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WO 83/01638 A **US 4281743 A** **US 3901353 A**

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(54) Loft ladder mounting frames

(57) A process for manufacturing a folding attic stairway comprising preparing a rectangular outer mounting frame 2 for mounting in a ceiling open and an associated inner stairway carrying frame 12 which is pivotally mounted by a hinge 13 on the outer frame 2. Side beams 14, on the inner frame 12 are spaced a preset distance inwardly of associated side members 6, 7 on the outer frame 2. A folding support arm 19 is mounted between each side beam 14, and the associated side member 6, 7 on the outer frame 2. A collapsible ladder 30 is then mounted on the inner frame 12 and is foldable between a collapsed stored position for nesting within the outer frame and an extended in-use position.

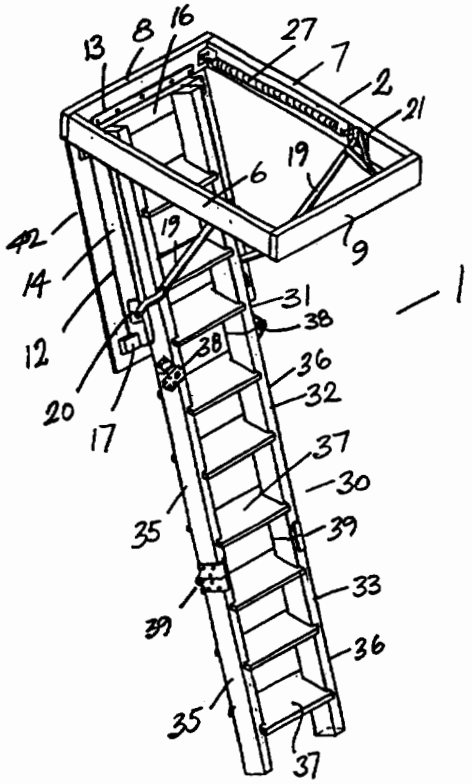

Fig.1

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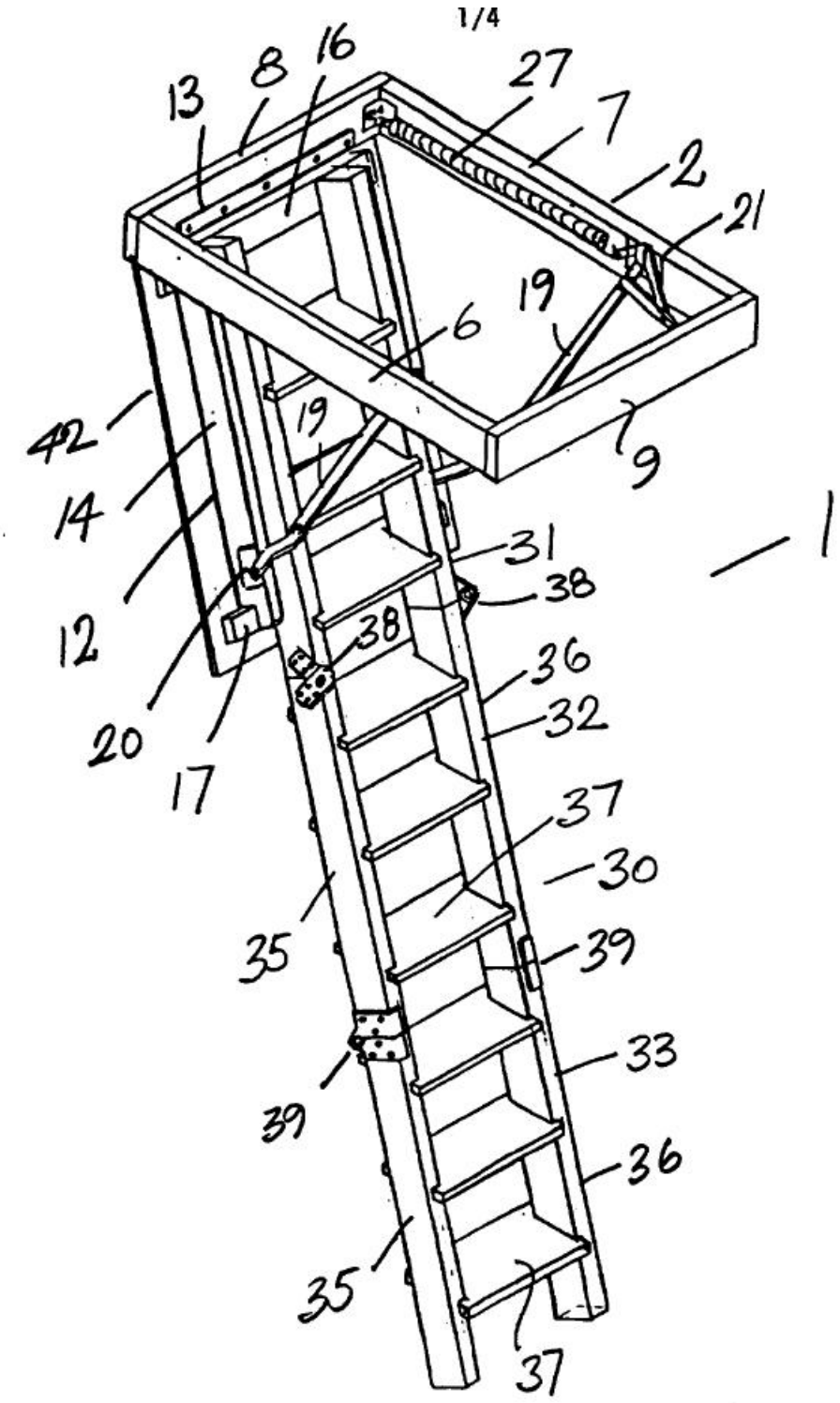
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Fig.1

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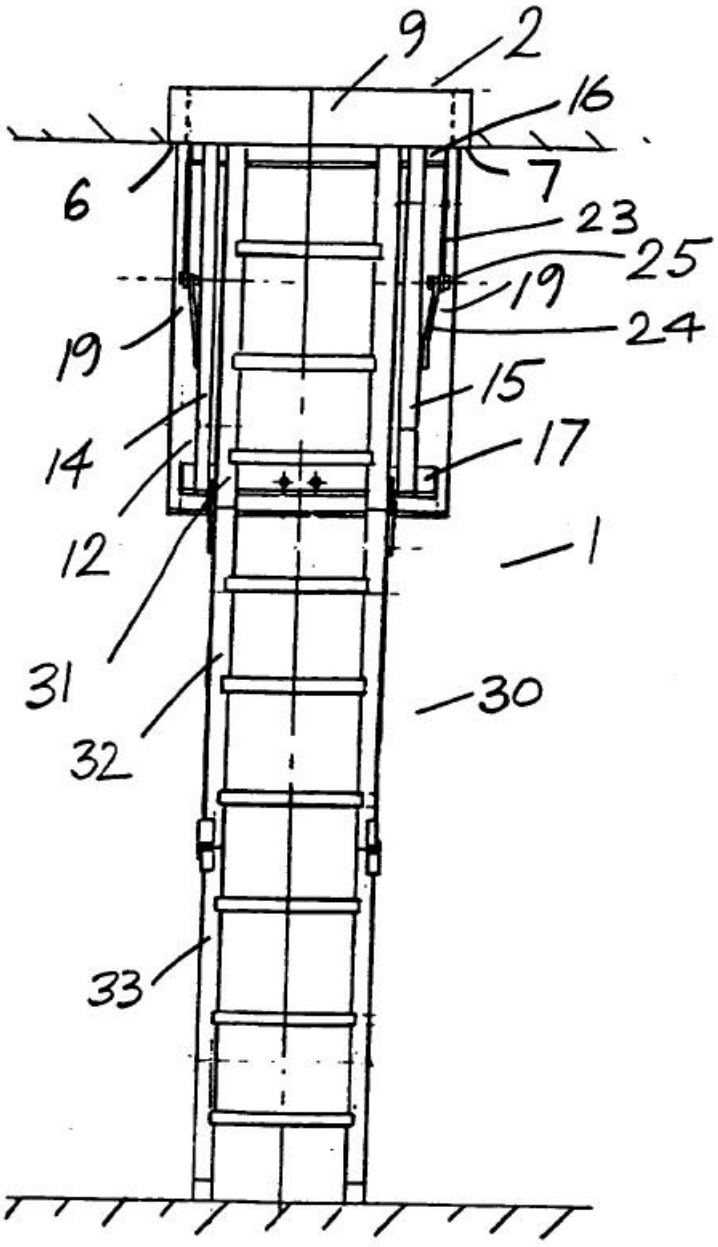

Fig.2

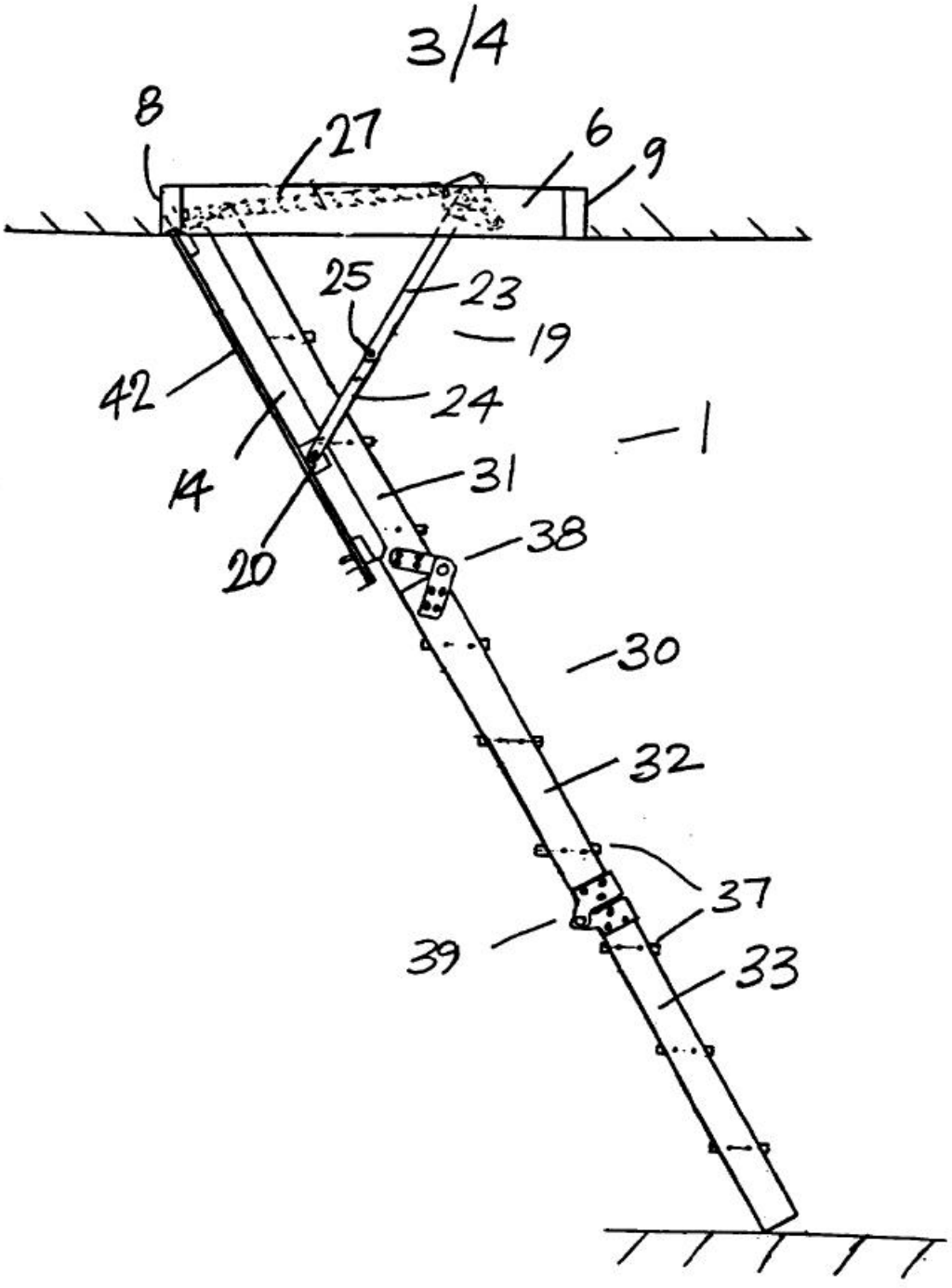

Fig.3

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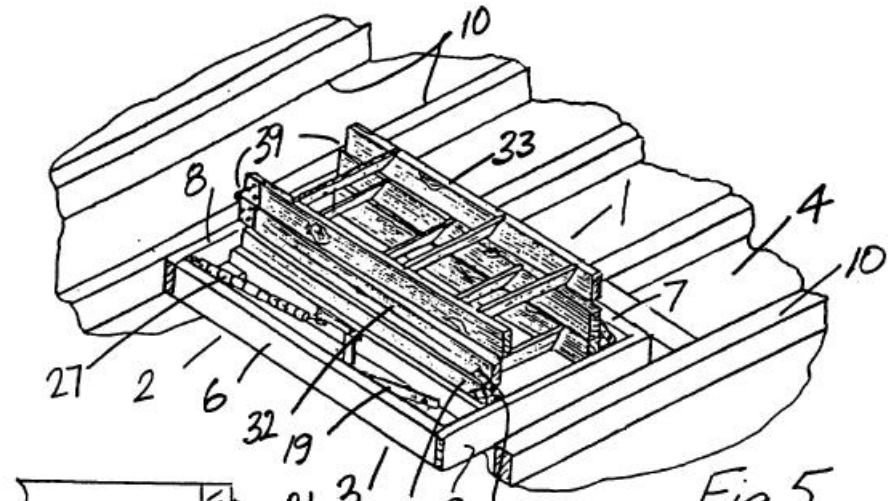

Fig.5

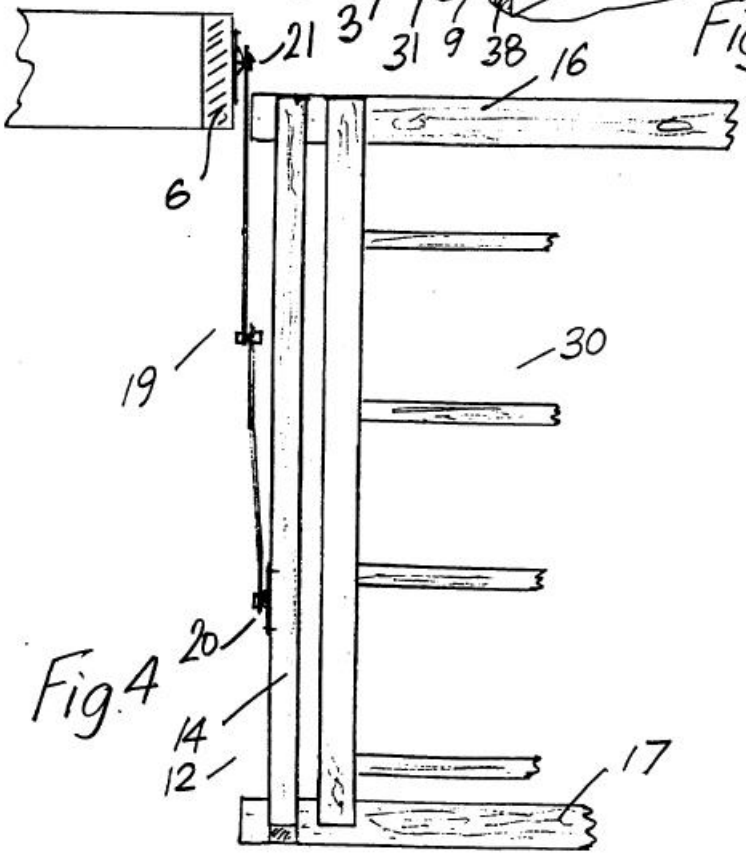

Fig.4

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"A Manufacturing Process"

Introduction

This invention relates to a manufacturing process for manufacturing a folding stairway.

It is known to provide a folding attic stairway of the type comprising a number of hingedly connected stairway sections for mounting in an opening in a ceiling. The stairway sections can be folded together and retained in a stored position in the opening when not in use and then as required folded down from the opening for access to the attic space. Generally folding support arms are pivotally mounted on each side of the stairway extending between an uppermost stairway section and a frame which is mounted in the opening. These arms may be spring biased towards a closed position to retain the stairway in the folded stored position within the opening when not in use and to act as a counter balance when folding and unfolding the stairway. As there is a gap between the side of the ladder and the side of the opening these support arms are generally cranked intermediate there ends to bridge the gap. However there is a limit to the size of the gap that can be tolerated. If the gap is excessive the arms will not operate freely and correctly. Further the greater the gap the more strain is applied to the pivot mounts at each end of the arm. This strain eventually leads to failure of the pivot joints. The size of the gap between the size of the stairway and the sides of the opening would depend on the size of the opening. To accommodate different sized openings different widths of stairway must be produce. This increases the manufacturing costs and production time.

It is an object of the present invention to overcome these problems and to provide a process for economically manufacturing a folding stairway of high quality which is reliable in operation.

According to the invention there is provided a manufacturing process for manufacturing a folding stairway comprising the steps:

forming a rectangular outer mounting frame for complementary engagement and mounting within an associated rectangular ceiling ope of a pre-determined size, the outer frame having a pair of spaced-apart side members interconnected by end members extending between associated ends of the side members;

forming an inner stairway carrying frame for pivotally mounting on the outer frame for movement between a nesting position within the outer frame and a downwardly extending in-use position hanging downwardly from the outer frame, the inner frame having a pair of spaced-apart side beams interconnected by an associated pair of spaced-apart end beams, connecting the side beams to the end beams such that each side beam is spaced a preset distance inwardly of the side members of the outer frame when the inner frame is mounted within the outer frame in the nesting position;

preparing an extendable stairway which is foldable between a collapsed stored position for nesting within the outer frame and an extended in-use position;

mounting the inner frame within the outer frame by securing a hinge between an outer frame end member and an end beam of the inner frame thus pivotally mounting the inner frame on the outer frame;

mounting a folding support arm between each side beam on the inner frame and an associated side member on the outer frame, each arm being pivotally mounted on each frame and being foldable intermediate its ends between an extended position corresponding to the downwardly extending in-use position of the inner frame and a folded position corresponding to the nesting position of the inner frame,

each arm having bias means for urging the arm towards the folded position for retaining the inner frame in the nested position within the outer frame; and

mounting an inner end of the stairway between the end beams on the inner frame such that the stairway is foldable between the collapsed and extended positions when the inner frame is in the in-use position.

In one embodiment of the invention the process includes the step of preparing an extendable stairway by forming two or more stairway portions and pivotally interconnecting the stairway portions end to end for folding the stairway portions between the collapsed stored position and the extended in-use position.

In a preferred embodiment the stairway has three stairway portions, namely an upper stairway portion, an intermediate stairway portion and a lower stairway portion, and the process includes pivotally mounting an upper end of the intermediate portion to a lower end of the upper portion for pivoting movement between an in-line extended position and a collapsed stored position overlapping the front faces of the upper portion and the intermediate portion, and the lower portion is pivotally mounted at a lower end of the intermediate portion for pivoting movement between an in-line extended position and a collapsed stored position overlapping the rear faces of the intermediate and lower portions.

In a further embodiment the process includes mounting a door on the rear face of the inner frame, said door being engagable with a lower end of the outer frame when the inner frame is in the nesting position.

In another aspect the invention provides a folding stairway whenever manufactured according to the process as described herein.

In a particularly preferred embodiment the folding stairway comprises a rectangular outer mounting frame having a pair of spaced-apart side members interconnected by spaced-apart end members an inner stairway carrying frame having an inner end pivotally mounted on an associated end member of the outer frame, the inner frame being pivotally movable on the outer frame between a raised nested position within the outer frame and a downwardly extending in-use position hanging downwardly from the outer frame, the inner frame having a pair of spaced-apart side beams interconnected by an associated pair of spaced-apart end beams, each side beam being spaced a pre-set distance inwardly of the associated side member on the outer frame, a folding return arm being mounted between each side beam and said associated side member, the arm being pivotally mounted by a pivot mounting on each frame and being foldable intermediate said pivot mountings, a bias spring being mounted between the arm and the outer frame to urge the arm towards the folded position for retaining the inner frame in the nested position on the outer frame, and a folding stairway having at least two pivotally interconnected parts for folding the stairway between a collapsed stored position and an extended in-use position, an inner end of the stairway being attached to the inner frame.

Detailed Description of the Invention

The invention will be more clearly understood from the following description of some embodiments thereof, given by way of example only with reference to the accompanying drawings, in which:-

Fig. 1 is a perspective view of a folding stairway manufactured according to the process of the invention;

Fig. 2 is a front elevational view of the folding stairway;

Fig. 3 is a side elevational view of the folding stairway;

Fig. 4 is a detail elevational view of portion of the folding stairway; and

Fig. 5 is a perspective view showing the folding stairway in use in a collapsed stored position.

Referring to the drawings a folding stairway and a process for manufacturing the folding stairway according to the invention will be described.

Referring to Fig. 1 there is shown a folding stairway according to the invention, indicated generally by the reference numeral 1. The folding stairway 1 comprises a rectangular outer mounting frame 2 for mounting within an associated rectangular ope 3 (Fig. 5) in a ceiling 4 or the like.

The outer mounting frame 2 has a pair of spaced-apart side members 6, 7 interconnected by spaced-apart end members 8, 9. The dimensions of the members 6, 7, 8, 9 are such that the outer frame 2 is a snug fit within the ope 3 and can be secured to rafters 10 or the like to securely mount the folding stairway 1 in the ceiling 4 as shown in Fig. 5.

An inner stairway carrying frame 12 is pivotally mounted by a hinge 13 on the outer frame 2. The inner frame 12 has a pair of spaced-apart side beams 14, 15 interconnected by an associated pair of spaced-apart end beams 16, 17. It will be noted that each side beam 14, 15 is spaced a preset distance inwardly of an associated side member 6, 7 on the outer frame 2.

A folding support arm 19 is mounted between each side beam 14, 15 and the associated side member 6, 7 on the outer frame 2. Each arm 19 is pivotally mounted by a lower pivot mounting 20 on the side beam 14, 15 and by an upper pivot mounting 21 on the side member 6, 7. The arm 19 is of two-part construction having an upper part 23 and a lower part 24 pivotally interconnected by a pivot pin 25. The arm 19 is movable between an extended position in which both arm parts 23, 24, are in-line as shown in Fig. 3 and a folded stored position as shown in Fig. 5.

A bias spring 27 is mounted between each arm 19 and the end member 8 of the outer frame 2 to urge the arm 19 towards the folded position for retaining the inner frame 12 in a nested position (shown in Fig. 5) within the outer frame 2. The springs 27 form a counter-balance to the weight of the inner frame 12 and an associated stairway mounted thereon so that the inner frame 12 is held in the nested position but can be readily easily pivoted in a controlled manner into the extended position shown in Fig. 1 without a sudden drop due to the weight of the inner frame 12 and associated stairway.

An extendable stairway 30 is mounted on the inner frame 12 and can be folded between a stored position shown in Fig. 5 and an extended in-use position shown in Fig. 1. In this case the stairway 30 comprises three stairway portions, namely, an upper stairway portion 31, an intermediate stairway position 32 and a lower stairway portion 33.

Each stairway portion 31, 32, 33 comprises a pair of spaced-apart substantially parallel side rails 35, 36 between which a number of steps 37 are mounted. Upper stairway hinges 38 are mounted between outer ends of the upper portion 31 and intermediate portion 32 so that the intermediate portion 32 folds inwardly over a front face of the upper portion 31. Lower stairway hinges 39 are mounted at a rear edge of the intermediate portion 32 and lower portion 33 so that the lower portion 33 can fold rearwardly across a back of the intermediate portion 35 as shown in Fig. 5. Thus, the stairway 30 can be folded compactly onto the inner frame 12 for nesting within the outer frame 2 as shown in Fig. 5.

A door 42 is mounted on a rear of the inner frame 12 for closing the ope 3 within which the folding stairway 1 is mounted.

In use, the inner frame 12 can be lowered from the nested stored position shown in Fig. 5 to the lowered position shown in Fig. 1, the arms 19 and counter-balance springs 27 ensuring the inner frame 12 is lowered smoothly in a controlled manner. When lowered, the stairway

30 is folded downwardly to provide access to the area above the stairway 1. After use, the extendable stairway 30 is collapsed into the stored position on the inner frame 12 and the inner frame 12 is then pivoted upwardly to nest within the outer frame 2. The arrangement of the arms 19 and the springs 27 are such that the inner frame 12 is held in the nested position within the outer frame 2 when released. It will be noted that the stairway is neatly stored above the door in the opening.

In a manufacturing process according to the invention, each of the outer frame 2, the inner frame 12 and the folding stairway 30 are prepared separately and delivered to an assembly station. At the assembly station the inner frame 12 is mounted within the outer frame 2 by securing a hinge 13 between the end member 8 of the outer frame 2 and an end beam 16 of the inner frame 12. Thus, the inner frame 12 is pivotally mounted within the outer frame 2. Next the support arms 19 are mounted between the inner frame 12 and the outer frame 2 and the associated counter-balance springs 27 are mounted between an upper end of each arm and the outer frame 2. The collapsible stairway 30 is then mounted on the inner frame 12 by attaching the upper portion 31 between the end beams 16, 17 of the inner frame 12.

The manufacturing process according to the invention enables the production of a high quality folding stairway in an efficient manner.

The provision of an inner frame for mounting the stairway on the outer mounting frame is particularly advantageous. A standard size of stairway can be produced which is capable of being mounted in ceiling openings of the varying sizes. The outer frame size is simply manufactured according to ope size and then the inner frame is manufactured to match the outer frame. The stairway can conveniently be manufactured in a constant width which is obviously more convenient and efficient from a manufacturing point of view. By varying the spacing between the side beams of the inner frame to accommodate various widths of outer frame the return arms can be fitted in the

optimum position without undue strain being applied to the pivots at each end of the arm which could lead to fracture of the pivot joints.

The invention is not limited to the embodiments hereinbefore described which may be varied in both construction and detail.

CLAIMS

1. A manufacturing process for manufacturing a folding stairway comprising the steps:

forming a rectangular outer mounting frame for complementary engagement and mounting within an associated rectangular ceiling ope of a predetermined size, the outer frame having a pair of spaced-apart side members interconnected by end members extending between associated ends of the side members;

forming an inner stairway carrying frame for pivotally mounting on the outer frame for movement between a nesting position within the outer frame and a downwardly extending in-use position hanging downwardly from the outer frame, the inner frame having a pair of spaced-apart side beams interconnected by an associated pair of spaced-apart end beams, connecting the side beams to the end beams such that each side beam is spaced a preset distance inwardly of the side members of the outer frame when the inner frame is mounted within the outer frame in the nesting position;

preparing an extendable stairway which is foldable between a collapsed stored position for nesting within the outer frame and an extended in-use position;

mounting the inner frame within the outer frame by securing a hinge between an outer frame end member and an end beam of the inner frame thus pivotally mounting the inner frame on the outer frame;

mounting a folding support arm between each side beam on the inner frame and an associated side member on the outer frame, each arm being pivotally mounted on each frame and

being foldable intermediate its ends between an extended position corresponding to the downwardly extending in-use position of the inner frame and a folded position corresponding to the nesting position of the inner frame,

each arm having bias means for urging the arm towards the folded position for retaining the inner frame in the nested position within the outer frame; and

mounting an inner end of the stairway between the end beams on the inner frame such that the stairway is foldable between the collapsed and extended positions when the inner frame is in the in-use position.

Claims 2 to 5 are not relevant for the case study

6. A folding stairway whenever manufactured according to the process as claimed in any preceding claim.