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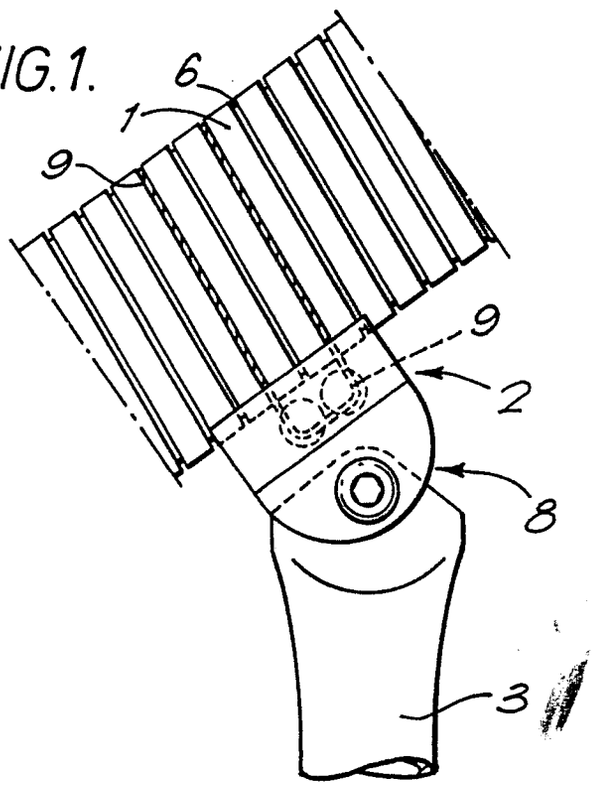
## (54) Spiral staircase.

(57) A spiral staircase including a handrail (1) of tubular flexible construction together with a clamping means (2) comprising a cradle support (8) and an endless loop of cable (9) to mount the handrail (1) to a baluster (3). The cable (9) is passed over the handrail (1), the two runs of the loop (9) being located in a spiral groove (6) of the handrail so that the loop (9) does not stand proud of the handrail (1). When the cable (9) is tensioned the handrail (1) is firmly clamped to the cradle.

The handrail being flexible and in need of alignment it is desirable that the connection between the vertical balusters and the outer ends of the stair treads of the spiral staircase provides for vertical adjustment of the balusters relative to the stair treads. Therefore, there is also provided a baluster mounting bracket including an elongate member (40) comprising an end part (40a) adapted to be slidably mounted in a channel or groove provided in the outer edge of a stair tread (4), a central collar part (40b) slidably engagable with a vertical baluster (3), the other end part (40c) of said member (40) being adapted to be clamped to said channel or groove, and clamping means (42, 43, 44) for clamping the other end part (40c) of said member (40) to said channel or groove, thereby to clamp the baluster (3) to the stairtread (4).

FIG.1.




EP 0 263 600 A2

# SPIRAL STAIRCASE

This invention relates to spiral staircases.

Conventionally handrails for spiral staircases are of two forms. Firstly steel or aluminium core rails are known which are welded or bolted to the tops of the balusters and capped with various thermoplastic cappings, the capping being heated to soften the plastics material and then fitted onto the core rail. The making of such core rails is a slow operation and the appearance of the finished plastic rail is not very pleasing.

Also known are tubular metal rails which are favoured for their comfort in use but are notoriously difficult to form and fix neatly. Usually the tubular handrail is bent in rollers, the shape being judged by eye, or in a mock-up jig, then the underside of the rail has to be accurately marked out for the position of each junction with a baluster, the connections being made by bolting or welding. This procedure is very time consuming and requires great skill to achieve a professional result.

It is an object of the present invention to provide a handrail for a spiral staircase which is easy to shape and to fit to the balusters.

Thus according to the invention a handrail is provided of tubular flexible construction such as will readily assume its required shape without preforming, together with clamping means mountable to the ends of the balusters of a spiral staircase and engageable with the flexible tubular handrail at any desired position along its length to clamp the handrail in position to the balusters.

The invention thus avoids the need to preform handrails to the required shape and accurately to mark out the underside of the rails for each junction with a baluster.

The handrail according to the invention may comprise multiple tubular members one sliding within the other. Thus, for example, the handrail preferably comprises a flexible spirally-wound metal tube of essentially known construction e.g. that used in car exhausts or shower hand sets, although made to the desired size and stiffness. Such a spirally-wound metal tube may be reinforced with an inner flexible plastic tube e.g. an ALCATHENE (Trade Mark) tube. Indeed, over any straight run of the flexible tubular handrail it may be reinforced with a rigid metal tube. The ends of the tube can be capped to provide a neat appearance.

The clamping means may take various forms. Preferably the clamping means include supports, each mountable to the end of a baluster as by bolts or screws so as to be pivotable about an axis perpendicular to the longitudinal axis of the baluster and to the axis of the tubular rail.

Preferably each support defines a cradle to receive and locate the tubular handrail. Thus each support may comprise two angled brackets, positionable back-to-back on opposite sides of the end of a baluster to define a generally Y-shaped support.

Tubular balusters may be provided, the ends to which the clamping means are to be mounted being flattened and drilled to take a fixing bolt or screw also serving as a pivot. To hold the handrail in position to the baluster ends, the clamping means preferably includes an elongate flexible member passable over or around the handrail and tensionable by suitable means to clamp the handrail in position. Whilst a tensionable flexible strap may be provided for the above purpose if, as is preferred, the handrail is in the form of a flexible spirally-wound metal tube having a narrow spiral groove between each winding of the tube, then a loop of wire or cable, desirably stainless steel, can be used in place of a strap, the wire or cable as it passes around the handrail being accomodated within the aforesaid groove. In this way clamping is achieved without creating any obstruction to a hand passing over the surface of the handrail and a neat and attractive fixing can be obtained.

In a preferred embodiment the clamping means is so constructed that the act of mounting the clamping means to the baluster serves to tension the aforesaid elongate flexible member around the handrail. Thus, for example with a support formed of two angled brackets and a closed cable loop engageable with both brackets and passable over or around the handrail, the length of the loop is such that upon the brackets being bolted or screwed to the baluster the cable loop already in position is put under tension and the fixing is complete.

The handrail being flexible and in need of alignment it is desirable that the connection between the vertical baluster and outer ends of the stair treads provide for vertical adjustment of the balusters relative to the stair treads. One suitable form of baluster mounting bracket is discussed in our European Patent Application No. 86302032.7 dated 19th March 1986 in connection with a preferred embodiment of the present invention described hereinafter. Experience has shown the need in some circumstances particularly external staircase installations for a robuster form of mounting bracket.

Thus according to a further aspect of the present invention there is provided a baluster mounting bracket, said bracket including an elongate member comprising an end part adapted to

be slidably mounted in a channel or groove provided in the outer edge of a stair tread, a central collar part slidably engagable with a vertical baluster, the other end part of said member being adapted to be clamped to said channel or groove, and clamping means for clamping said other end part of said elongate member to said channel or groove thereby to clamp said baluster to the stair-tread.

Such a mounting bracket particularly in combination with an all metal stair tread enables a particularly strong fixing to be obtained.

Whilst an intermediate member may be provided for disposition between a baluster and the edge of the stair tread the above bracket has been found to be satisfactory if the baluster is clamped directly to the stair tread edge.

Preferred embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings wherein:-

Figure 1 is a fragmentary side elevation showing a section of handrail, the upper end of a baluster and the clamping means,

Figure 2 is an end elevation of handrail, clamping means and baluster and also illustrating in partial cross-section the interconnection between the baluster and the tread of a staircase, and

Figure 3 is a scrap plan view partially in section illustrating the connection between the baluster and tread.

Figures 4 and 5 are side elevation views of an alternative interconnection between the baluster and tread.

Figure 6 is a plan view, in cross section, of the alternative interconnection between baluster and tread.

Referring to Figures 1 and 2 of the drawings there is shown a handrail 1, clamping means 2, baluster 3, tread 4 and mounting bracket 5 connecting the baluster to the tread. As will be described hereafter the connection between the mounting bracket 5 and the tread 4 readily allows for vertical adjustment of the baluster thus enabling the handrail 1 to be correctly aligned after having been connected to the balusters 3.

The handrail 1 is a spirally-wound metal tube of known construction and sold in different sizes for different purposes under the name "Tubelock" by TI Flexible Tubes Limited. For this purpose the tube is made of a size suitable to serve as a handrail and is reasonably stiff, consistent with being able to take up the required spiral shape without difficulty. This construction has a narrow spiral groove 6 on the outer surface and this is utilised by the clamping means 2 as described hereafter. Also illustrated is an inner stiffening sleeve or tube 7 for the handrail 1. The tube 7 is a sliding fit within the outer spirally-wound handrail 1.

The clamping means 2 comprises a support 8 and an endless loop 9 of stainless steel cable. The support 8 comprises two angle brackets 10 positionable on opposite sides of a flattened end 11 of a baluster 3 and drilled, as is the baluster, to enable the brackets to be screwed together and pivotably mounted to the end of the baluster 3. So assembled the brackets define a generally Y-shaped cradle or support which receives and locates the handrail 1.

On the inner faces of the outwardly angled arms of the brackets 10 are provided pairs of headed studs 12. The loop 9 is looped around the studs 12 of each bracket 10 and is passed over the handrail 1, the two runs of the loop being located in the groove 6. The cable loop 9 therefore does not stand proud of the outer surface of the handrail. The length of the loop is such that as the brackets 10 are presented on opposite sides of the end 11 of the baluster 3 and screwed together and to the baluster, the cable is automatically pulled tight and forces the handrail into place on the cradle support 8 provided by the clamping means 2.

Referring now to Figs. 2 and 3, the interconnection between the balusters 3 and the treads 4 will be described. Each tread 4 is provided with nosing or lipping 25. This lipping has a generally T-shaped channel formed therein as is clearly visible in Fig. 2. The lipping 25 includes a projecting rib 26 which engages a mating slot cut in the tread whereby the lipping 25 can be firmly secured to the tread 4. The mounting bracket 5 for attaching each baluster 3 to a tread 4 comprises two parts 31, 32 cut from an extruded profile and a grub screw 33. A circular hole 34 is formed in each of the parts 31, 32 to provide collars which are a sliding fit with the end of a baluster 5. Each mounting bracket part 31, 32 is also provided with a machined slot 35 which is formed in the rectangular end thereof so that with the parts positioned one above the other the slots, in use, respectively receive one of two engaging portions 36, 37 of the T-shaped channel in the lipping 25 and are then slidable together in the channel. The part 31 which is to be disposed uppermost in use is also provided with a tapped hole 38 which receives the grub screw 33.

In order to secure a baluster 3 to a tread 4, the two metal parts 31, 32 are placed one above the other with their respective holes 34 aligned and their respective machined slots 35 facing oppositely. The baluster 3 extends through both collars. The grub screw 33 is partially screwed into the hole in the upper part 31, but not sufficiently for it to extend completely therethrough. The slotted ends of the parts 31, 32 when overlying one an-

other are trapped within the channel of the lipping 25 but can be slid along the channel. The grub screw 33 is then turned to force the two parts 31, 32 apart.

The movement apart of the rectangular portions of the parts 31, 32 will be limited by the channel in the lipping 7, and continued tightening of the grub screw will cause the collars to diverge and thus wedge on the baluster 3. Sufficient tightening of the grub screw will cause the baluster to be friction held in the collars of the parts 31, 32 and thus prevented from vertical movement.

It will be appreciated that by slackening off the grub screw 33 the height of the baluster is readily adjustable. Thus the flexible handrail can be correctly aligned without difficulty.

The aforesaid interconnection between the balusters 3 and the treads 4 is as described in our European patent application No. 86302032.7 dated March 19, 1986. This application also describes an advantageous means of attaching the spiral staircase treads or their mounting brackets to a central support column of a spiral staircase although of course other conventional means may be used for this purpose.

An alternative interconnection between the balusters 3 and treads 4 is illustrated in Figures 4, 5 and 6. A rail 41 of an all metal stair tread, formed with a generally T-shaped channel, is attached to the outer edge of the tread 4. The baluster mounting bracket includes an elongate member 40 comprising a T-shaped end part 40a, a central collar part 40b and an opposite apertured end part 40c and clamping means in the form of a screw or bolt 42 and a nut or threaded block 43. T-shaped end part 40a slidably engages the T-shaped channel and extends substantially perpendicular to the rail 41, the curved collar part 40b embraces the baluster 3, and end part 40c extending parallel to rail 41 has a hole 44 therethrough into which a screw or bolt 42 is inserted and which engaged with threaded block 43 slidably trapped within rail 41.

In order to secure a baluster 3 to a tread 4, the nut or block 43 is inserted into the end of the rail 41 and moved along into the required position. The T-shaped end part 40a of member 40 is engaged with the rail, whilst collar part 40b embraces the baluster and the screw or bolt 42 can be inserted through the hole 44 in the end part 40c to be received by the nut or threaded block 43. As the screw or bolt 42 is tightened the nut or block 43 is brought up into contact with inner rim of the channel while the straight section of the collar 40 is brought nearer into contact with the rail 41, clamping the baluster 3 to the tread 4.

Slackening of the screw or bolt 42 releases the baluster 3, and allows the height to be easily and simply adjusted. Similarly the position of the baluster and mounting bracket along the edge of the tread 4 may be adjusted upon slackening.

This arrangement is potentially more robust than the previous interconnection described, and may be used in cases where greater stresses may be anticipated as for example with spiral staircases designed for outside use.

## Claims

1. A handrail for a spiral staircase, said handrail being of tubular flexible construction able to assume its required shape without preforming, together with clamping means mountable to the ends of the balusters of a spiral staircase and engageable with the flexible tubular handrail at any desired position along its length to clamp the handrail in position to the balusters.

2. A handrail as claimed in claim 1 comprising a flexible spirally-wound metal tube.

3. A handrail as claimed in claim 1 or 2, comprising multiple tubular members, one slidable within the other.

4. A handrail as claimed in claim 3 comprising an external spirally-wound metal tube reinforced with an inner flexible plastic tube.

5. A handrail as claimed in any of claims 1 to 4 wherein said clamping means includes supports each mountable to the end of a baluster so as to be pivotable about an axis perpendicular to the longitudinal axis of the baluster and to the axis of the handrail.

6. A handrail as claimed in claim 5 wherein each support defines a cradle to receive and locate the handrail.

7. A handrail as claimed in claim 6 wherein each support comprises two angled brackets, positionable back-to-back on opposite sides of the end of a baluster to define a generally Y-shaped support.

8. A handrail as claimed in any preceding claim wherein each clamping means includes an elongate flexible member passable over or around the handrail and tensionable by suitable means to clamp the handrail in position.

9. A handrail as claimed in claim 8 wherein each elongate flexible member is in the form of a loop of wire or cable and is accomodatable in passing over the handrail within a narrow spiral groove in the handrail.

10. A handrail as claimed in claim 8 or 9 so constructed that the act of mounting the clamping means to a baluster serves to tension the elongate flexible member around the handrail.

11. A baluster mounting bracket, said bracket including an elongate member comprising an end part adapted to be slidably mounted in a channel or groove provided in the outer edge of a stair tread, a central collar part slidably engagable with a vertical baluster, the other end part of said member being adapted to be clamped to said channel or groove, and clamping means for clamping said other end part of said elongate member to said channel or groove thereby to clamp said baluster to the stairtread.

12. A baluster mounting bracket as claimed in claim 11 wherein the clamping means comprises a nut or threaded block which is positionable within a channel or groove provided in the outer edge of the stair tread, and a screw or bolt which passes through a hole in said other end part to be received by the nut or threaded bolt whereby the baluster may be clamped between the collar part and stair tread.

13. A spiral staircase having a handrail as claimed in any of claims 1 to 10 and baluster mounting brackets as claimed in claim 11 or 12.

FIG.1.

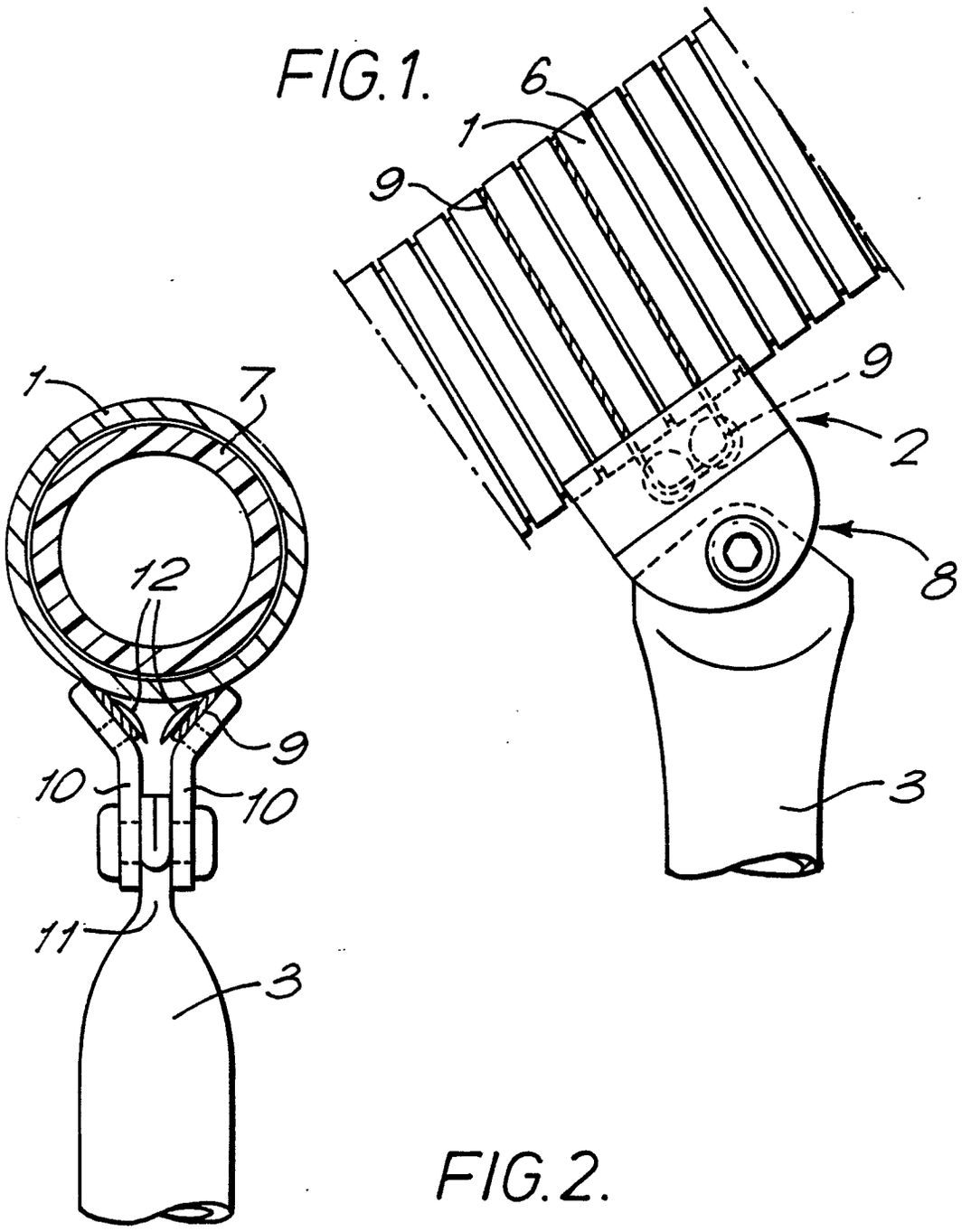
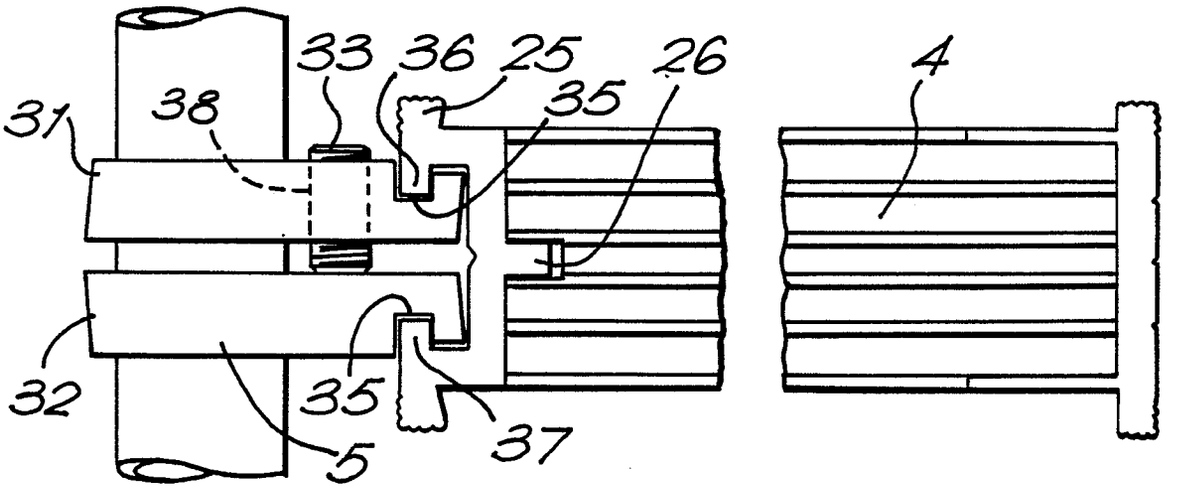



FIG.2.



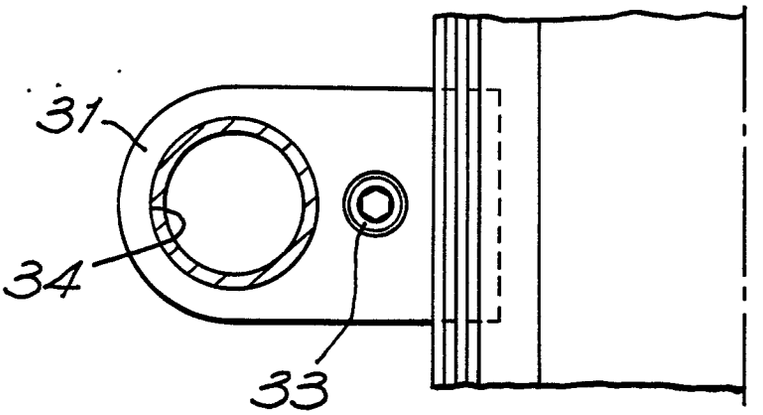



FIG.3.

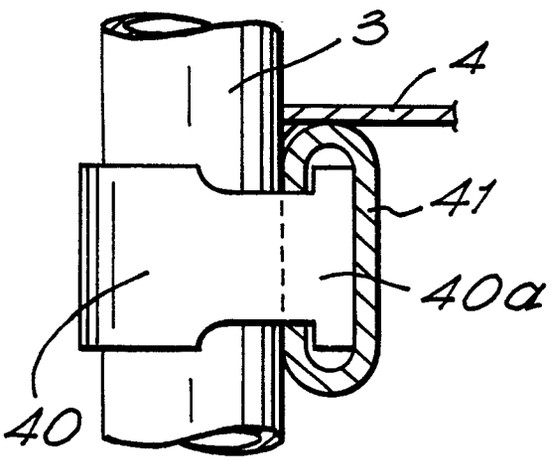



FIG.4.

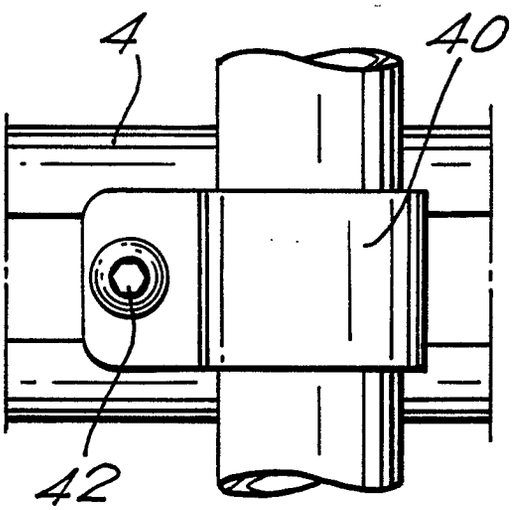



FIG.5.

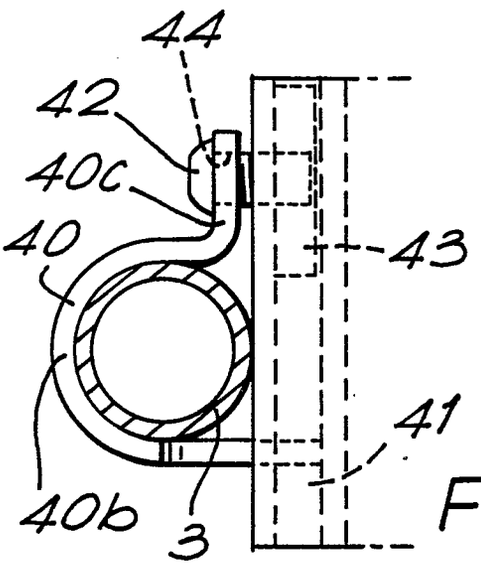



FIG.6.