said cam, said cam increasing the leverage of said spring upon said cam to a highest point intermediate the extreme positions of movement of said stairway, to urge said stairway into one extreme position.

8. A stair operating mechanism in combination with a stairway pivotally mounted in a frame, comprising a resilient means, a means pivotally mounted on said frame for changing the effective leverage of said resilient means and changing the tension thereon simultaneously, and linkage pivotally connecting said pivotally mounted means to said stairway.

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