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⑤④ ADJUSTABLE STAIRCASE.

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FR-A-2 118 042
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SE-B- 373 903
US-A-1 791 330
US-A-2 864 542
US-A-3 026 961 | |

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Description

Technical field

The present invention is related to an adjustable staircase comprising two stiles which are rigidly connected to each other and which have at least two intermediate treads. At its ends each tread is pivotally mounted around a bearing shaft in the adjacent stile. The staircase is intended to be used both as a staircase with a variable slope, in which case the treads always can be adjusted so that the upper surfaces are substantially horizontal, and as a ramp having a substantially plain surface of transportation, according to the first part of Claim 1.

Background art

Staircases having adjustable treads have been disclosed previously, e.g. in the SE—B—373903, the US Patent Specifications 2,864,542, 2,888,182 and 3,731,761. However, these previously known staircases have had a complicated construction, and it has not been possible to adjust the staircases to a ramp having a plain surface of transportation in an easy way. Therefore, the usefulness of these prior art staircases has been limited.

Disclosure of invention

The main object of the invention is therefore to provide a staircase in which the treads are pivoted in such a way that the staircase easily can be adapted to different angles of inclination and converted into a ramp having a substantially plain working surface, and which has a simple construction. This object has been achieved in accordance with the invention by giving the staircase the features set forth in the characterizing part of Claim 1 and the following claims.

Brief description of drawings

The invention will now be described more in detail below with reference to the accompanying drawings, wherein:

Figure 1 is a view in perspective of one embodiment of a staircase according to the invention having four treads and an operating lever for adjusting the treads.

Figure 2 shows the same staircase as Figure 1 with the treads adjusted to a ramp having a substantially plain surface of transportation.

Figure 3 is a longitudinal section through the staircase according to Figure 1 with the operating device for adjusting the treads.

Figure 4 shows schematically an alternative embodiment of the staircase according to the invention in which the strings of the staircase consist of telescopic sections, so that the staircase can be telescoped when not in use.

Best mode for carrying out the invention

The staircase shown in Figure 1 comprises two side stiles 10 and 11 rigidly connected to each other by means of cross bars 12—15. The staircase has four treads 16—19, and the treads are at their ends pivotally mounted on shafts (not

shown) in the adjacent stiles. The treads 16—19 can be turned around their bearing shafts, maintaining the upper surfaces of the treads in parallel, so that the angle between the upper surfaces of the treads and the longitudinal direction of the strings is changed. This turning movement is provided by means of an operating lever 20, as will be further explained below.

The treads 16—19 are also adapted to be turned to a common plane that is substantially parallel with the plane of the strings. The treads have a width that is so adapted that the front edge of a following, generally higher tread in this position abuts the rear edge of the preceding tread, so that a continuous, substantially plain surface is formed by the treads, as clearly shown in Figure 2.

Figure 3 shows a longitudinal section through the staircase shown in Figure 1. The treads 16—19 are formed of cut pieces of aluminium sections and have been provided with end elements 21—24 at one end for stiffening the treads. The bearing shafts 25—28 of the treads pass through these end elements and run substantially along the longitudinal centerlines of the treads. Each end element 21—24 is at its rear end provided with a projecting tab 29—32, and these tabs are pivotally connected to a link bar 33, e.g. by means of rivets or screws. The top tread 19 is rigidly connected to the operating lever 20, and a locking plate 20A is attached to the string 11 adjacent the operating lever. The locking plate is provided with a plurality of recesses 34—36, and a locking means (not shown) on the operating lever 20 can be positioned in any one of the recesses for locking the operating lever in a definite angle position.

At the front edges of the treads 16—19 the end elements are provided with notches 37—40 for engagement with the cross bars 12—15, when the staircase is converted to a ramp, so that the front edges of the treads in this position along their full length rest upon the cross bars.

When the staircase is to be used, the strings 10 and 11 are so positioned that the desired inclination is obtained. The treads are then adjusted by means of the operating lever 20. When steps are desired, the treads can be adjusted so that the upper surfaces of the treads are substantially horizontal, irrespective of the angle of inclination of the strings to the ground plane, so that the staircase will be comfortable to use. When a ramp is desired, the treads are adjusted so that they form a continuous, substantially plain surface.

In Figure 4 an alternative embodiment of an adjustable staircase according to the invention is shown. This embodiment is different from the embodiment shown in Figures 1—3 in that the stiles 10 and 11 have been designed of telescopic sections of which only the sections 10A, 10B and 10C of the string 10 have been shown. However, instead of the link bar shown in Figure 3 another link means 41 has to be used, e.g. a telescopic arm or any other means capable of take up the reduced distance between the treads 16—19,

when the sections 10A, 10B and 10C are telescoped, so that the telescoping of the sections is not restrained.

The embodiment shown in Figure 4 is primarily intended to be used as an entrance or exit stair or ramp on buses or railway waggons. Therefore, the staircase is at its upper end provided with a shaft 42 around which the staircase can be lifted up when not in use.

While only two embodiments of the adjustable staircase according to the invention have been described above, it is evident that many modifications and variations are possible within the scope of the invention. E.g., the treads can be provided with end elements at both ends. In that case also a link bar can be provided on either side of the staircase. The treads can also be connected to the link bar by means of tabs provided on the link bar, or by means of separate link arms pivotally connected to the treads as well as to the link bar. The link bar may also be a threaded shaft, the shaft providing the adjustment of the treads when turned. In that case the treads are connected to the shaft over threaded nuts or sleeves which are displaced on the shaft, when the shaft is turned. The operating means for adjusting the treads can also be designed in many different ways, e.g. as a wheel. Alternatively, the operating means may be a hydraulically, pneumatically or electrically driven adjusting means. The operating means can also be adapted to actuate locking means, e.g. movable taps, which can engage in holes in the opposite stile, so that the treads can be locked at the strings at both ends. Furthermore, it is not necessary that the treads are adapted to rest on the cross bars between the stiles, when the staircase is converted to a ramp. Instead, the treads can be adapted to rest upon projections on the strings. The stiles may also at both ends be provided with wedge-shaped shoulders pivotally mounted on the strings for forming adjustable support surfaces for the side strings.

Claims

1. Adjustable staircase, comprising two stiles (10, 11) which are rigidly connected to each other and which have at least two intermediate treads (16—19), each tread being pivotally mounted at its ends around a bearing shaft (25—28) in the adjacent string and each tread (16—19) being connected to at least one link arm (29—32), the link arm being connected to a link means (33) arranged to be adjusted in such a way that the treads (16—19) by means of the link arms (29—32) are turned around their bearing shafts (25—28), maintaining the upper surfaces of the treads in parallel, so that the angle between the upper surfaces of the treads (16—19) and the longitudinal direction of the stiles (10, 11) is changed, one angle being such that the upper surfaces of the treads are in substantial alignment with one another, characterized in that the two stiles (10, 11) are connected to each other by crossbars

(12—15) and in that the treads (16—19) are of one piece, which have such width that the upper and lower end surfaces of the treads abut when the treads are turned to the common plane, so that a substantially continuous, plain surface is formed by the treads, the treads (16—19) being adapted to rest with their front edges along their full length on the cross bars (12—15).

2. Staircase according to Claim 1, in which the treads (16—19) consist of a section of light metal characterized in that at least one end of each tread (16—19) is provided with an end element (21—24), the rear edge of which is designed with a downward projecting tab (29—32), the tab being pivotally connected to the link means (33) and forming the link arm.

3. Staircase according to Claim 2, characterized in that the end elements (21—24) at the front edges of the treads (16—19) are provided with notches (37—40) engaging with the cross bars (12—15), when the treads are positioned in the plane common to the treads.

4. Staircase according to Claim 1, characterized in that the link arms are pivotally connected to the treads (16—19) as well as to the link means (33).

5. Staircase according to any of the preceding claims, characterized in that the link means (33) is provided with an operating lever (20) attached to a tread (19) in the staircase and adapted to engage with a recess (35) in a locking plate (20A) provided with a plurality of recesses (34—36), the locking plate being provided adjacent the operating lever (20) along its path of movement for adjustment and retainment of the treads (16—19) in different angle position in relation to the longitudinal direction of the stiles (10, 11).

6. Staircase according to Claim 1, characterized in that the stiles (10, 11) consist of telescopic sections (10A, 10B, 10C), the link means (41) being linked between the sections in such a way that the link means does not retain telescoping of the sections.

7. Staircase according to Claim 1, characterized in that the bearing shafts (25—28) of the treads (16—19) run substantially along the longitudinal centerlines of the treads.

8. Staircase according to Claim 1, characterized in that the stiles (10, 11) at their both ends are provided with wedged shaped shoulders pivotally mounted on the stiles for forming adjustable support surfaces for the stiles.

Patentansprüche

1. Einstellbare Treppe mit zwei Treppenwangen (10, 11), die starr miteinander verbunden sind, und mit mindestens zwei Trittstufen (16—19), die an ihren Enden um je einen Tragschaft (25—28) drehbar gelagert sind und die je mit einem Verbindungsarm (29—32) verbunden sind, wobei die Verbindungsarme auf einer gemeinsamen Stange (33) sitzen, mittels der die Trittstufen (16—19) um die Tragschäfte (25—28) so verstellbar sind, daß der Winkel zwischen den Oberflächen der Trittstufen und den Treppenwangen (10, 11) veränderbar

ist, wobei die Oberflächen der Trittstufen parallel zueinander bleiben, und daß einer der Winkel so einstellbar ist, daß die Oberflächen der Trittstufen miteinander fluchten, dadurch gekennzeichnet, daß die beiden Treppenwangen (10, 11) miteinander durch Querstangen (12—15) verbunden sind, und daß die Trittstufen (16—19) jeweils aus einem Stück bestehen und eine derartige Ausdehnung aufweisen, daß die Ober- und die Unterseite der Trittstufen aneinanderstoßen, wenn letztere verstellt werden, um eine durchgehende Fläche der Oberseiten der Trittstufen zu bilden, und daß schließlich die Trittstufen (16—19) so angepasst sind, daß sie mit ihrer gesamten Vorderkante auf den Querstangen (12—15) ruhen.

2. Treppe nach Anspruch 1, bei der die Trittstufen (16—19) teilweise aus Leichtmetall bestehen, dadurch gekennzeichnet, daß wenigstens das eine Ende jeder Trittstufe (16—19) mit einem Versteifungselement (21—24) versehen ist, deren rückwärtige Enden jeweils einen nach unten gerichteten Streifen (29—32) aufweisen, der drehbar mit der Verbindungsstange (33) verbunden ist und somit den Verbindungsarm bildet.

3. Treppe nach Anspruch 2, dadurch gekennzeichnet, daß die Versteifungselemente (21—24) an den Vorderkanten der Trittstufen (16—19) Kerben (37—40) aufweisen, die in die Querstangen (12—15) eingreifen, wenn die Trittstufen so eingestellt sind, daß ihre Oberseiten eine durchgehende Fläche bilden.

4. Treppe nach Anspruch 1, dadurch gekennzeichnet, daß die Verbindungsarme drehbar sowohl mit den Trittstufen (16—19) als auch mit der Verbindungsstange (33) verbunden sind.

5. Treppe nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Verbindungsstange (33) mit einem Bedienhebel (20) verbunden ist, der seinerseits an einer Trittstufe (19) befestigt ist, und der in Aussparungen (34—36) der Sicherungsplatte (20A) eingreift, um so die verschiedenen Winkelpositionen der Trittstufen (16—19) einzustellen, und letztere in der eingestellten Position zu halten.

6. Treppe nach Anspruch 1, dadurch gekennzeichnet, daß die Treppenwangen (10, 11) aus Teilstücken (10A, 10B, 10C) bestehen, die teileko-partig ineinander verschiebbar sind, und daß die verbindungsstelle(n) (41) so zwischen den Teilstücken (10A, 10B, 10C) angeordnet sind, daß sie deren Teleskopbewegung nicht sperren.

7. Treppe nach Anspruch 1, dadurch gekennzeichnet, daß die Tragschäfte (25—28) der Trittstufen (16—19) etwa entlang deren Längsmittellinien verlaufen.

8. Treppe nach Anspruch 1, dadurch gekennzeichnet, daß die Treppenwangen (10, 11) an beiden Enden mit drehbaren, keilförmigen Schultern versehen sind, um so einstellbare Abstützflächen der Treppenwangen zu schaffen.

Revendications

1. Escalier réglable, comprenant deux limons (10, 11) qui sont reliés rigidement entre eux et qui comportent au moins deux marches intermédiaires (16—19), chaque marche étant montée de façon pivotante à ses extrémités autour d'un axe de support (25—28) situé sur le limon adjacent et chaque marche (16—19) étant reliée à au moins un bras de liaison (29—32) ce bras de liaison étant relié à des moyens de liaison (33) agencés de façon à être réglé de manière telle que, par l'intermédiaire des bras de liaison (29—32), les marches (16—19) pivotent autour de leurs axes de support (25, 28) en maintenant parallèles les surfaces supérieures de ces marches, de façon à faire varier l'angle existant entre ces surfaces supérieures des marches (16—19) et la direction longitudinale des limons (10, 11), un angle étant tel que ces surfaces supérieures des marches soient sensiblement en alignement entre elles, caractérisé en ce que les deux limons (10, 11) sont reliés entre eux par des traverses (12—15) et en ce que les marches (16—19) sont d'une seule pièce et ont une largeur telle que les surfaces extrêmes supérieure et inférieure de ces marches viennent en butée lorsqu'on fait pivoter les marches vers le plan commun, si bien qu'une surface plane sensiblement continue est formée par les marches, ces marches (16—19) étant agencées de façon à reposer par leurs bords avant, et sur toutes leur longueur, sur les traverses (12—15).

2. Escalier suivant la revendication 1, dans lequel les marches (16—19) sont constituées d'un profilé de métal léger, caractérisé en ce qu'au moins une extrémité de chaque marche (16—19) est pourvue d'un élément d'extrémité (21—24) dont le bord arrière présente une patte en saillie vers le bas (29—32), cette patte étant reliée de manière pivotante aux moyens de liaison (33) et constituant le bras de liaison.

3. Escalier suivant la revendication 2, caractérisé en ce que les éléments d'extrémité (21—24) situés à l'endroit des bords avant des marches (16—19) présentent des encoches (37—40) coopérant avec les traverses (12—15) lorsque les marches sont disposées suivant le plan commun à ces marches.

4. Escalier suivant la revendication 1, caractérisé en ce que les bras de liaison sont reliés de manière pivotante aux marches (16—19) ainsi qu'aux moyens de liaison (33).

5. Escalier suivant l'une quelconque des revendications précédentes, caractérisé en ce que les moyens de liaison (33) sont pourvus d'un levier de manoeuvre (20) rend solidaire d'une marche (19) de l'escalier et agencé de façon à coopérer avec un évidement (35) ménagé dans une plaque de verrouillage (20A) présentant plusieurs évidements (34—36), cette plaque de verrouillage étant prévue en position adjacente au levier de manoeuvre (20) le long de son trajet de déplacement afin de permettre le réglage et le maintien des marches (16—19) dans différentes positions

angulaires par rapport à la direction longitudinale des limons (10, 11).

6. Escalier suivant la revendication 1, caractérisé en ce que les limons (10, 11) sont constitués par des profilés télescopiques (10A, 10B et 10C), les moyens de liaison (41) assurant la liaison entre ces profilés d'une manière telle que ces moyens de liaison n'empêchant pas le mouvement télescopique de ces profilés.

7. Escalier suivant la revendication 1, caracté-

risé en ce que les axes de support (25—28) des marches (16—19) s'étendent sensiblement suivant les axes longitudinaux de symétrie des marches.

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8. Escalier suivant la revendication 1, caractérisé en ce que les limons (10, 11) présentent à leurs deux extrémités des épaulements en forme de coin qui sont montés de façon pivotante sur ces limons afin de former des surfaces réglables de support pour ces limons.

10

15

20

25

30

35

40

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50

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60

65

5

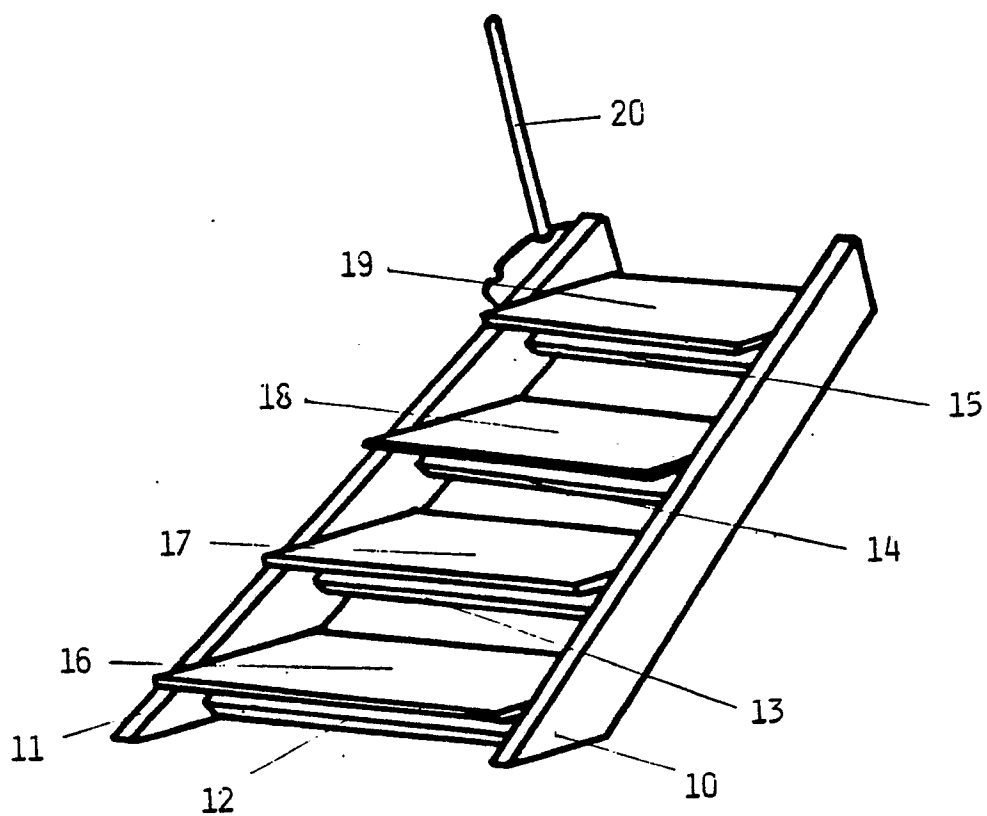


FIG 1

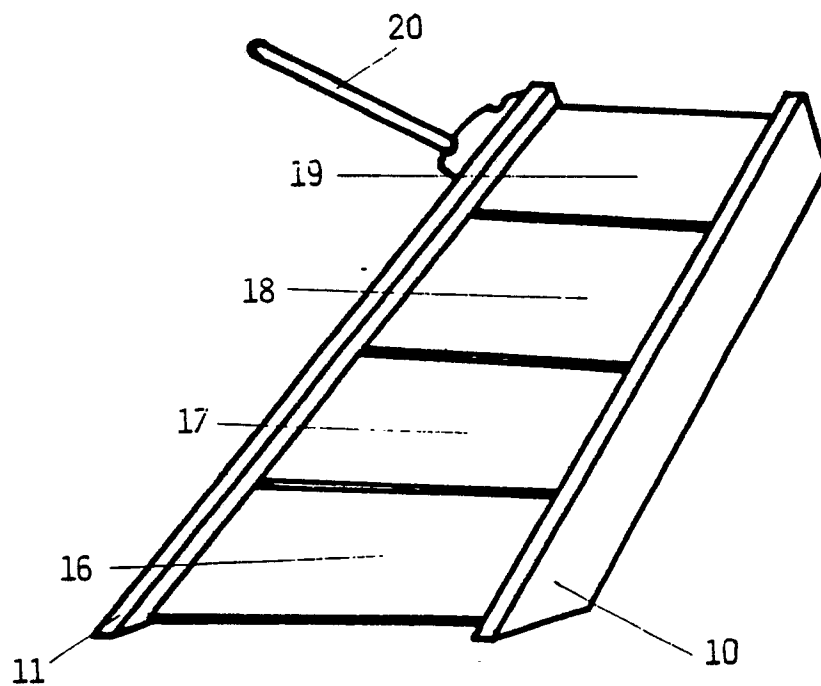


FIG 2

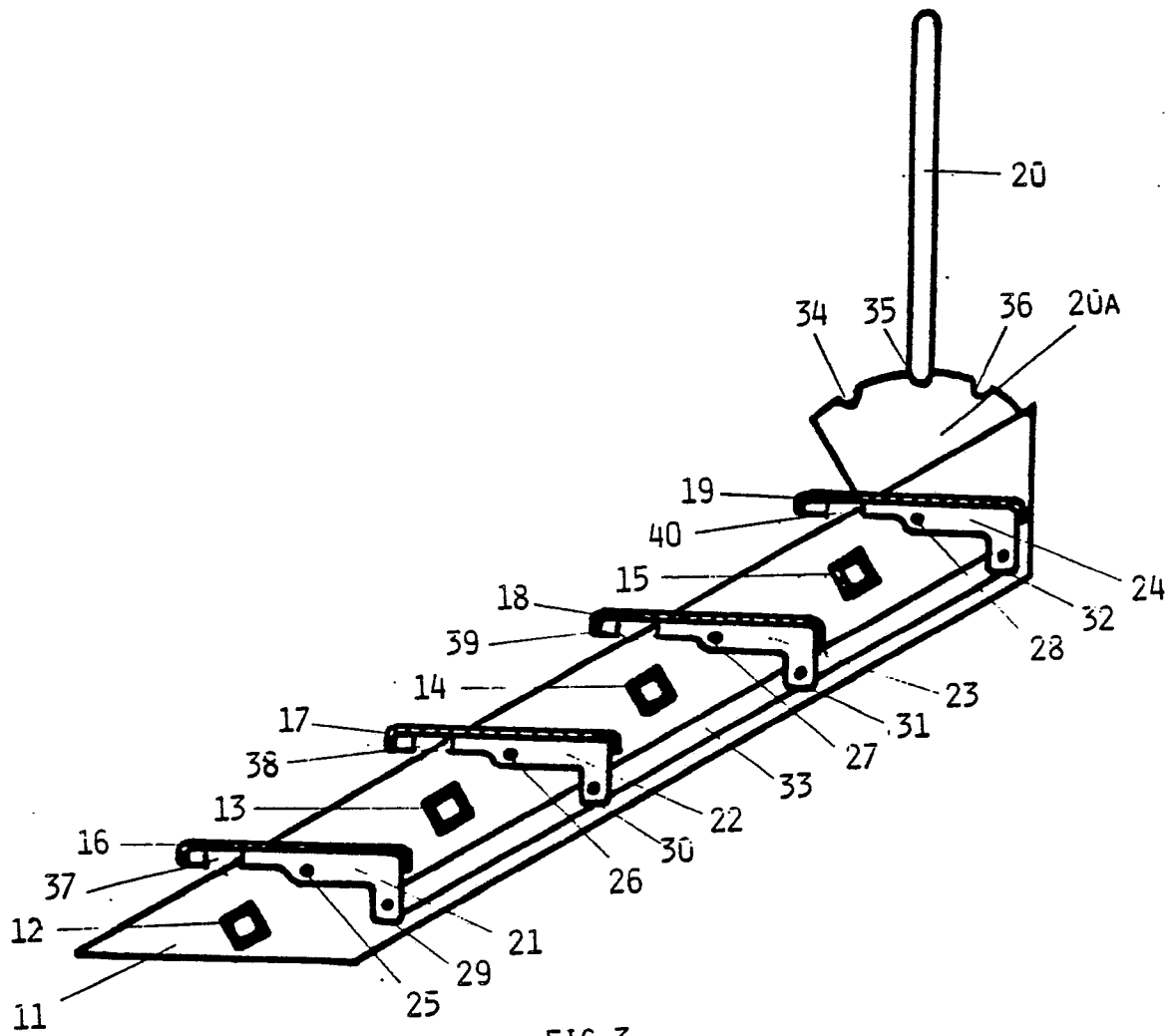


FIG 3

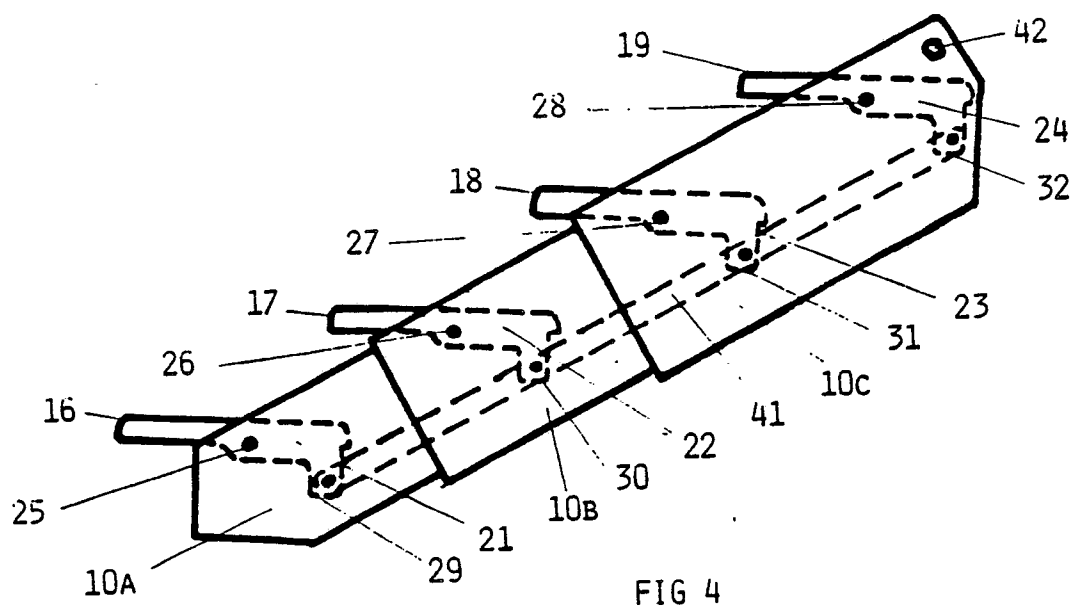


FIG 4