July 19, 1960 G. L. TAPP 2,945,548

FOLDING STAIRWAY CONSTRUCTION

Filed April 8, 1958

FIG. 1

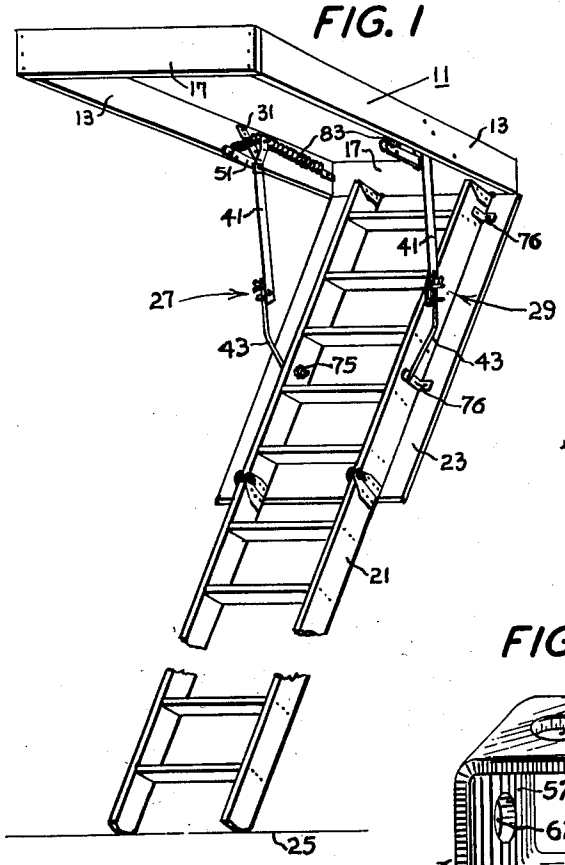


FIG. 2

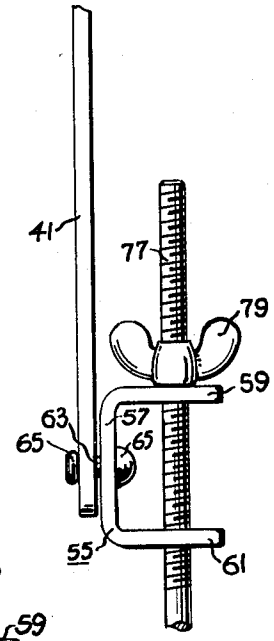


FIG. 3

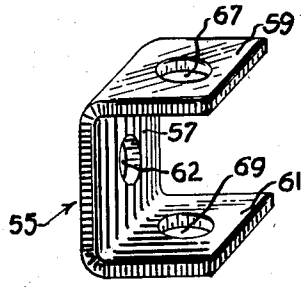


FIG. 4

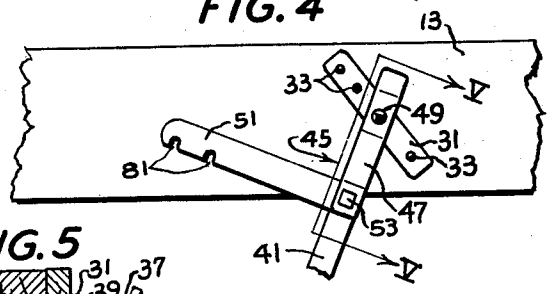
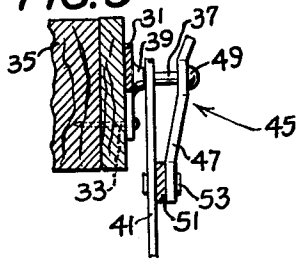


FIG. 5



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FOLDING STAIRWAY CONSTRUCTION

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4 Claims. (Cl. 182—77)

This invention relates to certain improvements in folding stairways of the type in which a frame is mounted in an opening in the ceiling of a room and a foldable ladder hingedly mounted adjacent one end to said frame, which ladder is adapted to be selectively disposed in a housed or folded position in said frame and disposed in an extended or unfolded position in which the distal end of the ladder rests on the floor of the room.

In most of the stairways of the above-mentioned type an articulated brace is provided between said frame and said ladder to support the load when the ladder is in said extended position. In order for this brace to support the load, the brace must be disposed in a straight disposition.

With a brace of a given length and a ladder of a given length, there is only one height of ceiling which would cause the brace to be straight when the stairway is in the extended position. It has generally been the practice in order to accommodate the folding stairways to different rooms having various heights of ceilings for the ladder to be cut to the correct length which would cause the brace to be straight when the folding stairway is in the extended position.

Therefore, one of the objects of the present invention is to provide a simple and convenient means for varying the length of the brace so as to accommodate the folding stairway to various heights of rooms without having to cut off the end of the ladder.

A further object is to provide such a brace which comprises an upper arm, a bracket pivotally attached to said upper arm, a lower arm extending through bores in said bracket, a nut threadedly engaged on a threaded portion of said lower arm and engaging said bracket whereby said lower arm is pivotally coupled to said upper arm and the length of said brace is adjustable.

A further object is to provide improved means for attaching the brace to said frame.

A further object is to provide an improved brace mechanism including a bifurcated portion which provides a double-bearing surface at its pivotal connection to give greater rigidity and which co-operates with the counterbalancing spring of the folding ladder to provide efficiency and ease of operation.

A further object is generally to improve the design and construction of folding stairways.

The means by which the foregoing and other objects of the present invention are accomplished and the manner of their accomplishment will be readily understood from the following specification upon reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of the folding stairway construction of the present invention.

Fig. 2 is an enlarged fragmentary view of the improved construction of the brace of the folding stairway.

Fig. 3 is a perspective view of the C-shaped bracket of the brace.

Fig. 4 is a fragmentary elevational view of the upper portion of the brace mechanism shown attached to the frame, with the counterbalancing spring being removed for the sake of clarity.

Fig. 5 is a fragmentary view taken as on the line V—V of Fig. 4.

Referring now to the drawings in which the various parts are indicated by numerals, the present invention is adapted to be used with a folding stairway of the general type shown in Fig. 1. This type of folding stairway comprises a substantially rectangular frame **11** which is mounted in an opening in the ceiling of a room. Frame **11** includes side members **13** joined at their opposite ends by end members **17**. The upper end of an articulated ladder **21** is hingedly attached to one of end members **17**. Ladder **21** is adapted to be disposed in a folded position and swung upwardly into frame **11** in the conventional manner. A door **23** is attached to the under side of ladder **21** along the upper portion thereof so that when the ladder **21** is in the folded position above mentioned door **23** closes the opening in the ceiling. When in use, ladder **21** is adapted to be disposed in an extended position shown in Fig. 1, wherein it will be seen the distal end of the ladder rests on the floor **25**.

The present invention resides primarily in the braces **27, 29** and the parts associated therewith. Each of braces **27, 29** is of similar construction and, therefore, the following description of the structure and operation will apply to both braces. The only difference between braces **27, 29** is in the fact that one is of right-hand construction and the other is of left-hand construction—that is to say, one of the braces has such an arrangement of parts that it is adapted to be mounted on one side of the ladder and frame and the other has such an arrangement of parts that it is adapted to be mounted on the other side of the ladder and the frame. Each of braces **27, 29** and its releated parts is described as follows:

An attachment member **31** preferably formed of a piece of metal or the like and provided with holes therethrough is fastened to side member **13** adjacent the inner face thereof. The means of fastening attachment member **31** is preferably by so-called screw nails **33**, which are driven into frame **11** through the holes in member **31**. The nails are preferably also driven into a ceiling joist **35** of the house structure to transfer the load thereto. A feature of the present invention resides in the fact that attachment member **31** is disposed at an angle relative to the horizontal so that an even load distribution is established. A stud **37** is fixedly attached to attachment member **31** as by welding or the like and projects therefrom. The portion of attachment member **31** adjacent the place of attachment of stud **37** is preferably protuberant as at **39** so as to provide clearance for the moving parts supported by stud **37** as will be hereinafter more apparent.

Each brace **27, 29** is preferably formed of metal or the like and includes in general an upper arm **41** and a lower arm **43**. Referring, first, more specifically to upper arm **41**, the upper arm includes a bifurcated end portion **45** adjacent the upper end thereof. One branch of bifurcated end portion **45** is preferably formed by an irregular piece **47** which is fixedly attached to the main body of upper arm **41** and spaced below the upper end thereof. The other branch of the bifurcated end portion is formed by that portion of the main body of the upper arm **41** extending above the point of attachment with piece **47**. When viewed as in Fig. 5, piece **47** first extends upwardly, thence is angled outwardly, thence extends upwardly, and, finally, is angled outwardly to form the somewhat zigzag pattern shown in this figure. Aligned apertures are provided through bifurcated end portion **45**—that is, one aperture is provided in piece **47** and the other aperture is provided in the main body of upper arm **41**. Stud **37** extends through the aligned apertures in bifurcated end portion **45**

to pivotally support upper arm 41 from frame 11. Stud 37 is provided with a head 49 outwardly of the bifurcated end portion 45 to hold upper arm 41 on the stud.

A bar 51 is fixedly attached adjacent one end thereof to upper arm 41 and extends forwardly therefrom. The means of connecting bar 51 and piece 47 to upper arm 41 preferably comprises a square rivet 53. The end of bar 51 is preferably disposed between piece 47 and upper arm 41 with the rivet extending through aligned square openings in these three pieces to prevent relative rotation of any of the pieces. Additionally, rivet 53 is flattened on either end to hold the pieces together. The particular construction of the bifurcated portion 45 above described forms an important part of the present invention. It will be understood that such a construction provides a double-bearing surface where the bifurcated end portion contacts stud 37. This bifurcated construction provides an ease of operation and rigidity heretofore not attained in stair constructions of this general type.

A C-shaped bracket 55 is pivotally attached to upper arm 41 adjacent the lower end thereof. C-shaped bracket 55 includes a web 57 and a pair of spaced flanges 59, 61 which are respectively integrally formed at the opposite ends of web 57 and outwardly extend therefrom. The means for pivotally connecting bracket 55 with upper arm 41 is preferably by providing an aperture in the lower end of the upper arm and an aperture 62 in web 57 and extending a hinge pin 63 through the apertures. Hinge pin 63 is provided with enlarged portions 65 at the opposite ends thereof to hold the parts together. Additionally, aligned bores 67, 69 are respectively provided in flanges 59, 61.

Lower arm 43 is pivotally attached adjacent the lower end thereof to ladder 21 intermediate the ends thereof. The means of attaching lower arm 43 to ladder 21 is preferably by providing a bent end portion 71 at the lower end of the lower arm, which bent end portion is threaded as at 73. Bent end portion 71 extends through a bore provided in the side of the ladder and is held therein by a nut 75 threadedly engage on threaded portion 73. For additional strength, a bracket 76 may be provided adjacent the juncture of bent end portion 71 and the ladder, in which case the bracket is attached to door 23 and provided with a bore through which end portion 71 extends. Other brackets 76 are preferably provided for fastening door 23 to ladder 21.

The upper end of lower arm 43 is preferably threaded as at 77 and extends upwardly through bores 69 and 67 with a wing nut 79 being threadedly engaged on threaded portion 77 above bracket 55 whereby to couple lower arm 43 to upper arm 41 through the bracket and limit separating movement of the lower arm relative to the bracket. It will be understood from the foregoing that the position of wing nut 79 along threaded portion 77 will determine the length of each of braces 27, 29 and the length of the braces may be varied by turning wing nut 79 to change the position thereof.

Notches 81 are provided in bar 51 adjacent the outer end thereof. One end of an elastic means, as a spring 83 or the like, is engaged in one of notches 81 and it attached adjacent the other end thereof to from 11. When ladder 21 is in the extended disposition shown in Fig. 1, spring 83 is disposed over stud 37 between the branches of bifurcated end portion 45, whereby rendering the portion of the spring rearwardly of the stud substantially inactive insofar as exerting force on bar 51 is concerned.

In operating the stairway from the extended disposition into the folded disposition, it will be understood that the ladder 21 is folded upwardly in a conventional manner and braces 27, 29 are pulled forwardly to allow door 23 to close. It will be understood that during the movement of the stairway towards closure, springs 83 will act as counter-springs to aid in the closure thereof. This is because as upper arms 41 are swung upwardly bars 51 move upwardly and springs 83 exert a force on the end of the bars. In operating the stairway from the folded disposition into the extended disposition, door 23 is pulled downwardly and ladder 21 is unfolded in the usual manner.

It will be understood that when the stairway is in the extended disposition with the distal end of the ladder on the floor and with braces 27, 29 being respectively in a straight disposition—that is to say, with upper arm 41 and lower arm 43 being in a substantially straight line when viewed from the side of the ladder—the load is borne by the braces. In other words, the weight of the ladder 21 or any other weight placed upon the ladder is borne by the braces when the stairway is in the above-mentioned disposition. It will be understood that the stairway of the present invention is easily adjusted after installation by simply adjusting the position of wing nuts 79 on threaded portions 77 until the braces 27, 29 are straight when the ladder 21 is in an extended disposition shown in Fig. 2. Thus, if, after installation, the distal end of ladder 21 does not reach the floor, it is only necessary to lengthen the braces by running wing nuts 79 upwardly on the threaded portions 77. Or, if the upper arm 41 and lower arm 46 are disposed at an angle relative to one another when the distal end of the ladder is touching the floor, then it is necessary only to shorten the braces by running wing nuts 79 downwardly on threaded portions 77.

Although the invention has been described and illustrated with respect to a preferred embodiment thereof, it is to be understood that it is not to be so limited since changes and modifications may be made therein which are within the full intended scope of this invention as hereinafter claimed.

I claim:

1. In a folding stairway of the type including a frame mounted in an opening in the ceiling of a room and a foldable ladder hingedly mounted adjacent one end to said frame which ladder is adapted to be disposed in a folded position in said frame and an extended position in which the distal end of the ladder rests on the floor of the room, the improvement in said folding stairway comprising an attachment member having holes therein, fastening means extending through the holes in said attachment member and into said frame whereby attaching the member to said frame, said attachment member being disposed at an angle relative to said frame for providing an even load distribution, a stud fixedly attached to said attachment member and projecting therefrom, an upper arm including a bifurcated end portion at the upper end thereof, said bifurcated end portion having aligned apertures in the forks thereof, said stud extending through said aligned apertures to pivotally support said upper arm from said frame, a bar fixedly attached to said upper arm and extending forwardly therefrom, elastic means attached at one end to said bar and attached at the other end to said frame for urging said upper arm upwardly in pivoting movement about said stud, when said stairway is in said extended position said elastic means being disposed over said stud between the forks of said bifurcated end portion whereby rendering inactive a part of the force of said elastic means, a C-shaped bracket pivotally attached to said upper arm adjacent the lower end thereof, said bracket including bores, a lower arm pivotally attached adjacent the lower end thereof to said ladder at a point intermediate the ends thereof, said lower arm being threaded adjacent the upper end thereof and extending through the bores in said bracket, a nut threadedly engaged on the threaded portion of said lower arm, said nut engaging said bracket to limit separating movement of said lower arm relative to said bracket and to couple said lower arm to said upper arm through said bracket whereby providing an adjustable brace adapted to accommodate the folding stairway to various rooms having various heights of ceilings.

2. In a folding stairway of the type including a frame mounted in an opening in the ceiling of a room and a foldable ladder hingedly mounted adjacent one end to said frame which ladder is adapted to be disposed in a

folded position in said frame and an extended position in which the distal end of the ladder rests on the floor of the room, the improvement in said folding stairway comprising an attachment member having holes therein, fastening means extending through the holes in said attachment member and into said frame whereby attaching the member to said frame, said attachment member being disposed at an angle relative to said frame for providing an even-load distribution, a stud fixedly attached to said attachment member and projecting therefrom, an upper arm including a bifurcated end portion at the upper end thereof, said bifurcated end portion having aligned apertures in the forks thereof, said stud extending through said aligned apertures to pivotally support said upper arm from said frame, a bar fixedly attached to said upper arm and extending forwardly therefrom, elastic means attached at one end to said bar and attached at the other end to said frame for urging said upper arm upwardly in pivoting movement about said stud, when said stairway is in said extended position said elastic means being disposed over said stud between the forks of said bifurcated end portion whereby rendering inactive a part of the force of said elastic means, a lower arm pivotally attached adjacent the lower end thereof to said ladder at a point intermediate the ends thereof, and means pivotally and adjustably coupling said upper arm and said lower arm together to provide an adjustable brace for accommodating the folding stairway to various rooms having various heights of ceilings.

3. In a folding stairway of the type including a frame mounted in an opening in the ceiling of a room and a foldable ladder hingedly mounted adjacent one end to said frame which ladder is adapted to be disposed in a folded position in said frame and an extended position in which the distal end of the ladder rests on the floor of the room, the improvement in said folding stairway comprising a stud fixedly mounted from said frame and projecting therefrom, an upper arm including a bifurcated end portion at the upper end thereof, said bifurcated end portion having aligned apertures in the forks thereof, said stud extending through said aligned apertures to pivotally support said upper arm from said frame, a bar fixedly attached to said upper arm and extending forwardly therefrom, elastic means attached at one end to said bar and attached at the other end to said frame for urging said upper arm upwardly in pivoting movement about said stud, when said stairway is in said extended position said elastic means being disposed over said stud between the forks of said bifurcated end portion whereby rendering inactive a part of the force of said elastic means, a lower arm pivotally attached adjacent the lower end thereof to said ladder at a point intermediate the ends thereof, and means pivotally and adjustably coupling said upper arm and said lower arm together to provide an adjustable brace for accommodating the folding stairway to various rooms having various heights of ceilings.

4. In a folding stairway of the type including a frame mounted in an opening in the ceiling of a room and a foldable ladder hingedly mounted adjacent one end to said frame which ladder is adapted to be disposed in a folded position in said frame and an extended position in which the distal end of the ladder rests on the floor of the room, at least one adjustable brace for carrying part of the load when said ladder is in an extended position, said adjustable brace comprising an upper arm pivotally mounted adjacent the upper end thereof from said frame, said upper arm being provided with an aperture adjacent the lower end thereof, a C-shaped bracket including a web and a pair of spaced flanges respectively integrally formed at the opposite ends of said web and projecting therefrom, said web being provided with an aperture therethrough, said flanges being respectively provided with bores therethrough with the bore in one of the flanges being disposed in alignment with the bore in the other of the flanges, a hinge pin extending through the aperture of said web and the aperture of said upper arm whereby hingedly joining said upper arm and said bracket, a lower arm pivotally attached adjacent the lower end thereof to said ladder at a point intermediate the ends thereof, said lower arm being threaded adjacent the upper end thereof and extending through the bores in said flanges, a nut threadedly engaged on the threaded portion of said lower arm, said nut engaging said bracket to limit separating movement of said lower arm relative to said bracket and to pivotally couple said lower arm to said upper arm through said bracket whereby providing said brace with adjustability of length for accommodating the folding stairway to various rooms having various heights of ceilings.

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