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(54) Step Ladder

(57) A step ladder, including a rung assembly (22) and first and second legs (14, 16) characterised by a single support member (26) depending from the rung assembly (22) such that, in use, an end of the support member (26) and one end of each of the first and second legs (14, 16) define the contact points upon which the ladder rests.

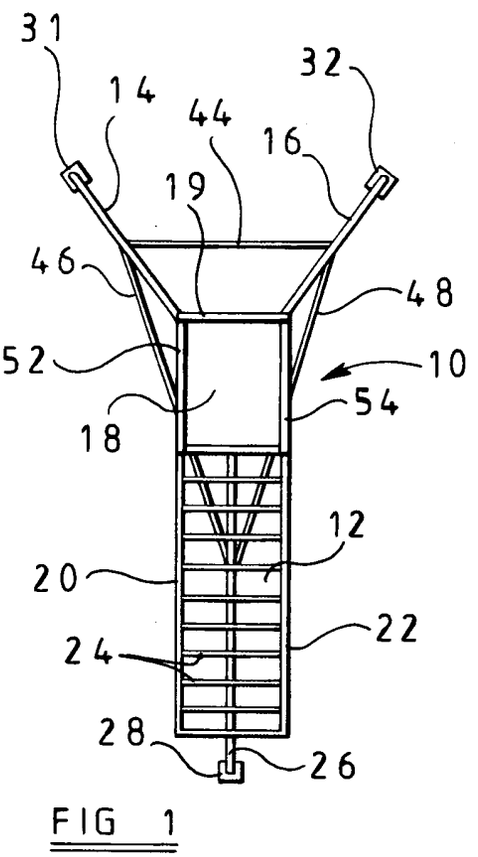

FIG 1

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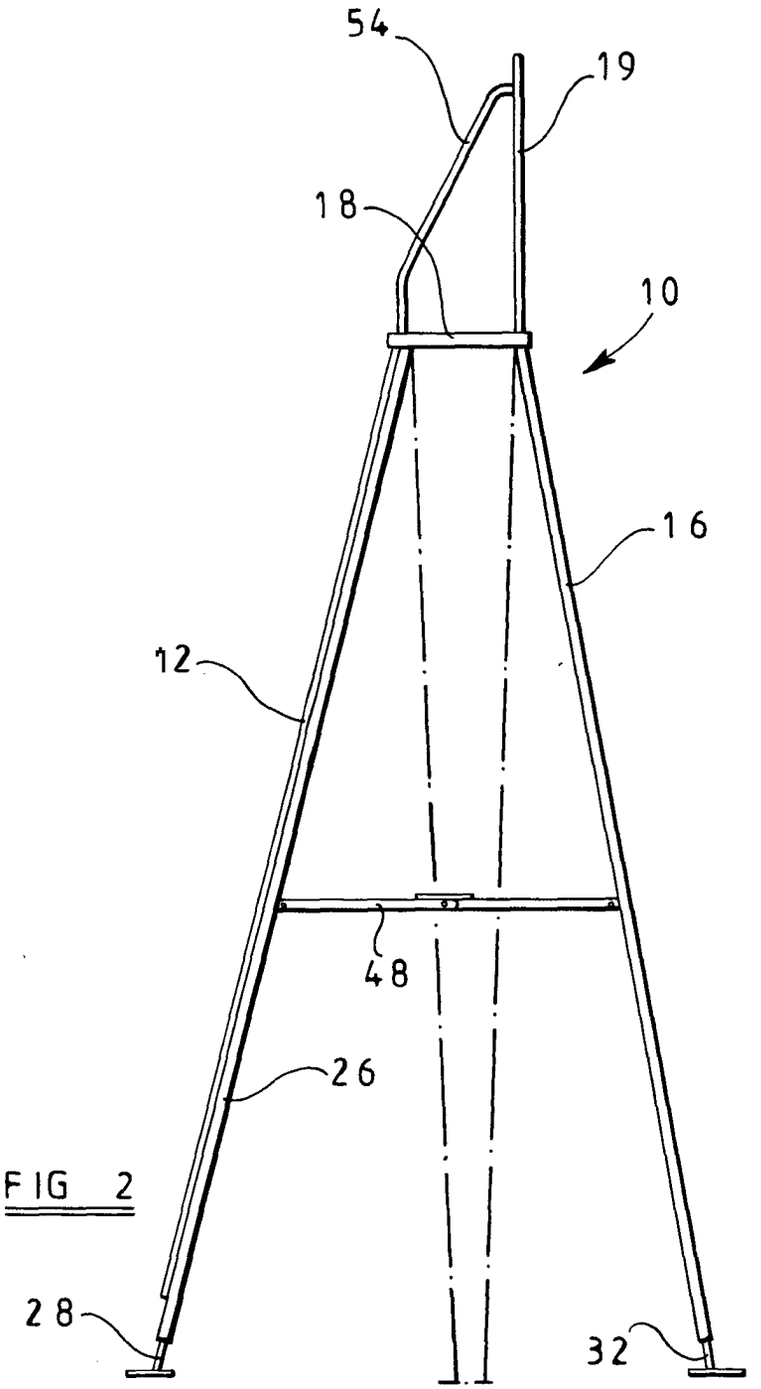


FIG 2

Description

[0001] This invention relates to a step ladder.

[0002] Conventional step ladders have two support legs which are usually divergent away from a top platform and a pair of uprights, between which are arranged the rungs of the step ladder, the uprights also being connected to the top platform. The uprights and the support legs are in contact with the ground when the step ladder is erected for use. This conventional step ladder arrangement has the inherent problem of being unstable when placed upon rough or uneven ground where only three of the four possible points of contact do actually contact the ground.

[0003] It is an object of the present invention to provide a step ladder which mitigates this problem.

[0004] According to the present invention there is provided a step ladder, including a rung assembly and first and second legs and a single support member depending from the rung assembly such that, in use, an end of the support member and one end of each of the first and second legs define the contact points upon which the ladder rests.

[0005] Preferably there is a pivotal connection between the rung assembly and said legs whereby the step ladder is foldable for storage.

[0006] Desirably at least one of said support member and said first and second legs terminates in a foot assembly adjustable in position relative to the respective leg or support member.

Conveniently there is provided tie means capable of limiting the separation of the rung assembly and the legs.

[0007] Desirably said tie means includes a tie between said legs.

[0008] Conveniently said tie means includes ties of adjustable length.

[0009] Preferably there is a platform linking the legs and the rung assembly.

[0010] Desirably the legs and the rung assembly lie within the area defined by the platform when the step ladder is folded.

[0011] Preferably each of the legs and said support member has an adjustable foot assembly, and desirably the or each adjustable foot assembly has a projection slidably received in its respective leg or support member and retained in a selected position relative thereto by a spring loaded peg extending from the projection through a selected one of a longitudinal array of apertures in said leg or support member.

[0012] Desirably the step ladder is made of mild steel. The step ladder may be made of either stainless steel or aluminium.

[0013] The invention will now be described, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a plan view of a step ladder according to the present invention;

Figure 2 is a side view of the step ladder of Figure 1;

Figure 3 is a plan view of a hinge arrangement incorporated in the step ladder of Figure 1;

Figure 4 is a view on the line A of the hinge arrangement of Figure 3;

Figure 5 is a side view of a fixing arrangement incorporated in the step ladder of Figure 1;

Figure 6 is a transverse sectional view of a tie arrangement of the step ladder of Figure 1; and

Figure 7 is a partial front view of a tie of the step ladder of Figure 1.

[0014] All orientations referred to herein correspond to those shown in Figure 2.

[0015] Referring to the drawings, the step ladder 10 is constructed from mild steel components which are treated before or after assembly to provide corrosion protection and to enhance the visual appeal of the step ladder. It is to be understood that other materials, for example stainless steel, aluminium and aluminium alloys, may prove suitable for the construction of some all of the step ladder components. The step ladder includes a rung assembly 12; elongate support legs 14,16 formed from tubular material of circular cross-section; a rectangular platform 18 and a handrail 19.

[0016] The rung assembly 12 comprises a pair of elongate uprights 20,22, formed from tubular material of circular cross-section, a plurality of rungs 24 and an elongate intermediate support 26 also formed from tubular material of circular cross-section similar to that of the legs 14, 16. The uprights 20,22 are parallel and support the rungs 24 at regular intervals therebetween, the rungs being secured at their ends to the uprights by welding. The support 26 extends parallel to the uprights 20,22, projecting beyond the uprights 20,22 at the lower end thereof and is secured to the rungs 24 by welding midway between the uprights 20,22. A foot 28 extends from the lower end of the support 26.

[0017] At their upper ends the uprights 20,22 have welded thereto respective lugs (not shown) which project outwardly from the uprights and are pivotally connected by respective pivot pins to respective corners of the platform 18. The upper end of the support 26 is pivotally connected by an appropriate pivot pin to a bracket (not shown) welded beneath the platform 18 between the uprights 20,22, such that the pivot axis of the support 26 and the pivot axes of the uprights 20,22 are coextensive and lie along one edge of, and are contained within, the thickness of the platform 18.

[0018] Each of the legs 14,16 receives a respective foot 31,32 at its lower end. The upper end of each of the legs 14,16 is pivotally connected to the platform 18 at the corners thereof opposite to the uprights 20,22. Re-

ferring now to Figures 3 and 4 it can be seen that the pivot axes of the legs 14,16 are disposed at an angle of 45° relative to the pivot axis of the uprights 20,22 and support 26, so that the legs can splay outwardly in use. The underside of the platform 18 has respective channel sections 34 welded therein for receiving the ends of the legs 14,16. Each section 34 has an inner surface 36 against which the leg abuts when the step ladder is erect, to define the fully splayed state. Each leg has a pair of concentric circular holes 38 in opposite sidewalls and seats inside its respective section 34. A threaded pivot bolt 40, passes through holes in the side walls of the respective channel section 34 and the holes 38 to pivotally secure the respective leg to the platform 18. Each bolt 40 is locked in position by a nut 42. The pivot axis of the uprights 20,22, and the support 26 is coplanar with pivot axes of the legs 14,16, the pivot axes of the legs 14,16 being disposed at an angle of 90° to each other.

[0019] It will be recognised that the splay of the legs 14, 16 and the support member 26 governs the area occupied by the step ladder and the "in use" height of the platform 18 for a given leg length. It is possible, through the use of stays or ties of adjustable length to provide a step ladder where the splay is adjustable, and such an arrangement is within the scope of this invention. However in the embodiment described herein the splay of the legs 14, 16 and the support 26 in the erected configuration of the step ladder is fixed by a folding tie 44 linking the legs 14, 16 and similar ties 46, 48 linking the support 26 and the legs 14 and 16 respectively.

[0020] Each of the legs 14,16 and the support 26 has welded thereto adjacent its mid-point, a bracket 75, 76, 77 each defining a pair of outwardly extending lugs indicated in Figure 6 by the suffix a and b respectively. Each tie 44, 46, 48 is as depicted in Figure 7 and comprises two arms 78, 79 formed from substantially equal lengths of strip material overlapped at one end and interconnected for pivotal movement at right angles to the plane of the strip material by a bolt 80 and self-locking nut passing through the overlapping regions of the arms. As the ties 44, 46 ,48 are so similar only the tie 44 is shown in Figure 7.

[0021] The free end of the arm 78 of tie 44 is pivotally connected to the lug 75b by a bolt 81 and self-locking nut passing through overlapping regions of the arm and the lug. Similarly the free end of the arm 79 of tie 44 is pivotally connected to the lug 76a by a bolt 82 and self-locking nut passing through the overlapping regions of the arm and the lug, the bolts 80, 81, and 82 being parallel. The tie 46 similarly interconnects the lugs 75a and 77b while the tie 48 similarly interconnects the lugs 76b and 77a.

[0022] The pivotal connection of the arms of the ties 44, 46, 48 to each other and to the respective lugs allows the folding movement of the ties necessary to permit hinging of the legs 14, 16 and the support 26 relative to the platform 18 to move the step ladder between a storage configuration and an erected configuration. In use the weight of the step ladder and any user will splay the legs and support 26 to the maximum amount such that the arms of the ties are aligned. However in order to defined the aligned position and to prevent the arms moving "over-centre" the arm 78 of each tie has a laterally extending flange 78a along its upper edge in and adjacent the region of overlap with the arm 79, the flange engaging the upper edge of the arm 79 when the arms are aligned (the position of maximum length of the tie). The flange 78a can be integral with the arm or can be a strip welded thereto. In the present example for a step ladder of 3metre height it is intended that the spread of the legs 14, 16 at ground level should be about 1.8m and the spread of the support 26 to the legs 14, 16 at ground level should be about 2.3m. For a step ladder where the length of the legs and support is chosen to give a 2metre step ladder height the equivalent spread should be about 1.3m and 1.65m.

[0023] The handrail 19 comprises a vertical substantially U-shaped portion 50 and two angled portions 52,54. The U-shaped portion 50 projects upwardly from, and spans, the platform 18 and is fixed thereto adjacent the pivot points of the legs 14,16. The angled portions 52,54 depend from near the top of the U-shaped portion 50, being fixed to the platform 18 adjacent the pivot points of the uprights 20,22.

[0024] As mentioned above each of the legs 14, 16 and the support 26 has a foot assembly 28, 31, 32 at it lower end through which contact with the ground is made. Each of the feet 28,31,32 is substantially identical and so only one (the assembly 32 of leg 16) will be described. The foot assembly 32 as shown in Figure 5, comprises a flat square plate 63 with an inclined hollow projection 64 upstanding from the midpoint thereof. The projection 64 is welded to the plate 63 and comprises a length of tubular material of a diameter such that it is received in the end region of the leg 16 as a sliding fit. An aperture 56 in the wall of the projection 64 can be aligned, by sliding movement of the projection 64 within the leg 16, with any one of a longitudinal array of similar apertures 58 in the wall of the leg 16 such that a spring loaded peg 60 carried by the projection 64 can extend through the aligned apertures 56, 58 to lock the projection 64 in a selected position of extension relative to the leg 16.

[0025] As can be seen in Figure 5 the peg 60 is carried at the mid point of a spring strip 61 housed within the projection 64, the end regions of the strip 61 being bent back at 62 to engage the opposite inner wall of the projection 64 and thus to urge the peg 60 to project through the aligned apertures. The user can alter the amount by which the foot assembly extends from the leg by depressing the peg 60 against the spring 61, 62 to free the peg 60 from the aperture 58 and so free the projection 64 for sliding movement relative to the leg 16 to align the aperture 56 and peg 60 with a different aperture 58.

[0026] Each foot assembly 28,31,32 may be inde-

pendently distanced from the end of the respective leg 14,16 and support 26 in the manner described above in relation to the foot assembly 32 and leg 16, in order to accommodate the use of the step ladder on uneven ground. The foot assemblies 28,31,32 typically have a length (height) adjustment range of 300mm. While the spring pressed peg 60 is the preferred adjustment device it is to be recognised that a simple pin passing through transverse holes in the components could be used if desired.

[0027] Any of the foot assemblies 28,31,32 can be secured to the ground upon which it lies (not shown) by the use of a location pin 65 which, in use, is driven through an aperture 66 in the plate 63 into the ground.

[0028] A castor assembly can be added to each foot assembly if desired in order, for example, to facilitate moving the erected step ladder on smooth floors. For this purpose a nut 72 is fixed to the upper surface of the plate 63 within the projection 64. A hole 74 in the plate 63 is aligned with the threaded bore of the nut 72 so as to receive, in use, a threaded shaft associated with the castor. The castor is typically a swivel castor with a locking or braking mechanism.

[0029] When the step ladder 10 is fully erect with the legs at maximum splay, the outer surface of each leg abuts the surface 36 of the section 34. When the step ladder 10 is in its folded configuration the position of the pivot bolts 40 allows the passage of each leg into an over centre position bringing the foot 31 of each leg within the "shadow" defined by the platform 18, as shown by the dashed line in Figure 2.

[0030] It will be appreciated that in a simplified version of the step ladder there need not be a platform 18 and the rung assembly 12 may be directly pivotally connected to the legs 14,16. Moreover because the wall 36 of the channel section 34 limits movement of the legs 14, 16 it would be possible to provide ties only between the legs 14, 16 and the rung assembly 22, but it is preferred to provide also the tie 44 between the legs 14, 16. In addition it will be recognised that it might be possible to provide only one of the foot assemblies 28, 31, 32 with height adjustment, but in order to achieve maximum flexibility of adjustment to ensure that the step ladder stands upright on uneven ground it is preferred to make all three foot assemblies height adjustable.

[0031] It will be further appreciated that the lowest rung of the rung assembly may be narrower than the other rungs. The narrow rung is centred on the axis of the rung assembly, thus gives increased stability as an initial load when a user climbs on the rung assembly will lie along the central axis of the support.

Claims

1. A step ladder, including a rung assembly (22) and first and second legs (14, 16) characterised by a single support member (26) depending from the rung assembly (22) such that, in use, an end of the support member (26) and one end of each of the first and second legs (14, 16) define the contact points upon which the ladder rests.

2. A step ladder as claimed in claim 1 characterised by a pivotal connection between the rung assembly (22) and said legs (14, 16) whereby the step ladder is foldable for storage.

3. A step ladder as claimed in claim 1 or claim 2 characterised in that at least one of said support member (26) and said first and second legs (14,16) terminates in a foot assembly adjustable in position relative to the respective leg or support member.

4. A step ladder as claimed in any one of the preceding claims characterised by tie means (44, 46, 48) capable of limiting the separation of the rung assembly (22) and the legs (14, 16).

5. A step ladder as claimed in claim 4 characterised in that said tie means includes a tie between said legs (14, 16).

6. A step ladder as claimed in claim 5 wherein said tie means includes ties of adjustable length.

7. A step ladder as claimed in any one of the preceding claims characterised by a platform (18) linking the legs (14, 16) and the rung assembly (22).

8. A step ladder as claimed in claim 7 characterised in that the legs (14, 16) and the rung assembly (22) lie within the area defined by the platform (18) when the step ladder is folded.

9. A step ladder as claimed in any one of the preceding claims 3 to 8 characterised in that each of the legs (14, 16) and said support member (26) has an adjustable foot assembly.

10. A step ladder as claimed in any one of the preceding claims 3 to 9 characterised in that the or each adjustable foot assembly has a projection (64) slidably received in its respective leg or support member and retained in a selected position relative thereto by a spring loaded peg extending from the projection through a selected one of a longitudinal array of apertures in said leg or support member.

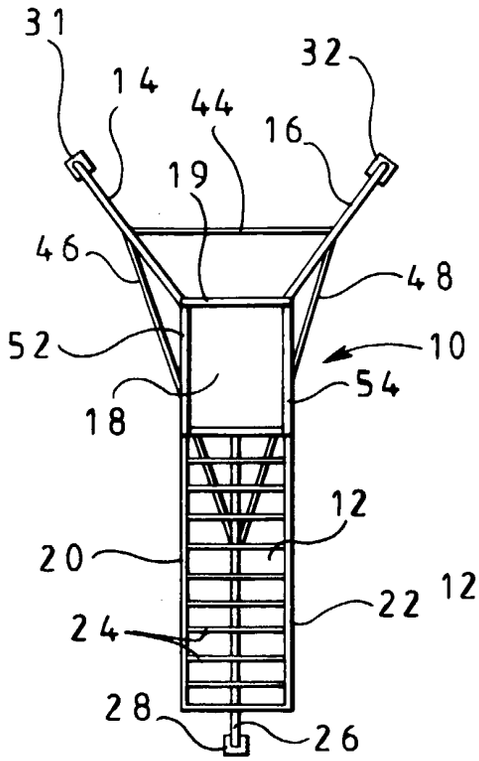


FIG 1

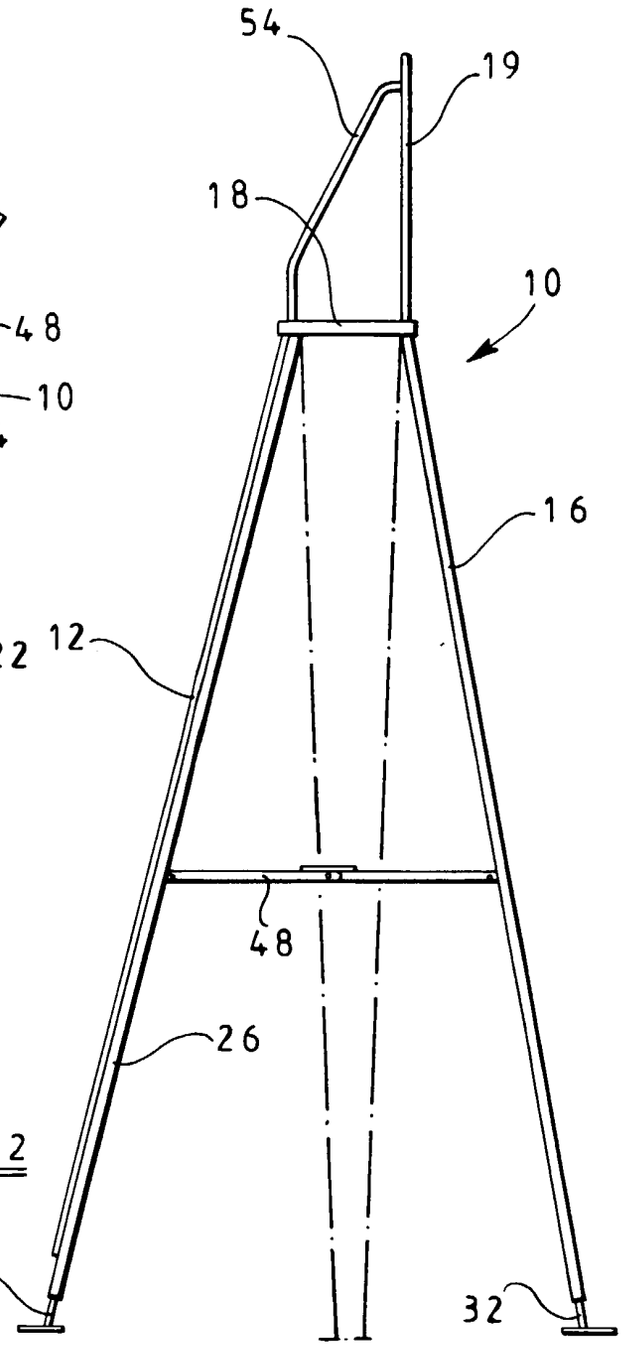


FIG 2

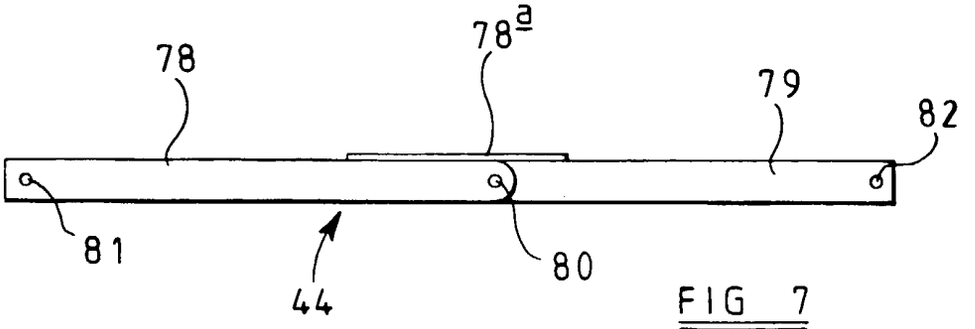


FIG 7

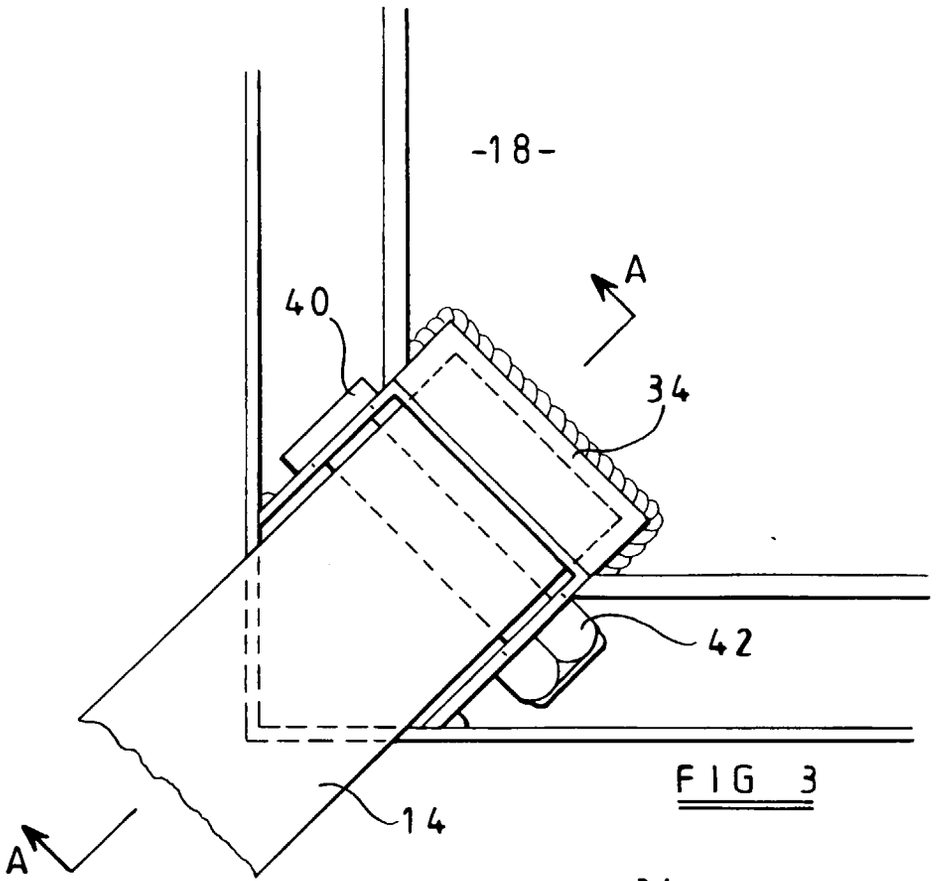
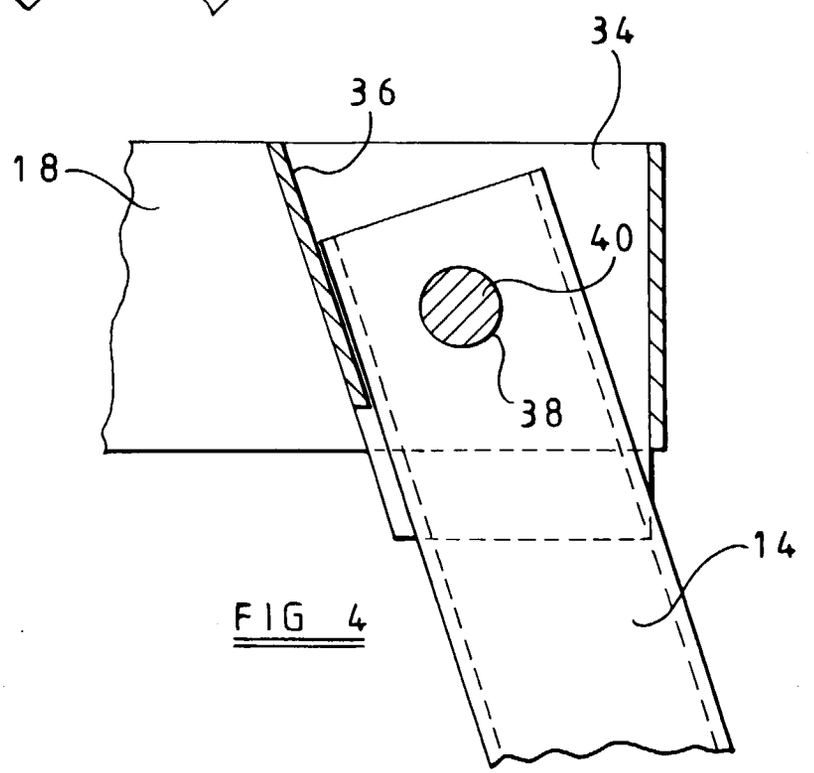


FIG 3



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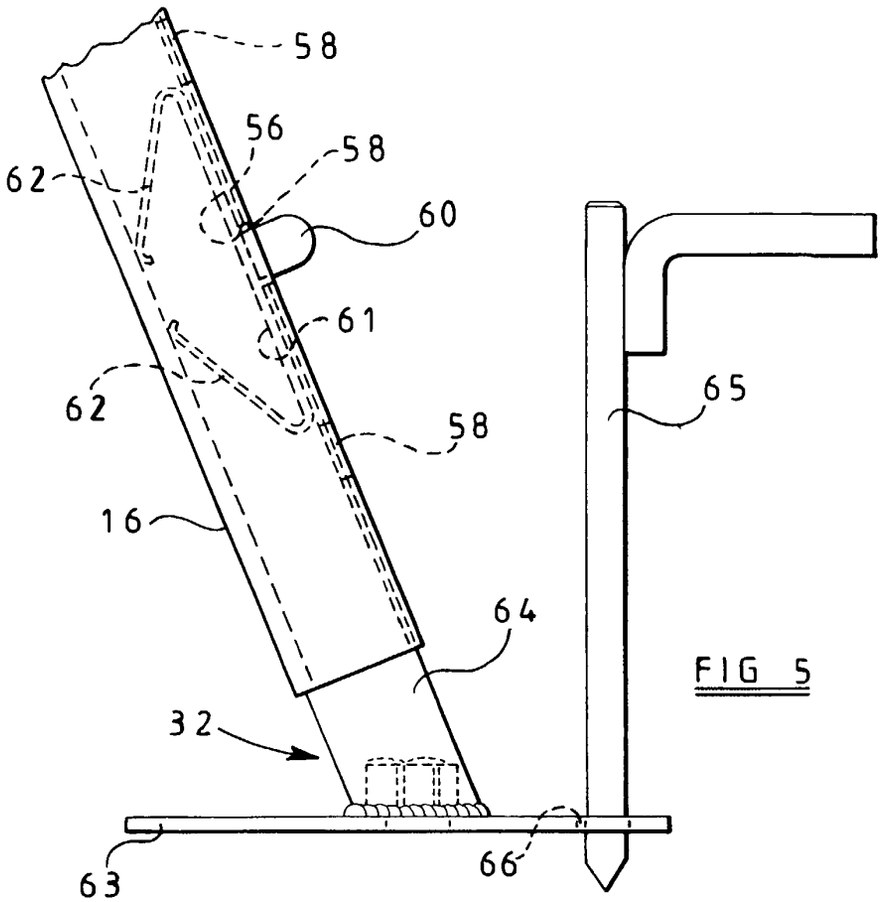
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FIG 5

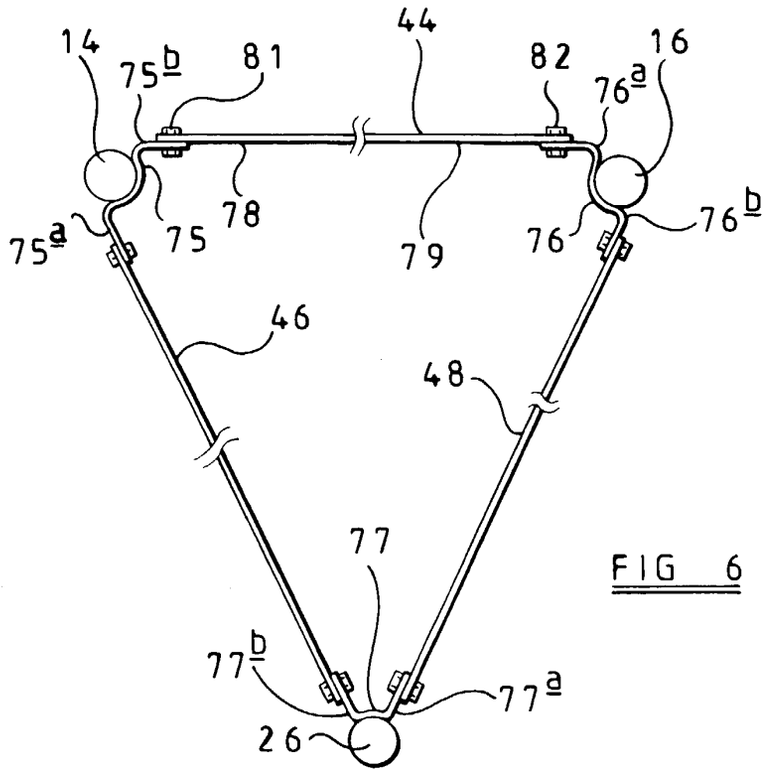
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FIG 6