

[54] **VERTICALLY ADJUSTABLE SUPPORT**

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[52] U.S. Cl. **248/408**

[51] Int. Cl. **F16m 11/04**

[58] Field of Search 108/146; 287/58 CT;
248/407, 408, 409

[56] **References Cited**

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Primary Examiner—William H. Schultz

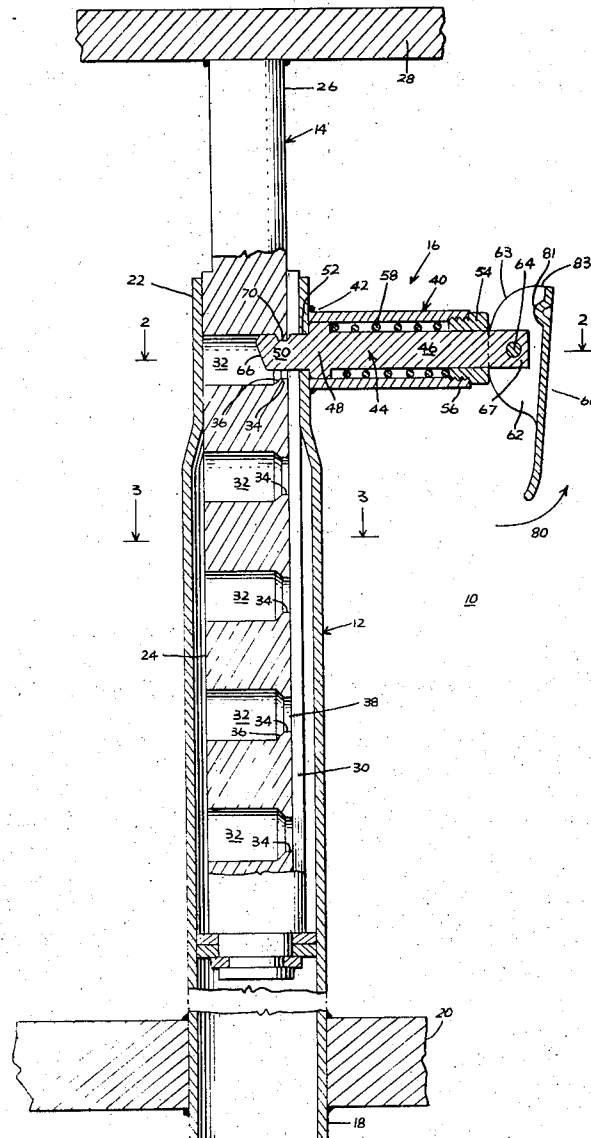
Attorney—Harold B. Hood et al.

[57] **ABSTRACT**

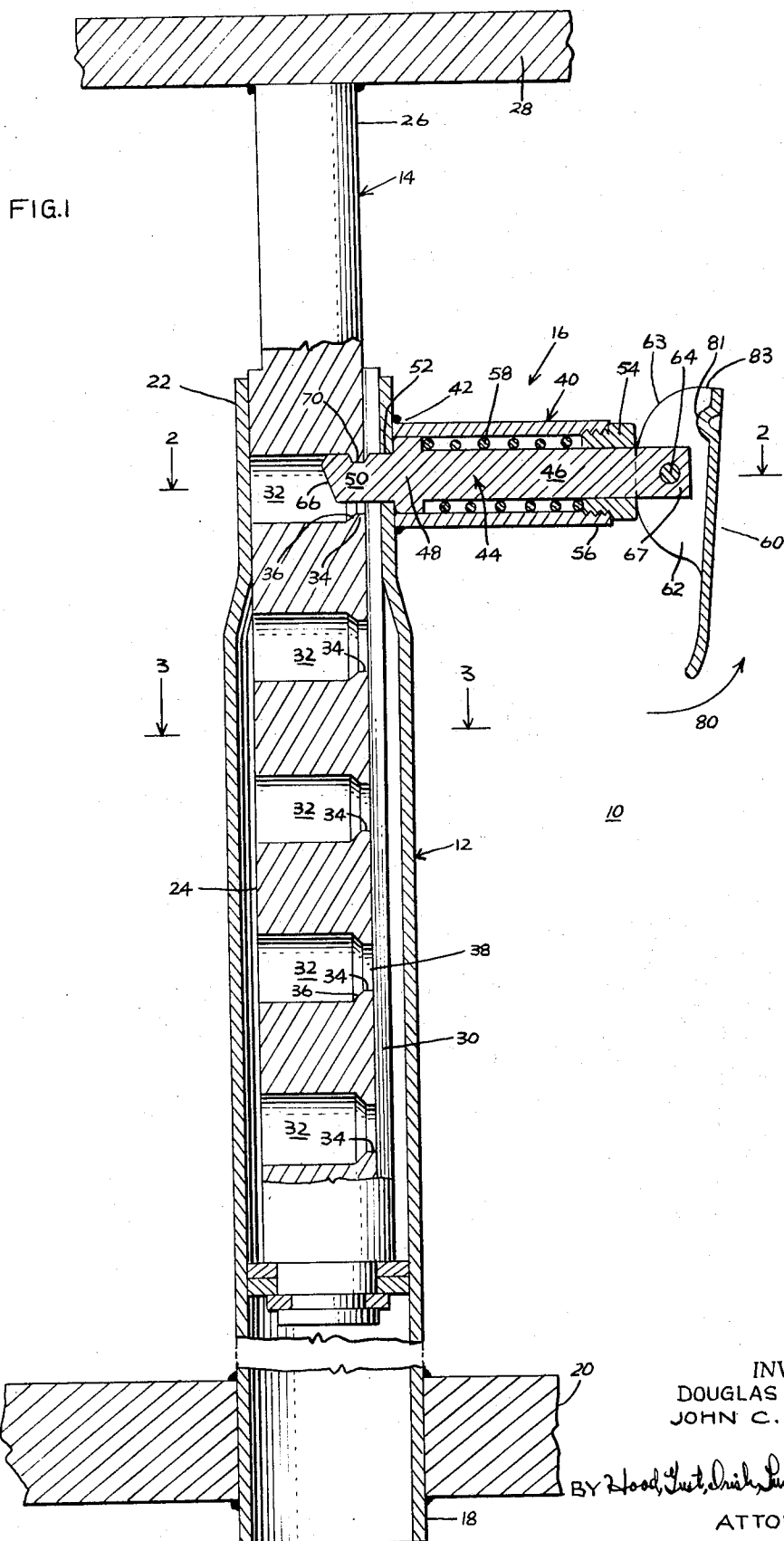
A vertically adjustable seat support assembly for chairs,

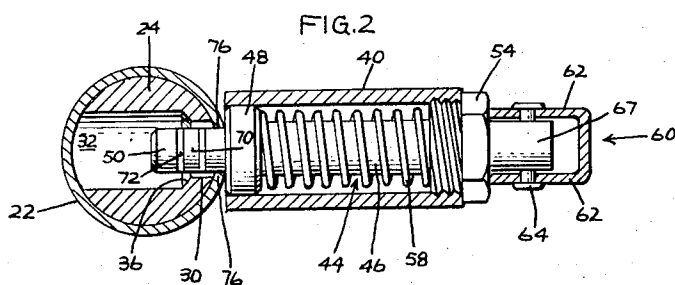
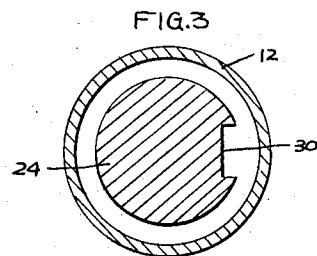
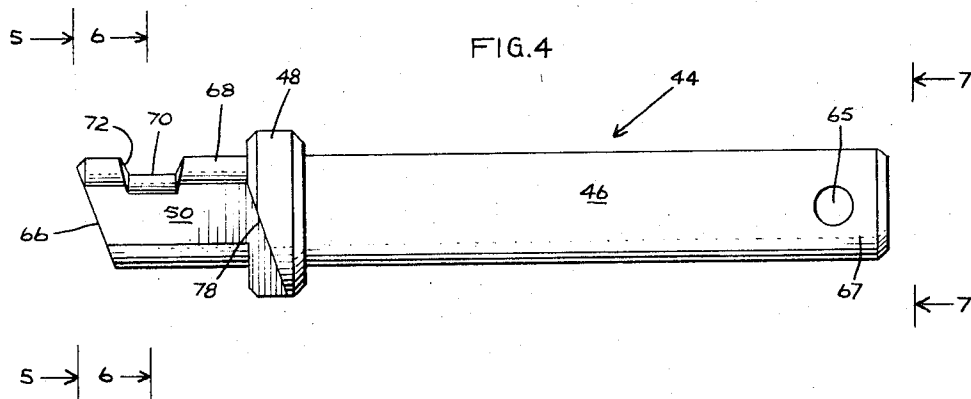
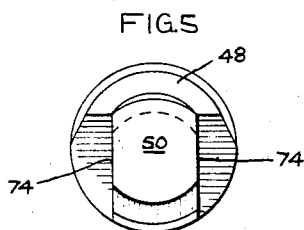
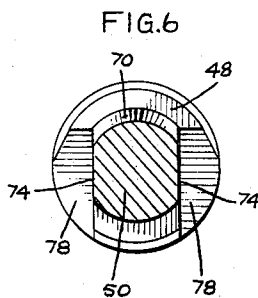
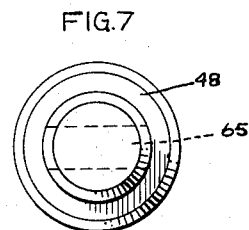
stools and the like. An elongated tubular member has its lower end supported on a base, and an elongated support post is telescopically received in the tubular member and is vertically movable with respect thereto, the upper end of the support post supporting the seat. The post member has a plurality of vertically aligned, spaced holes formed therein. A locking mechanism is provided including a pin and a mechanism on the tubular member for selectively moving the pin laterally between a locking position seated in a selected hole and an unlocked position withdrawn therefrom thereby to hold the post member in a plurality of selected vertical positions. An annular, inwardly extending flange defines the entrance of each hole and the pin has an upwardly facing notch therein which is engaged by the flange in the locking position of the pin in response to a load on the post member thereby preventing withdrawal of the pin to the unlocked position. The locking end of the pin is further provided with an inclined surface that assures locking engagement of the pin with the support post during downward movement of the latter.

6 Claims, 7 Drawing Figures



SHEET 1 OF 2





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VERTICALLY ADJUSTABLE SUPPORT

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to vertically adjustable support assemblies for seats and the like.

2. DESCRIPTION OF THE PRIOR ART

A variety of vertically adjustable seat support assemblies for chairs, stools and the like have been provided. In one known form of such support assembly, an elongated tubular member is provided having its lower end adapted to be supported on a base. An elongated support post member is telescopically received in the tubular member and is vertically movable with respect thereto, the post member having its upper end adapted to support the seat of the chair or stool. The post member has a plurality of vertically aligned, spaced holes formed therein, and a locking mechanism is provided including a pin and means on the tubular member for selectively moving the pin laterally between a locking position seated in a selected hole and an unlocked position withdrawn therefrom. In that known type of support assembly, it was possible to withdraw the locking pin while a person was seated on the chair thereby resulting in sudden and possibly injurious falling of the chair. Further, in such known types of support assemblies, the distal end of the nose of the locked pin has been rounded or blunt thereby rendering it possible for the support post to be moved throughout its entire adjustable length without the pin entering a particular hole. Thus, it was possible for the support post to be in a position with the nose of the pin engaging the post between a pair of holes with the result that the chair would fall when a person sat thereon.

SUMMARY OF THE INVENTION

The invention, in its broader aspects, provides an improvement in the above-described known type of vertically adjustable support assembly in that the wall of each of the holes has a relatively narrow abutment thereon having a downwardly facing portion with the pin having an upwardly facing notch therein which is engaged by the abutment in the locking position of the pin in response to a load on the post member thereby preventing withdrawal of the pin to the unlocked position. In the preferred embodiment, the notch has a cam surface on its side toward the distal end of the pin which cooperates with the respective abutment so as to cam the post member upwardly in response to withdrawal movement of the pin thereby to permit withdrawal of the pin in the absence of a load on the post member. Further, in the preferred embodiment the distal end of the pin is beveled downwardly and rearwardly thereby to assure entry of the pin into a respective hole.

It is accordingly an object of the invention to provide an improved vertically adjustable seat support assembly.

The above-mentioned and other features and objects of this invention and the manner of attaining them will become more apparent and the invention itself will be best understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side longitudinal-sectional view showing the preferred embodiment of the invention;

FIG. 2 is a cross-sectional view taken generally along the line 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view taken generally along the line 3—3 of FIG. 1;

FIG. 4 is a side view of the locking pin employed in the embodiment of FIG. 1;

FIG. 5 is an end view of the locking pin as viewed generally along the line 5—5 of FIG. 4;

FIG. 6 is a cross-sectional view taken generally along the line 6—6 of FIG. 4; and

FIG. 7 is an end view of a locking pin as viewed generally along the line 7—7 of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the Figures of the drawing which are substantially to scale, the improved vertically adjustable seat support assembly of the invention, generally indicated at 10, comprises an elongated, vertically disposed, tubular member 12, an elongated, vertically disposed support post 14, and locking mechanism 16.

Tubular member 12 has its lower end 18 secured to base 20, as by welding, and is supported thereby. Base 20 may form a part of the base for a chair, stool or the like (not shown). Support post 14 is telescopically received in tubular member 12 and is vertically movable with respect thereto. Tubular member 12 has a reduced-diameter portion 22 at its upper end which slidably receives and guides enlarged portion 24 of post member 14. Upper end 26 of post member 14 is adapted to support chair or stool seat 28 thereon which may be attached thereto by suitable means (not shown).

Enlarged portion 24 of post 14 has a longitudinally extending slot 30 therein. A plurality of vertically spaced and aligned holes 32 are formed horizontally through enlarged portion 24 of post 14, respectively, communicating with slot 30. The end of each hole 32 adjacent to the slot 30 has a smaller diameter flange 34 provided with a bevelled inner surface 36, the flange 34 defining an opening 38 in the surface of the slot 30. As will appear, this flange 34 may be considered to be a detent.

Locking mechanism 16 comprises sleeve 40 extending laterally from neck 22 of tubular member 12, having its inner end 42 secured thereto, as by welding. A locking pin 44 has rear portion 46 and shoulder 48 reciprocally positioned in sleeve 40 and has a front portion or nose 50 extending through opening 52 in neck 22. Rear portion 46 slideably extends through bushing 54 threadedly secured to rear end 56 of sleeve 40, the end of the bushing 54 being essentially flat to provide a cam reaction surface explained further later on. Locking pin 44 is selectively reciprocable in sleeve 40 between a forward, locking position (shown in FIG. 1) with nose 50 inserted into a selected hole 32, as shown in FIG. 1, and a rearward, unlocked position in which nose 50 is withdrawn from the hole 32. Locking pin 44 is biased forwardly to its locking position by a suitable helical compression spring 58 surrounding rear portion 46 and acting between shoulder 48 and bushing 54. A manually actuatable lever 60, pivotally secured to the rear end 67 of the pin 44 is provided with two spaced apart parallel sides 62 that straddle the rear end 67, the

edges 63 of the sides 62 being identically shaped as shown and engaged slidingly with the end surface of the bushing 54. The edges 63 being so shaped serve as cam edges or actuating cams which function as will be explained later. A pin 64 pivotally received by a transverse opening 65 in rear end 67 is secured at the ends thereof to the sides 62 as shown. The force of the spring 58 maintains engagement of the cam edges 63 with the bushing 54, the spring 58 compressing as pin 44 is withdrawn when the lever is swung in the direction of arrow 80 to the horizontal position.

Nose 50 of locking pin 44 has an inclined surface 66 on the distal end thereof as shown. Upper surface 68 thereof has an upwardly facing, transversely extending arcuate notch 70. At least side 72 of notch 70 toward end surface 66 is beveled, as shown; in the illustrated embodiment both sides of notch 70 are beveled.

Nose 50 has flat opposite sides 74, as best seen in FIGS. 5 and 6. Opening 52 in portion 22 of tubular member 12 has complementary flat sides 76 (FIG. 2) which slideably guide nose 50 thereby preventing rotation thereof.

Pivotal actuation of lever 60 in the direction shown by arrow 80 (FIG. 1) cams locking pin 44 rearwardly against spring 58 thereby to withdraw nose 50 from an engaged hole 32. When withdrawn to this unlocked position, end surface 66 of nose 50 is disposed in slot 30 thereby preventing rotation of post 14. An indented dimple or abutment 81 in handle 60 is engageable with pin 46 to prevent the flat rear portion 83 of cam edge 63 from locking against the flat surface of nut 54 whereby release of handle 60 will assure return thereof to its illustrated position by reason of the rounded contour of cam edge 63. This prevents the handle from locking in the horizontal position whereby the pin 46 could not engage a hole 32 in post 14.

With locking pin 44 in its locking position (FIG. 1), the upper portion of flange or detent 34 of the respective hole 32 is engaged by notch 70. In the absence of a load on seat 28, beveled side 72 of notch 70 and beveled surface 36 of detent 34 of the respective hole 32 cooperate to cam post 14 slightly upwardly in response to withdrawal movement of pin 44 thereby permitting withdrawal of nose 50 from the respective hole 38 for upward or downward adjustment of post 14. However, with a load on seat 28, the manual force required to actuate lever 60 to withdraw pin 44 is so great as to be in fact prevented. Thus, inadvertent actuation of lever 60 to withdraw pin 44 when a person is sitting on seat 28 with consequent sudden falling of post 14 and the seat is prevented.

The inclined end surface 66 performs a very important function in preventing the collapse downwardly under the weight of a person on seat 28 of the post 14 from a position at which the nose 50 is retracted and engaged with the bottom of slot 39 between two holes 38. This may be best explained as follows. Referring to FIG. 1, assume first that the post 14 has been elevated. Also assume that the locking pin 44 has been retracted such that the nose 50 and end surface 66 is not inserted into a hole 32, 38 but instead is engaged with the bottom of the slot 30 between holes 32 with the handle 60 being in its illustrated position. Thus, the point of the end surface 66 has only abutting engagement with the slot 30. By applying a downward force on the post 14, it may be moved until a hole 32, 38 comes into registry with the pointed extremity of nose 50, with continued

movement permitting deeper entry of nose 50 because of the inclination of surface 66. The spring 58 continually forces the nose 50 deeper into hole 32 with progressive movement of post 14 until the penetration becomes deep enough to produce full entry of the nose 50 into the hole 32 as shown.

If the end surface 66 were vertical, it would be possible for the movement of the post 14 downward to be so rapid that the nose 50 would not enter sufficiently into a hole 38 to become locked therein whereupon the post 14 could collapse to its extreme downward position, the nose 50 being bypassed by all of the holes 38. This is especially true when the transverse dimension of the nose 50 is substantially the same as the diameter of the hole 38. A person sitting on the seat 28 could be injured by falling this entire distance. However, the presence of the inclined end surface 66 avoids this falling by reason of the fact that even though the downward motion of post 14 is rapid, the moment any part of the hole 38 comes into registry with the point of the end surface 66, the latter will begin its entry into the hole 38. As the downward motion of the post 14 progresses, the penetration of the nose 50 increases such that by the time the opening 38 becomes fully registered with the nose 50, the latter will have fully penetrated therein as well as into the adjacent hole 32. The detent 34 will thereby engage the slot 70 locking the post 14 against further downward movement.

Thus, falling of the seat 28 and support post 14 throughout the complete stroke of post 14 with the possibility of consequent injury to the occupant on the seat is prevented.

While there have been described above the principles of this invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of the invention.

We claim:

1. In a vertically adjustable support assembly including an elongated tubular member having upper and lower ends with its lower end adapted to be supported on a base, an elongated support post member of solid cross-section having upper and lower ends with its upper end adapted to support a load, said post member being telescopically received in said tubular member and being vertically movable with respect thereto, said post member having a plurality of vertically aligned, generally horizontal, spaced holes therein, a locking mechanism including a horizontally extending pin and means for selectively rectilinearly moving said pin generally in parallelism with its axis horizontally between a locking position in which one end thereof is seated in a selected hole and an unlocked position in which said end is withdrawn therefrom thereby to hold said post member in a plurality of selected vertical positions, said one end having an end surface which inclines downwardly toward the other end of said pin, said mechanism including means yieldably urging said pin in a horizontal direction in which said one end normally engages said post member when it is not seated in one of said holes, the wall of each of said holes having a relatively narrow abutment extending downwardly, said one pin end having an upwardly facing notch engageable selectively by the abutment of the respective hole into which said pin is entered thereby resisting withdrawal from said hole, each said abutment comprising an annular, inwardly extending flange adjacent to the

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entrance of the respective hole, the inner surface of each flange being beveled, said pin having a distal end, said notch having a beveled surface on the side thereof toward said distal end which cooperates with the beveled surface of the respective flange to cam said post member upwardly in response to withdrawal movement of said pin in the absence of a load on said post member.

2. The assembly of claim 1 wherein said moving means is coupled to said pin adjacent to said other end thereof.

3. The assembly of claim 1 wherein said tubular member has an opening therein through which a portion of said pin extends, said pin portion having flat, opposite sides, said opening having complementary side thereby preventing rotation of said pin.

4. The assembly of claim 1 wherein said moving means includes a manually operable lever pivotally mounted between its ends to said other end of said pin, said locking mechanism including a pin-retaining member rigidly mounted on said tubular member, said lever having a cam portion engageable with said pin-retaining member, said cam portion having a shape that causes withdrawal of said pin as aforesaid upon movement of said lever in a given direction.

5. The assembly of claim 4 wherein said pin-retaining member is hollow and receives for reciprocation therein said pin, said other pin end projecting from said pin-retaining member, and a spring within said pin-retaining member acting on said pin urging it toward said post member.

6. In a vertically adjustable support assembly includ-

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ing an elongated tubular member having upper and lower ends with its lower end adapted to be supported on a base, an elongated support post member of solid cross-section having upper and lower ends with its upper end adapted to support a load, said post member being telescopically received in said tubular member and being vertically movable with respect thereto, said post member having a plurality of vertically aligned, generally horizontal, spaced holes therein, a locking mechanism including a horizontally extending pin and means for selectively rectilinearly moving said pin generally in parallelism with its axis horizontally between a locking position in which one end thereof is seated in a selected hole and an unlocked position in which said end is withdrawn therefrom thereby to hold said post member in a plurality of selected vertical positions, said one end having an end surface which inclines downwardly toward the other end of said pin, said mechanism including means yieldably urging said pin in a horizontal direction in which said one end normally engages said post member when it is not seated in one of said holes, the wall of each of said holes having a relatively narrow abutment extending downwardly, said one pin end having an upwardly facing notch engageable selectively by the abutment of the respective hole into which said pin is entered thereby resisting withdrawal from said hole, said post member having a vertically extending groove formed therein, said holes being formed in said groove, said one end being positioned in said groove in said unlocked position.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,770,236 Dated November 6, 1973

Inventor(s) Douglas D. Marsh and John C. Newlin

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

IN THE SPECIFICATION

Column 2, Line 26, "lowr" should be ---lower---;
Column 2, Line 29, "tublar" should be ---tubular---;
Column 2, Line 49, "clocking" should be ---locking---;
Column 3, Line 56, "39" should ---30---.

Signed and sealed this 9th day of April 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents