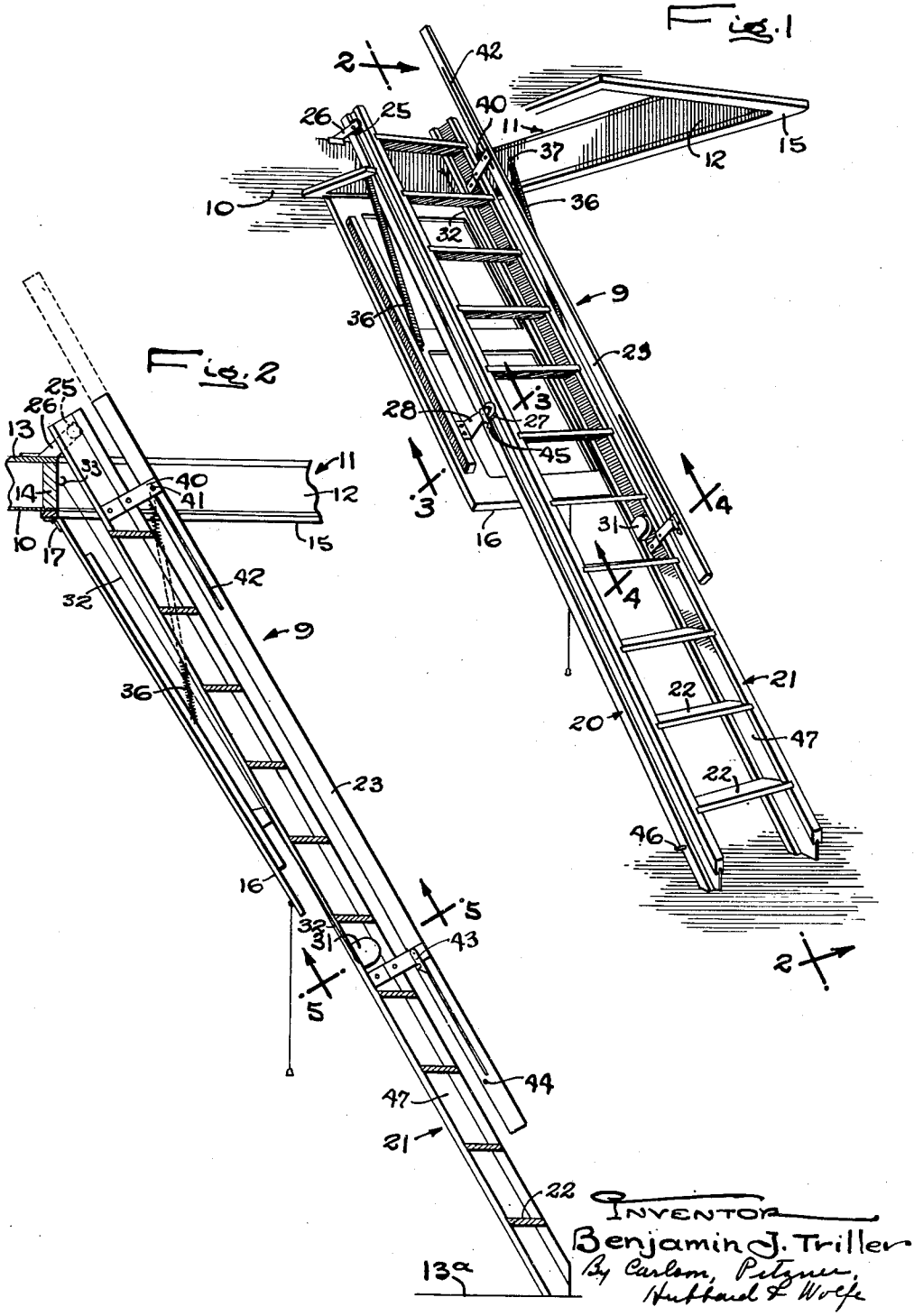
Jan. 1, 1952 B. J. TRILLER 2,580,978

CEILING-SUSPENDED STAIR

Filed Nov. 19, 1948 2 SHEETS—SHEET 1

Fig. 1



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Fig. 3

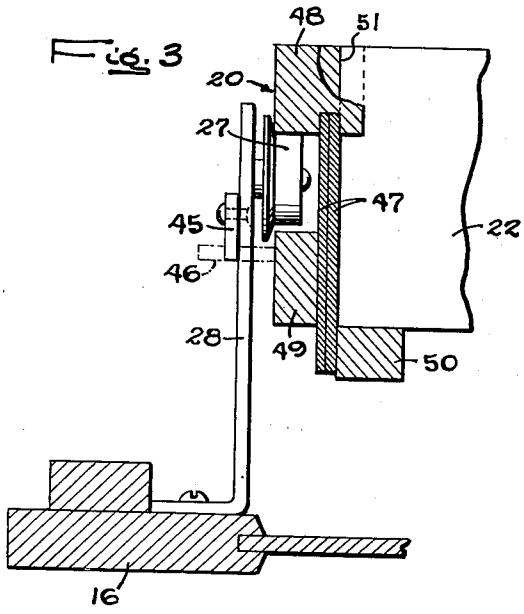


Fig. 4

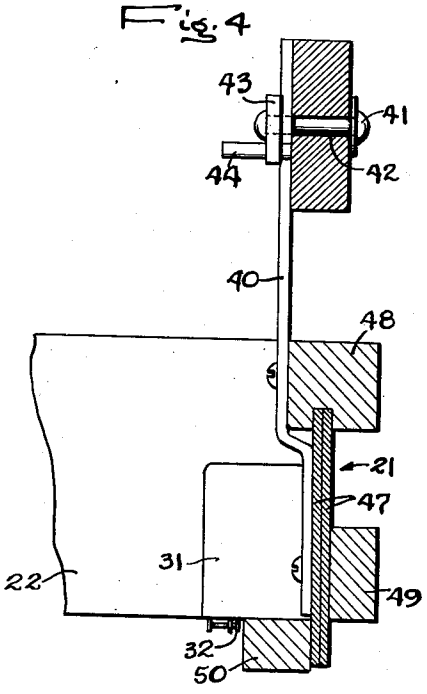
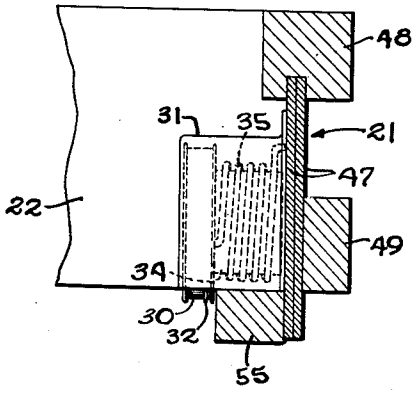


Fig. 5



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CEILING-SUSPENDED STAIR

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3 Claims. (Cl. 228—50)

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The invention relates to stairs generally, and more particularly to ceiling-suspended retractable or "disappearing" stairs.

One object of the invention is to provide an improved stair of the above general character which is strong and rigid yet light in weight and easy to operate between open and closed positions, and which requires a minimum of overhead and lateral clearance in its movement to the closed or "up" position.

Another object is to provide improved counterbalance mechanism for ceiling-suspended stairs which is simple and inexpensive to manufacture, easy to install, and efficient and reliable in operation.

A further object is to provide an improved handrail construction for ceiling-suspended stairs which affords greater safety in the use of the stairs and which minimizes the overhead clearance requirements.

It is also an object of the invention to provide a stair utilizing built-up stringers or side rails which can be constructed of inexpensive and readily available stock and which is substantially as strong and durable as the more expensive one-piece construction heretofore employed.

Other objects and advantages of the invention will become apparent from the following detailed description of the preferred embodiment illustrated in the accompanying drawings, in which:

Figure 1 is a perspective view of a ceiling-suspended stair embodying the features of the invention, the stair being shown in the operative or "down" position.

Fig. 2 is a longitudinal sectional view of the stair taken in a plane substantially on the line 2—2 of Fig. 1.

Fig. 3 is a transverse sectional view through one of the side rails of the stair taken in a plane substantially on the line 3—3 of Fig. 1.

Fig. 4 is a sectional view taken in a plane substantially on the line 4—4 of Fig. 1, showing details of the handrail support.

Fig. 5 is a sectional view taken in a plane substantially on the line 5—5 of Fig. 2.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

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For purposes of illustration, the improved stair, indicated generally at 9, has been shown in a form particularly suitable for use in ordinary homes or residential buildings to provide access to an overhead space such as an attic. In buildings of this character the ceiling 10 ordinarily constitutes the lower surface of a horizontal partition 11 which includes the usual joints 12 and flooring 13 for the attic. To accommodate the stair, a rectangular opening is provided in the partition 11, such opening preferably being located below the highest portion of the attic. As herein shown, the stair opening is formed by cutting out a section from one of the joists 12 and providing headers 14 for supporting the ends of the remaining joist sections. The opening may be framed with conventional trim 15 and a closure panel 16 of any preferred construction is secured to the header 14 at one end of the opening by hinges 17 to swing between open and closed positions.

Referring now to Figs. 1 and 2 of the drawings, the improved stair comprises generally a pair of elongated stringers or side rails 20 and 21 disposed in spaced parallel relation and supporting a plurality of stair treads 22. A handrail 23 is carried on one of the side rails for the convenience and safety of persons using the stair.

When positioned for use, the stair is supported on its upper end by a pair of rollers 25 spaced apart for cooperation with guideways or tracks on the side rails 20 and 21, to be described presently. As herein shown, the rollers are journaled on brackets 26 anchored to the floor portion 13 of the partition 11 adjacent the end of the stair opening at which the panel 16 is hinged. In the present instance, the brackets project outwardly over the opening and are spaced upwardly from the floor 13 so that the stair may be shifted endwise upwardly through the opening and then swing about the axis of the rollers to a horizontal retracted position. At its lower end the stair is adapted to rest on the floor 13a and the side rails are cut off to provide bearing surfaces parallel to the floor when the stair is in the lower limit position shown in Figs. 1 and 2.

The rollers 25 support and guide the stair 9 in its upward movement to retracted position. Additional guidance is provided by a pair of rollers 27 journaled on brackets 28 carried by the hinged closure panel 16. These rollers are located adjacent the free end of the panel and are spaced apart laterally to cooperate with the guideways or tracks on the side rails 20 and 21

so that the panel is constrained to swing as a unit with the stair structure.

In accordance with the usual practice, provision is made for counterbalancing the weight of the stair structure so that it can be moved between operative and retracted positions with a minimum of effort. The counterbalancing mechanism provided by the instant invention is characterized by its simple construction and by the facility with which it may be installed, both of which contribute to the low over-all cost of the stair. To this end the counterbalancing means comprises two independently operating spring means, one acting directly on the stair to exert a continuous upwardly-directed endwise pull thereon and the other acting on the closure panel 16 tending to urge it toward the closed position.

The spring means acting directly on the stair preferably comprises a spring-actuated cable drum 30 (Fig. 5) journaled within a housing 31 rigidly secured to the inner face of one of the side rails of the stair, in this instance the rail 21. A flexible cable 32 of wire or other suitable material is anchored at one end to the drum 30 and at the other end to the partition 11 between the closure panel 16 and the roller-supporting bracket 26. As shown in Figs. 1 and 2, the cable may be anchored to the header 14 by means of a simple screw hook 33.

In the particular stair structure illustrated, the drum 30 is provided with a rigid, axially alined hub 34 around which is wound a torsion spring 35. One end of the spring is secured to the housing 31 and the other to the drum 30, the arrangement being such that the unwinding of the cable 32 from the drum acts to tension the spring. The spring thus operates through the cable to exert a continuous upward pull on the stair.

The spring means acting on the panel 16 in its preferred form comprises a pair of elongated retractile springs 36 connected respectively between the partition 11 and opposite sides of the panel 16 substantially centrally thereof. Preferably the upper ends of the springs 36 are anchored to the partition within the stair opening and somewhat forwardly of the rear edge thereof so that the springs extend generally vertically when the stair is in the operative or "down" position. These connections may be made by means of simple hooks 37 screwed into the joists 12 at the sides of the stair opening and similar hooks screwed into the closure panel.

It will be evident that the counterbalancing mechanism above described can be installed and adjusted for operation very quickly and with a minimum of labor. The housing 31 for the cable drum 30 and its associated spring 35 may be attached to the side rail at the factory and the installer is only required to insert the screw hook 33 and hook the end of the cable 32 thereover. Likewise, attachment of the panel counterbalance springs 36 involves only the insertion of the screw hooks 37. The tension of the spring 35 may be readily adjusted by varying the number of turns of the cable 32 around the drum 30 before attaching the cable to the screw hook. In practice, this spring is usually tensioned so that the stair will remain in its operative or "down" position, but may be shifted upwardly by a relatively light push until the overhang at the upper end substantially balances the structure for pivotal movement about the common axis of the rollers 25. The springs 37 then act to swing the panel 16 to the closed position, the stair swinging with it as a unit to fully retracted position.

To afford maximum safety in the use of the stair and at the same time maintain overhead clearance requirements at a minimum, the handrail 23 is mounted in a novel manner which permits it to be extended substantially beyond the upper end of the stair when the latter is in operative position and to be withdrawn flush with the top of the stair when the latter is to be swung into its retracted position. In the exemplary stair structure the handrail 23 comprises an elongated narrow wood strip and is carried by a pair of upstanding brackets 40 attached by screws or the like to the side rail 21, as shown in Figs. 1, 2 and 4. Each bracket is provided at its upper end with a laterally-projecting headed pin or rivet 41 and the handrail 23 is formed with elongated longitudinally-extending slots 42 for the reception of the pins. These slots are located and dimensioned to permit movement of the handrail between the retracted position in which it is shown in full lines in Fig. 2 and the extended position shown in broken lines in that figure. A hook member 43 pivotally supported on one of the brackets 40 is adapted to coact with a pin 44 on the handrail to releasably latch the rail in extended position.

The handrail 23 when extended provides a convenient and safe hold for a person near or at the top of the stair and thus affords maximum safety in ascending or descending the same. When retracted the upper end of the handrail is substantially flush with the upper end of the stair so that no additional overhead clearance is required for its accommodation as the stair is shifted endwise and rocked to retracted position. Thus, the safety factor of the stair is materially increased without restricting its adaptability for use in spaces presenting relatively small overhead or lateral clearance.

Provision is made for releasably latching the stair structure in retracted position to prevent accidental lowering of the same. Such latching is effected in the present instance by a hook-like latch member 45 (Figs. 1–3) pivotally supported on one of the roller brackets 28 for cooperation with a latch pin 46 projecting from the side rail 20.

While the side rails 20 and 21 may be made of any suitable material, the present invention contemplates a built-up or composite type of rail which can be constructed of relatively inexpensive and readily available stock and which, while light in weight, is very strong and rigid. As herein shown, each side rail comprises an elongated webbing strip 47 made up of a plurality of thin strips (two in this instance) of "Presdwood" or the like.

The strip 45 is reinforced at its upper edge by an elongated wood strip 48 of generally rectangular cross section and of substantially the same length as the webbing strip 47. These elements are preferably assembled with the upper edge portion of the webbing strip seated in a longitudinally extending groove in the lower face of the reinforcing strip 48 and are secured together as by gluing. Additional reinforcement for the webbing strip 47 is provided by an elongated wood strip 49 secured to the outer facing of the webbing strip 47 in spaced parallel relation to the edge strip 48. The inner faces of the strips 48 and 49 thus define the guideway or track for the rollers 25 and 27, as shown in Fig. 3.

Secured to the inner face of the webbing strip

47 adjacent its lower edge is an elongated stop strip 50 which serves as a rest for the rear edges of the stair treads 22 when they are assembled with the side rail. To support their forward edges, the treads are fitted into transverse grooves 51 formed in the inner face of the top edge strip 48, as shown in Fig. 3. These grooves are disposed at an angle to the longitudinal axis of the side rail so as to locate the stair treads in vertically stepped horizontal planes when the stair is in the operative position.

It will be apparent from the foregoing that the invention provides a ceiling-suspended retractable or "disappearing" stair of novel and advantageous construction. The weight of the stair structure is reduced to a minimum by the use of built-up or composite side rails of novel construction without sacrifice of either strength or rigidity. The light weight of the stair structure facilitates its movement between operative and retracted positions and such movement is further facilitated by the novel counterbalance means employed. This counterbalance means affords additional advantages by reason of its simple and inexpensive construction and by the ease with which it may be installed. Additionally, the improved support which allows the handrail to be extended beyond the upper end of the stair and to be retracted substantially flush therewith renders the stair safer to use without increasing overhead clearance requirements.

I claim as my invention:

1. A ceiling-suspended stair comprising, in combination, a pair of spaced parallel side rails, stair treads supported between said side rails, an elongated handrail, means including a plurality of brackets mounted on one of said side rails supporting said handrail for endwise movement between an operative position in which its upper end projects beyond the corresponding end of said one side rail and a retracted position in which its upper end is substantially flush with that end of the side rail, and latch means for releasably retaining said handrail in operative position.

2. A stair for providing access to an opening in an overhead partition, said stair comprising a pair of elongated side rails supporting a plurality of stair treads, means supporting and guiding said stair for endwise sliding movement through the opening and for pivotal movement to a retracted position above the opening, and an elongated handrail extending parallel to and adjustably supported on one of said side rails, said handrail normally extending beyond the upper end of the stair and being shiftable endwise to locate its upper end substantially flush with the upper end of the stair whereby to minimize the overhead clearance requirements of the rail in the movement of the stair to retracted position.

3. A ceiling-suspended stair comprising, in combination, a pair of spaced parallel side rails, stair treads supported between said side rails, an elongated handrail, means supporting said handrail above and in parallel relation to one of said side rails, said supporting means including upright metal brackets mounted on and projecting upwardly from said one side rail, each of said brackets having a laterally projecting pin adjacent its upper end, said handrail being formed with longitudinally disposed slots for the reception of said pins, said slots being located so as to permit endwise movement of the handrail between an operative position in which its upper end projects beyond the upper end of said one side rail and a retracted position in which its upper end is substantially flush with the upper end of the side rail, and latch means for releasably retaining said handrail in operative position.

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