Feb. 3, 1959 S. D. SHEARMAN ET AL 2,872,223

EXTENSIBLE COLUMN FOR A STOOL OR THE LIKE

Filed March 17, 1958

2 Sheets-Sheet 1

Fig. 1.

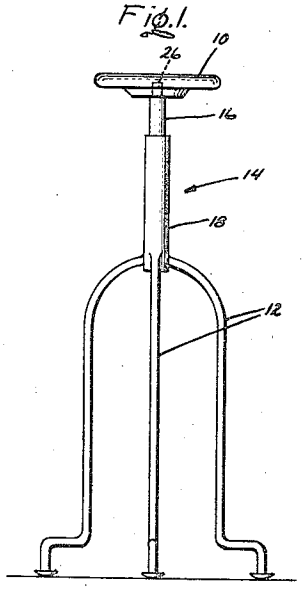


Fig. 2.

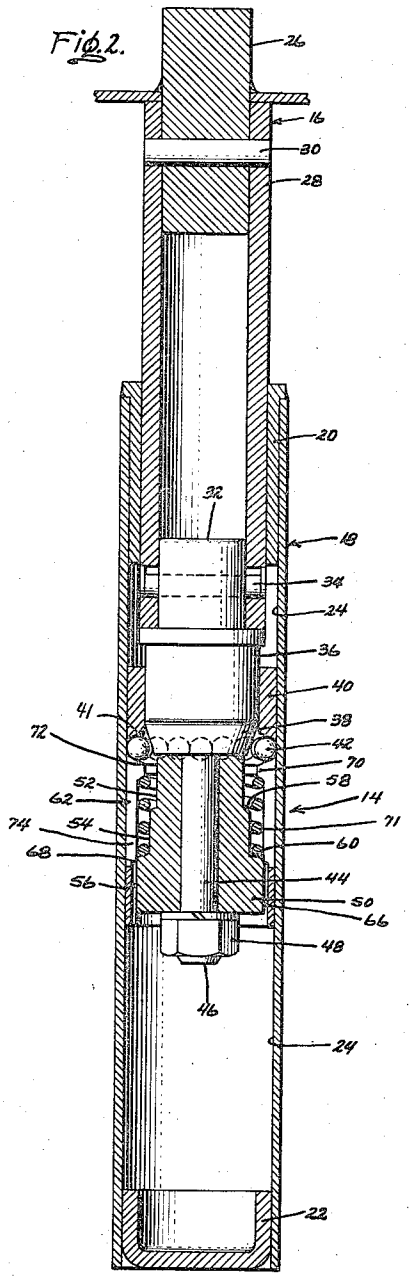
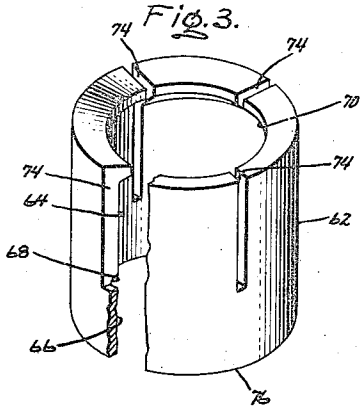


Fig. 3.



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Fig. 4.

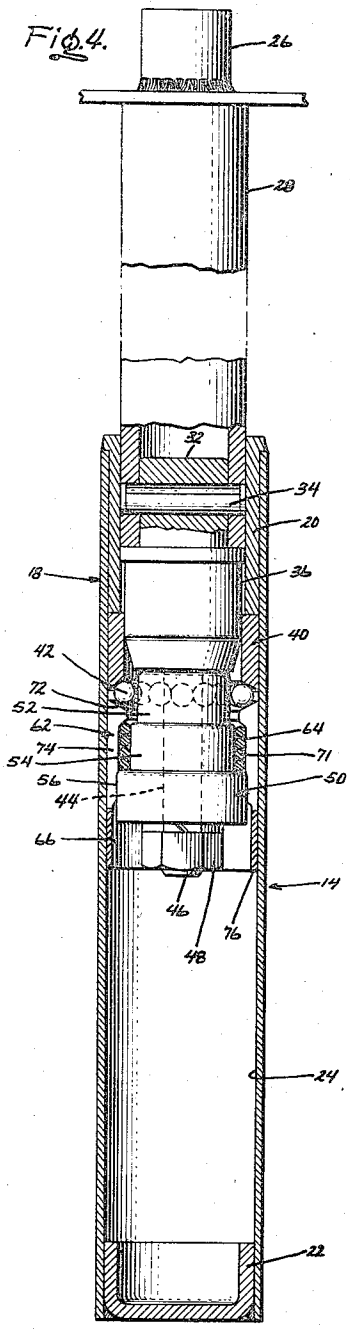


Fig. 5.

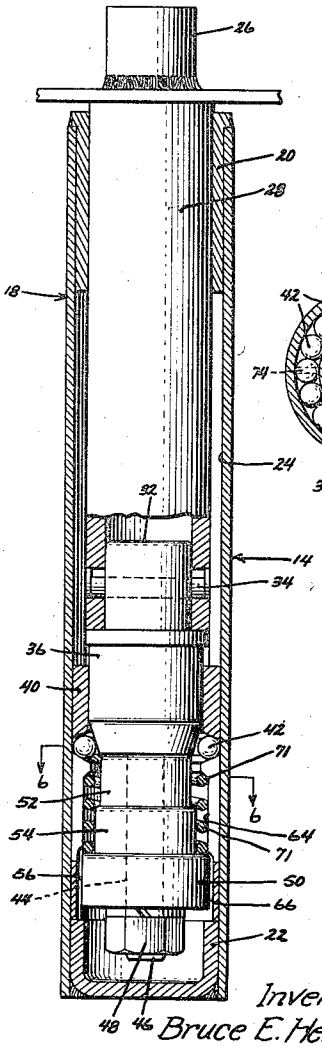
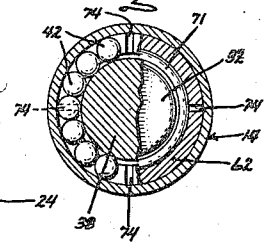


Fig. 6.



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2,872,223

EXTENSIBLE COLUMN FOR A STOOL OR THE LIKE

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Application March 17, 1958, Serial No. 722,066

16 Claims. (Cl. 287—58)

The present invention relates to an extensible column for a stool or the like and more particularly to an extensible support composed of a pair of relatively movable, telescoped members having locking means for selectively securing the members in any desired extended length.

The extensible column of this invention is particularly useful in stools for the purpose of varying the supported height of the seat with respect to the floor. This column, however, may be used in any structural environment in which an adjustable extensible column locked against collapse is desired. Such a column has use in connection with towers, tables, furniture or as chair legs, and many other uses as will occur as obvious to a person skilled in the art.

The stool or similar supported device incorporating this invention is provided with two relatively movable telescoping members, with one of said members secured to the seat and the other of said members secured to the stool legs or base. A locking mechanism is interposed between the two members, which is operable to permit adjustment of the two members with respect to each other and to hold or lock the two members in such adjusted position. This locking means is also provided with automatically operable unlocking means whereby the two members may be collapsed completely one inside the other for reducing the length of the column to a minimum. A still further feature incorporated in the locking mechanism is an arrangement for automatically returning the locking mechanism to its normal operable condition, whereby the extension adjustment as previously explained may be obtained.

It is an object of this invention to provide an extensible column for a stool or the like, which is infinitely adjustable in extended position.

It is still another object of this invention to provide an extensible column of infinitely adjustable length whereby the column may be secured in any extended position within its structural capabilities and locked against collapse.

Other objects will become apparent as the description proceeds.

To the accomplishment of the above and related objects, the invention may be embodied in the forms illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that specific change may be made in the specific construction illustrated and described, so long as the scope of the appended claims is not violated.

In the drawings:

Fig. 1 is a side elevation of a stool incorporating the present invention;

Fig. 2 is a longitudinal sectional illustration of the extensible column;

Fig. 3 is a perspective view of the locking sleeve partially sectioned for clarity of illustration;

Fig. 4 is a view similar to Fig. 2 but with the telescoping members extended to the maximum limit and the locking means moved to inoperative position preparatory to collapsing the two telescoping members;

Fig. 5 is a sectional view similar to Fig. 4 but with the telescoping members completely collapsed and the locking mechanism returned to its operable position; and

Fig. 6 is a cross-section taken substantially on section line 6—6 of Fig. 5.

Referring to the drawings, and more particularly to Figs. 1 and 2, a stool is shown having a seat 10 and legs 12, and an extensible support 14 being connected therebetween. The extensible support 14 comprises two telescoping members 16 and 18, which members are provided with locking mechanism (to be described hereinafter) which permits raising the seat 10 to any desired height within the limit of extension of the column 14. The supported height of the seat 10 is fixed merely by a slight downward force which serves to actuate the locking mechanism preventing the collapse of the telescoping members 16 and 18.

The extensible column 14 is shown more clearly in Fig. 2. The outer member 18 is tubular and preferably formed of cold rolled steel. In the opposite ends of the outer member 18 are fixed two tubular sleeves or abutments 20 and 22, respectively, which are involved in the operation of the locking mechanism to be explained in the following. The abutment 22 is preferably cup-shaped as shown, but may be a sleeve of substantially the same form as the sleeve 20. The inner wall of the tubular member 18 is preferably smooth, but the degree of smoothness is not critical.

The inner member 16 is somewhat more complex in structure than the outer member 18 and is constructed to be freely, axially movable in the member 18. The upper end of the inner member 16 is a post 26 suitably formed for attachment to the stool seat 10. A hollow or tubular strut 28 is telescoped over the post 26 and is pinned or otherwise secured thereto by means of a roll pin 30. In the lower end of this strut 28 is received and secured the reduced diameter end 32 of the column-locking sub-assembly. This reduced end 32 is secured to the strut end by means of a roll pin or the like 34.

Axially extending from and immediately below the reduced end 32 is a cam support 36 of cylindrical shape terminated in a frusto-conical cam surface 38 which extends radially inwardly from the periphery of the cam support 36. Interposed between this cam support 36 and the outer member 18 is a releasing or tripping section or sleeve 40 of such size as to be freely movable with respect to both the outer member 18 and the cam support 36 (or inner member 16).

An annular series of steel balls or rolling elements 42 surround the cam surface 38 and are of such diameter as to be wedged or locked between this cam surface and the inner wall 24 of the outer member 18 when the inner column member 16 is forced in the collapsing direction.

Axially extending from the cam support 38 is a mounting stud 44 threaded at its lower extremity 46 for receiving a mounting nut 48. Received on the stud 44 and secured thereto by nut 48 is a locking member 50 having three different diameter portions 52, 54 and 56, respectively. The portion 52 is the smallest and is disposed adjacent to the cam surface 38. The portion 54 is intermediate in size, and the portion 56 is the largest. Each of these different diameter portions is joined to the next portion by annular shoulders 58 and 60, respectively. This locking member 50 is secured to the inner member 16 and therefore may be considered as a part thereof.

Surrounding the locking member 50 is a locking sleeve 62 which is freely, axially slidable in the outer member

18. The inner wall of this sleeve 62 is divided into two different diameter lengths 64 and 66, which are joined by a chamfered surface 68. The diameter 66 is large enough to have a clearance fit with the largest diameter portion 56 of the sleeve-locking member. This being true, the sleeve 62 is free to move relative to the sleeve-locking member 50 when the sleeve portion 66 surrounds the portion 56.

The sleeve length 64, however, is smaller in diameter than the portion 66, this diameter being slightly smaller than the outer diameter of the sleeve-locking member portion 56. Thus, when the sleeve portion 64 is moved or telescoped over the enlarged portion 56, an interference fit results which frictionally locks the sleeve 62 onto the sleeve-locking member 50. Thus, the portion 64 of the sleeve 62 is said to have an interference frictional fit with respect to the enlarged portion 56 of the sleeve-locking member, while the sleeve length 66 is said to have a clearance fit therewith.

Surrounding the intermediate diameter portion 54 of the sleeve-locking member is a compressed helical spring 71 which bears at one end against the shoulder 60 and at the other end against a radially inwardly projecting ridge 70 on the upper end of the locking sleeve 62. The upper surface 72 of this ridge is conically tapered and normally engaged with the balls 42. This tapered surface 72 normally urges the balls 42 radially inwardly toward the center of the inner member 16. The spring 71 maintains the sleeve 62 in normal engagement with the balls 42.

The balls 42 are straddled by the releasing and locking sections which in the illustrated embodiment comprise the two sleeves 40 and 62, respectively, both of these sleeves having conically tapered ends 41 and 72, respectively, which urge the balls radially inwardly.

The spring 71 need only be strong enough to hold the sleeve surface 72 into engagement with the balls 42 and should have a compressed height which will allow the balls 42 to be moved into the annular space surrounding the smallest portion 52 of the sleeve-locking member 50.

While the sleeve 62 has been described as having a larger diameter portion 66, as will appear from the following, this portion may be dispensed with in some instances. However, it is preferred that this portion 66 be present inasmuch as it improves the operability of the entire assembly.

Since the smaller diameter length 64 of the sleeve 62 has an interference fit with the enlarged portion 56 of the sleeve-locking member 50, it is desirable to provide a series of axially extending slots 74 substantially coextensive with the length 64, which will permit the sleeve to be expanded enough to fit over the enlarged portion 56 in gripping relation. While these slots are described, other frictional gripping means may be used without departing from the spirit or scope of this invention.

With the extensible column as described used in the stool construction of Fig. 1, the column will be upright with the inner member 16 uppermost and the outer member 18 lowermost. The stool is adjusted to a higher, fixed level merely by pulling upwardly on the inner member 16 and then releasing the seat when the desired height has been reached. The member 16 tends to fall downwardly under the force of gravity, but this is prevented by the wedge-locking effect of the balls 42 between the cam surface 38 and the inner wall 24 of the outer member 18. This raising or extending adjustment may be continued until the inner member 16 is fully extended to the position where the upper end of the tripping sleeve 40 meets the lower end of the abutment sleeve 20.

If it is desired to lower the seat 10, the inner member 16 is fully extended to the position shown in Fig. 4. The seat 10, or in other words, the inner member 16, in such extended position has the upper end of the tripping sleeve 40 engaged with the lower end of the abutment sleeve 20. Further upward movement of the inner member 16 results in relative movement between the sleeve 40 and the cam support 36, which relative movement forces the balls 42 into the annular space between the portion 52 of the sleeve-locking member 50 and the inner wall of the outer member 18. The diameter of this portion 52 has a size which will provide a radial space between the periphery thereof and the inner wall of the outer member, which is larger than the diameter of the balls or rolling elements 42. Thus, with the balls so positioned, they are unlocked, or, in other words, moved to inoperative position. The tapered faces on the two sleeves 40 and 62 normally urge the balls 42 inwardly against the periphery of the smallest portion 52.

In addition to the balls 42 being forced into retracted or inoperative position, the locking sleeve 62 is also forced downwardly with the smaller diameter portion 64 frictionally sliding or telescoping over the outer surface of the enlarged portion 56 of the sleeve-locking member. The interference fit between the sleeve and the member is such that the sleeve and member frictionally lock together, the force of the return spring 71 being insufficient to break this frictional lock.

With the assembly so locked in retracted or inoperative position, the inner member 16 may be freely lowered or collapsed into the outer member 18. At the limit of the collapsing movement, the lower end 76 of the sleeve 62 engages the upper end of the abutment 22, and by exerting a slight downward or collapsing force on the inner member 16, the sleeve 62 may be forced upwardly relative to the inner member until the interference fit with the enlarged portion 56 is broken. This frees the sleeve 62 whereupon the spring 71 forces the balls 42 as well as the sleeve 40 upwardly until the balls enter the wedge-shaped, annular space between the cam surface 38 and the outer member wall 24. The column 16 may once again be incrementally raised to any adjusted position within the structural limits of the mechanism.

If the column is used inverted from the position just explained, it would not be necessary to use the spring 71. However, it has been found that improved results are obtained by using this spring regardless of the position in which the column is used.

Since spring force is used in the mechanism, positive, locking operation is always assured, which prevents accidental release of the telescoped members, which could result in serious injury to a person sitting on the stool.

While the sleeve-locking member 50 has been shown as mounted on a stud 44 extending from the inner member 16, an alternative embodiment of this invention has the sleeve-locking member 50 integral with the inner member 16. This integral construction requires that the sleeve 62 be axially split along its entire length so that it may be expanded enough to be assembled over the sleeve-locking member.

Another form of the invention resides in eliminating the second or intermediate diameter portion 54 in the sleeve-locking member, which portion serves to center and retain the spring 71 in position.

A still further modification, which is regarded as falling within the scope of the invention, eliminates the tapers on the lower and upper ends, respectively, of the sleeves 40 and 62. While the removal of these tapers is not regarded as an equivalent of the tapers, nevertheless, such alternative construction falls within the scope and spirit of this invention.

Other alternative constructions will occur to a person skilled in the art without departing from the scope of this invention, such as making the cross-sectional shape of the telescoped members, the related sleeves and other parts square or ovular. Also, the rolling elements 42 may be cylindrical instead of spherical.

What is claimed is:

1. For use in combination with a stool or the like, two relatively movable telescoped members, the outer member being tubular, a frusto-conical cam surface on the inner member between the ends thereof, a reduced diameter portion on said inner member joining said cam surface, said cam surface extending radially inwardly from said reduced diameter portion, a plurality of balls lockingly engageable with said cam surface and the inner wall of said outer member, a tripping sleeve surrounding said reduced diameter portion and engageable at one end with said balls, said sleeve being movable relative to both of said members, a mounting stud on said inner member coaxially extending from said cam surface, a sleeve-locking member secured on said stud and having three stepped diameter portions which are joined in annular shoulders and arranged with the smallest and largest diameter portions on opposite sides of the intermediate diameter portion, the smallest portion disposed adjacent said cam surface and having a diameter smaller than the diameter of said cam surface, said balls having a diameter smaller than the radial space between said outer member and said smallest diameter portion, a locking sleeve surrounding said sleeve-locking member freely axially slidable in said outer member, an annular ridge at one end of said sleeve which projects radially inwardly toward said smallest diameter portion of said sleeve-locking member, the inner diameter of said ridge clearing at least said smallest diameter portion, a depressed conically tapered surface on the outer end of said ridge engageable with said balls on the side opposite said tripping sleeve for urging them radially inwardly toward said inner member, the inner wall of said locking sleeve being divided into two different diameter lengths joined by a chamfered surface, the larger diameter length extending from the end of said sleeve opposite said ridge and having a clearance fit with the largest diameter portion of said sleeve-locking member, the smaller diameter length being intermediate the ends of said locking sleeve and having a frictional interference fit with said largest diameter portion but a clearance fit with the intermediate diameter portion, said locking sleeve having an axially extending split along its smaller diameter length, a compressed helical spring surrounding said intermediate diameter portion and bearing at one end against the annular shoulder formed with the largest diameter portion and at its other end against said ridge for urging said locking sleeve into engagement with said balls and said balls into locking engagement with said cam surface and said outer member, said larger diameter length surrounding said largest diameter portion when said balls are in locking position and said smaller diameter length surrounding and frictionally engaging said largest diameter portion when said balls are in unlocked position, and two annular abutment elements secured to the opposite end portions respectively of said outer member for selective engagement with said tripping and locking sleeves respectively, said inner member being movable inside said abutment elements.

2. For use in combination with a stool or the like, two relatively movable telescoped members, the outer member being tubular, a frusto-conical cam surface on the inner member between the ends thereof, a reduced diameter portion on said inner member joining said cam surface, said cam surface extending radially inwardly from said reduced diameter portion, a plurality of balls lockingly engageable with said cam surface and the inner wall of said outer member, a tripping sleeve surrounding said reduced diameter portion and engageable at one end with said balls, said sleeve being movable relative to both of said members, a sleeve-locking member secured to and axially extending from said cam surface, said sleeve-locking member having three stepped diameter portions which are joined in annular shoulders and arranged with the smallest and largest diameter portions on opposite sides of the intermediate diameter portion, the smallest portion disposed adjacent said cam surface and having a diameter smaller than the diameter of said cam surface, said balls having a diameter smaller than the radial space between said outer member and said smallest diameter portion, a locking sleeve surrounding said sleeve-locking member freely axially slidable in said outer member, an annular ridge at one end of said sleeve which projects radially inwardly toward said smallest diameter portion of said sleeve-locking member, the inner diameter of said ridge clearing at least said smallest diameter portion, a depressed conically tapered surface on the outer end of said ridge engageable with said balls on the side opposite said tripping sleeve for urging them radially inwardly toward said inner member, the inner wall of said locking sleeve being divided into two different diameter lengths joined by a chamfered surface, the larger diameter length extending from the end of said sleeve opposite said ridge and having a clearance fit with the largest diameter portion of said sleeve-locking member, the smaller diameter length being intermediate the ends of said locking sleeve and having a frictional interference fit with said largest diameter portion but a clearance fit with the intermediate diameter portion, said locking sleeve being axially split along its smaller diameter length, a compressed helical spring surrounding said intermediate diameter portion and bearing at one end against the annular shoulder formed with the largest diameter portion and at its other end against said ridge for urging said locking sleeve into engagement with said balls and said balls into locking engagement with said cam surface and said outer member, said larger diameter length surrounding said largest diameter portion when said balls are in locking position and said smaller diameter length surrounding and frictionally engaging said largest diameter portion when said balls are in unlocked position, and two annular abutment elements secured to the opposite end portions respectively of said outer member for selective engagement with said tripping and locking sleeves respectively, said inner member being movable inside said abutment element.

3. For use in combination with a stool or the like, two relatively movable telescoped members, the outer member being tubular, a frusto-conical cam surface on the inner member between the ends thereof, and extending radially inwardly from the periphery of said inner member, a plurality of balls lockingly engageable with said cam surface and the inner wall of said outer member, a tripping sleeve surrounding said inner member and engageable at one end with said balls, said sleeve being movable relative to both of said members, a sleeve-locking member having three stepped diameter portions which are joined in annular shoulders and arranged with the smallest and largest diameter portions on opposite sides of the intermediate diameter portion, the smallest portion secured adjacent said cam surface and having a diameter smaller than the diameter of said cam surface, said balls having a diameter smaller than the radial space between said outer member and said smallest diameter portion, a locking sleeve surrounding said sleeve-locking member freely axially slidable in said outer member, an annular ridge at one end of said sleeve which projects radially inwardly toward said smallest diameter portion of said sleeve-locking member, the inner diameter of said ridge clearing at least said smallest diameter portion, a depressed conically tapered surface on the outer end of said ridge engageable with said balls on the side opposite said tripping sleeve for urging them radially inwardly toward said inner member, the inner wall of said locking sleeve being divided into two different diameter lengths joined by a chamfered surface, the larger diameter length extending from the end of said sleeve opposite said ridge and having a clearance fit with the largest diameter portion of said sleeve-locking member, the smaller diameter length being intermediate the ends of said locking sleeve

and having a frictional interference fit with said largest diameter portion but a clearance fit with the intermediate diameter portion, a compressed helical spring surrounding said intermediate diameter portion and bearing at one end against the annular shoulder formed with the largest diameter portion and at its other end against said ridge for urging said locking sleeve into engagement with said balls and said balls into locking engagement with said cam surface and said outer member, said larger diameter length surrounding said largest diameter portion when said balls are in locking position and said smaller diameter length surrounding and frictionally engaging said largest diameter portion when said balls are in unlocked position, and two annular abutment elements secured to the opposite end portions respectively of said outer member for selective engagement with said tripping and locking sleeves respectively, said inner member being movable inside said abutment elements.

4. For use in combination with a stool or the like, two relatively movable telescoped members, the outer member being tubular, a frusto-conical cam surface on the inner member between the ends thereof and extending radially inwardly from the periphery of said inner member, a plurality of balls lockingly engageable with said cam surface and the inner wall of said outer member, a tripping sleeve surrounding said inner member and engageable at one end with said balls, said sleeve being movable relative to both said members, a sleeve-locking member having three stepped diameter portions which are joined in annular shoulders and arranged with the smallest and largest diameter portions on opposite sides of the intermediate diameter portion, said sleeve-locking member being secured to said inner member with the smallest portion adjacent to said cam surface and having a diameter smaller than the diameter of said cam surface, said balls having a diameter smaller than the radial space between said outer member and said smallest diameter portion, a locking sleeve surrounding said sleeve-locking member freely axially slidable in said outer member, an annular ridge at one end of said sleeve which projects radially inwardly toward said smallest diameter portion of said sleeve-locking member, the inner diameter of said ridge clearing at least said smallest diameter portion, a depressed conically tapered surface on the outer end of said ridge engageable with said balls on the side opposite said tripping sleeve for urging them radially inwardly toward said inner member, the inner wall of said locking sleeve being divided into two different diameter lengths joined by a chamfered surface, the larger diameter length extending from the end of said sleeve opposite said ridge and having a clearance fit with the largest diameter portion of said sleeve-locking member, the smaller diameter length being intermediate the ends of said locking sleeve and having a frictional interference fit with said largest diameter portion but a clearance fit with the intermediate diameter portion, means for yieldably urging said locking sleeve into engagement with said balls and said balls into locking engagement with said cam surface and said outer member, said larger diameter length surrounding said largest diameter portion when said balls are in locking position and said smaller diameter length surrounding and frictionally engaging said largest diameter portion when said balls are in unlocked position, and two abutment elements secured near the opposite ends of said outer member for selective engagement with said tripping and locking sleeves respectively, said inner member being movable relative to said abutment elements.

5. For use in combination with a stool or the like, two relatively movable telescoped members, the outer member being tubular, a frusto-conical cam surface on the inner member between the ends thereof and extending radially inwardly from the periphery of said inner member, a plurality of balls lockingly engageable with said cam surface and the inner wall of said outer member, a tripping sleeve surrounding said inner member and engageable at one end with said balls, said sleeve being movable relative to both said members, a sleeve-locking member having three stepped diameter portions which are joined in annular shoulders and arranged with the smallest and largest diameter portions on opposite sides of the intermediate diameter portion, said sleeve-locking member being secured to said inner member with the smallest portion disposed adjacent to said cam surface and having a diameter smaller than the diameter of said cam surface, said balls having a diameter smaller than the radial space between said outer member and said smallest diameter portion, a locking sleeve surrounding said sleeve-locking member freely axially slidable in said outer member, an annular ridge at one end of said sleeve which projects radially inwardly toward said smallest diameter portion of said sleeve-locking member, the inner diameter of said ridge clearing at least said smallest diameter portion, a depressed conically tapered surface on the outer end of said ridge engageable with said balls on the side opposite said tripping sleeve for urging them radially inwardly toward said inner member, the inner wall of said locking sleeve being divided into two different diameter lengths joined by a chamfered surface, the larger diameter length extending from the end of said sleeve opposite said ridge and having a clearance fit with the largest diameter portion of said sleeve-locking member, the smaller diameter length being intermediate the ends of said locking sleeve and having a frictional interference fit with said largest diameter portion but a clearance fit with the intermediate diameter portion, means for urging said locking sleeve into engagement with said balls and said balls into locking engagement with said cam surface and said outer member, said larger diameter length surrounding said largest diameter portion when said balls are in locking position and said smaller diameter length surrounding and frictionally engaging said largest diameter portion when said balls are in unlocked position, and two abutment elements near the opposite end portions respectively of said outer member for selective engagement with said tripping and locking sleeves respectively, said inner member being movable relative to said abutment elements.

6. For use in combination with a stool or the like, two relatively movable telescoped members, the outer member being tubular, a frusto-conical cam surface on the inner member between the ends thereof and extending radially inwardly from the periphery of said inner member, a plurality of rolling elements lockingly engageable with said cam surface and the inner wall of said outer member, a tripping sleeve surrounding said inner member and engageable at one end with said rolling elements, said sleeve being movable relative to both said members, a sleeve-locking member having at least two stepped diameter portions, said sleeve-locking member extending axially from and being secured to said inner member with the smaller diameter portion disposed adjacent to said cam surface, said rolling elements having a diameter smaller than the radial spacing between said outer member and said smaller diameter portion, a locking sleeve surrounding said sleeve-locking member freely axially slidable in said outer member, one end of said locking sleeve being engageable with said rolling elements on the side opposite said tripping sleeve, the inner wall of said locking sleeve being divided into two different diameter lengths, the larger diameter length extending from the end of said locking sleeve opposite said one end and having a clearance fit with the larger diameter portion of said sleeve-locking member, the smaller diameter length of said locking sleeve having a frictional interference fit with said larger diameter portion but a clearance fit with the smaller diameter portion, means for urging said locking sleeve into engagement with said rolling elements and said rolling elements into locking engagement with said cam surface and said outer member, said larger diameter length surrounding said larger diameter portion when

said rolling elements are in locking position and said smaller diameter length surrounding and frictionally engaging said larger diameter portion when said rolling elements are in unlocked position, and two abutment elements near the opposite end portions respectively of said outer member for selective engagement with said tripping and locking sleeves respectively, said inner member being movable relative to said abutment elements.

7. For use in combination with a stool or the like, two relatively movable telescoped members, a tapered cam surface on the inner member between the ends thereof and extending radially inwardly from the periphery of said inner member, at least one rolling element lockingly engageable with said cam surface and the inner wall of said outer member, a tripping sleeve surrounding said inner member and engageable at one end with said rolling element, said sleeve being movable relative to both said members, a sleeve-locking member having at least two stepped diameter portions, said sleeve-locking member extending axially from and being secured to said inner member with the smaller diameter portion disposed adjacent to said cam surface, said rolling element being smaller than the radial spacing between said outer member and said smaller diameter portion, a locking sleeve surrounding said sleeve-locking member freely axially slidable in said outer member, a projection at one end of said sleeve which extends radially inwardly toward said smaller diameter portion of said sleeve-locking member, the inner portion of said projection clearing said smallest diameter portion, said projection being engageable with said rolling element on the side opposite said tripping sleeve for urging said rolling element radially inwardly toward said inner member, the inner wall of said locking sleeve being divided into two different diameter lengths, the larger diameter length extending from the end of said sleeve opposite said projection and having a clearance fit with the largest diameter portion of said sleeve-locking member, the smaller diameter length being intermediate the ends of said locking sleeve and having a frictional interference fit with said larger diameter portion but a clearance fit with the smaller diameter portion, means for urging said locking sleeve into engagement with said rolling element and said rolling element into locking engagement with said cam surface and said outer member, said larger diameter length surrounding said largest diameter portion when said rolling element is in locking position and said smaller diameter length surrounding and frictionally engaging said largest diameter portion when said rolling element is in unlocked position, and two abutment elements near the opposite end portions respectively of said outer member for selective engagement with said tripping and locking sleeves respectively, said inner member being movable relative to said abutment elements.

8. For use in combination with a stool or the like, two relatively movable telescoped members, a frusto-conical cam surface on the inner member between the ends thereof and extending radially inwardly from the periphery of said inner member, a plurality of rolling elements lockingly engageable with said cam surface and the inner wall of said outer member, a tripping sleeve surrounding said inner member and engageable at one end with said rolling elements, said sleeve being movable relative to both said members, a sleeve-locking member extending axially from and secured to said inner member adjacent to said cam surface, said sleeve-locking member having a small diameter portion adjacent said cam surface and a larger diameter portion remote from said cam surface, said rolling elements having a diameter smaller than the radial space between said outer member and said smaller diameter portion, a locking sleeve surrounding said sleeve-locking member freely axially slidable in said outer member, one end of said locking sleeve being engageable with rolling elements on the side opposite said tripping sleeve, the inner wall of said locking sleeve being divided into two axially spaced different diameter lengths, the larger diameter length of said sleeve having a clearance fit with the larger diameter portion of said sleeve-locking member, the smaller diameter length having a frictional interference fit with said larger diameter portion, said larger diameter length surrounding said larger diameter portion when said rolling elements are in locking position and said smaller diameter length surrounding and frictionally engaging said larger diameter portion when said rolling elements are in unlocked position, means for urging said locking sleeve into engagement with said rolling elements and said rolling elements into locking engagement with said cam surface and said outer member, and two abutment elements near the opposite end portions respectively of said outer member for selective engagement with said tripping and locking sleeves respectively, said inner member being movable relative to said abutment elements.

9. For use in combination with a stool or the like, two relatively movable telescoped members, a tapered cam surface on the inner member between the ends thereof and extending radially inwardly from the periphery of said inner member, a plurality of rolling elements lockingly engageable with said cam surface and the inner wall of said outer member, a tripping sleeve surrounding said inner member and engageable at one end with said rolling elements, said sleeve being movable relative to both said members, an annular recess in said inner member adjacent to the smaller diameter portion of said cam surface, an enlarged portion on said inner member adjacent to said recess on the side opposite said cam surface, said rolling elements having a diameter smaller than the radial space between said recess and said outer member, a locking sleeve surrounding said enlarged portion freely axially slidable in said outer member, one end of said locking sleeve being engageable with said rolling elements on the side opposite said tripping sleeve, the inner wall of said locking sleeve being divided into two axially spaced different diameter lengths, the larger diameter length having a clearance fit with said enlarged portion, the smaller diameter length having a frictional interference fit with said enlarged portion, said larger diameter length surrounding said enlarged portion when said rolling elements are in locking position and said smaller diameter length surrounding and frictionally engaging said enlarged portion when said rolling elements are in unlocked position, means for urging said locking sleeve into engagement with said rolling elements and said rolling elements into locking engagement with said cam surface and said outer member, and two abutment elements near the opposite end portions respectively of said outer member for selective engagement with said tripping and locking sleeves respectively, said inner member being movable relative to said abutment elements.

10. For use in combination with a stool or the like, two relatively movable telescoped members, a tapered cam surface on the inner member between the ends thereof and extending radially inwardly from the periphery of said inner member, a plurality of rolling elements lockingly engageable with said cam surface and the inner wall of said outer member, a tripping sleeve surrounding said inner member and engageable at one end with said rolling elements, said sleeve being movable relative to both said members, an annular recess in said inner member adjacent to the smaller diameter portion of said cam surface, an enlarged portion on said inner member adjacent to said recess on the side opposite said cam surface, said rolling elements having a diameter smaller than the radial space between said recess and said outer member, a locking sleeve surrounding said enlarged portion freely axially slidable in said outer member, one end of said locking sleeve being engageable with said rolling elements on the side opposite said tripping sleeve, the inner wall of said locking sleeve being divided into two axially spaced different diameter lengths, the larger diameter length having a clearance fit with said enlarged

portion, the smaller diameter length having a frictional interference fit with said enlarged portion, said larger diameter length surrounding said enlarged portion when said rolling elements are in locking position and said smaller diameter length surrounding and frictionally engaging said enlarged portion when said rolling elements are in unlocked position, and two abutment elements near the opposite end portions respectively of said outer member for selective engagement with said tripping and locking sleeves respectively, said inner member being movable relative to said abutment elements.

11. For use in combination with a stool or the like, two relatively movable telescoped members, the outer member being tubular, a frusto-conical cam surface on the inner member between the ends thereof and extending radially inwardly from the periphery of said inner member, a plurality of rolling elements lockingly engageable with said cam surface and the inner wall of said outer member, a tripping sleeve surrounding said inner member and engageable at one end with said rolling elements, said sleeve being movable relative to both said members, a sleeve-locking member having at least two stepped diameter portions, said sleeve-locking member extending axially from and being secured to said inner member with the smaller diameter portion disposed adjacent to said cam surface, said rolling elements having a diameter smaller than the radial spacing between said outer member and said smaller diameter portion, a locking sleeve surrounding said sleeve-locking member freely axially slidable in said outer member, one end of said locking sleeve being engageable with said rolling elements on the side opposite said tripping sleeve, the inner wall of said locking sleeve being divided into two different diameter lengths, the larger diameter length extending from the end of said locking sleeve opposite said one end and having a clearance fit with the larger diameter portion of said sleeve-locking member, the smaller diameter length of said locking sleeve having a frictional interference fit with said larger diameter portion but a clearance fit with the smaller diameter portion, said larger diameter length surrounding said larger diameter portion when said rolling elements are in locking position and said smaller diameter length surrounding and frictionally engaging said larger diameter portion when said rolling elements are in unlocked position, and two abutment elements near the opposite end portions respectively of said outer member for selective engagement with said tripping and locking sleeves respectively, said inner member being movable relative to said abutment elements.

12. For use in combination with a stool or the like, two relatively movable telescoped members, a tapered cam surface on the inner member extending inwardly from the periphery thereof, at least one rolling element lockingly engageable with said cam surface and the inner wall of the outer telescoped member, a tripping element interposed between and relatively movable with respect to said telescoped members, said tripping element being engageable with said rolling element, a recessed portion in said inner member adjacent to the radially inner portion of said cam surface, an enlarged portion on said inner member adjacent to said recessed portion on the side opposite said cam surface, a locking sleeve surrounding said recessed and enlarged portions and being engageable with said rolling element on the side opposite from said tripping element, said sleeve being movable inside said outer member, the inner wall of said sleeve being axially divided into two different diameter lengths, the larger diameter length having a clearance fit with said enlarged portion, the smaller diameter portion having a frictional fit with said enlarged portion, means yieldably urging said sleeve into engagement with said rolling element, and two abutments on said outer member engageable respectively by said tripping element and said locking sleeve, said abutments being spaced apart in straddling relation to the tripping element in assembly with the locking sleeve.

13. For use in combination with a stool or the like, two relatively movable telescoped members, a tapered cam surface on the inner member extending inwardly from the periphery thereof, at least one rolling element lockingly engageable with said cam surface and the inner wall of the outer telescoped member, a tripping element interposed between and relatively movable with respect to said telescoped members, said tripping element being engageable with said rolling element, a recessed portion in said inner member adjacent to the radially inner portion of said cam surface, an enlarged portion on said inner member adjacent to said recessed portion on the side opposite said cam surface, a locking sleeve surrounding said recessed and enlarged portions and being engageable with said rolling element on the side opposite from said tripping element, said sleeve being movable inside said outer member, the inner wall of said sleeve being axially divided into two different diameter lengths, the larger diameter length having a clearance fit with said enlarged portion, the smaller diameter portion having a frictional fit with said enlarged portion, and two abutments on said outer member engageable respectively by said tripping element and said locking sleeve, said abutments being spaced apart in straddling relation to the tripping element in assembly with the locking sleeve.

14. For use in combination with a stool or the like, two relatively movable telescoped members, a tapered cam surface on the inner member extending inwardly from the periphery thereof, at least one rolling element lockingly engageable with said cam surface and the inner wall of the outer telescoped member, a tripping element interposed between and relatively movable with respect to said telescoped members, said tripping element being engageable with said rolling element, a recessed portion in said inner member adjacent to the radially inner portion of said cam surface, an enlarged portion on said inner member adjacent to said recessed portion on the side opposite said cam surface, a locking sleeve surrounding said recessed and enlarged portions and being engageable with said rolling element on the side opposite from said tripping element, said sleeve being movable inside said outer member, the inner wall of said sleeve being axially divided into two different diameter lengths, the larger diameter length having a clearance fit with said enlarged portion, the smaller diameter portion having a frictional fit with said enlarged portion, and means for selectively alternatively forcing said tripping element and said locking sleeve into engagement with said rolling element.

15. For use in combination with a stool or the like, two relatively movable telescoped members, a tapered cam surface on the inner member extending inwardly from the periphery thereof, at least one rolling element lockingly engageable with said cam surface and the inner wall of the outer telescoped member, releasing and locking means comprising releasing and locking sections relatively movable with respect to said telescoped members, said releasing section being engageable with said rolling element, a locking member on said inner member on the side of said cam surface opposite said releasing section, said locking section interposed between said inner and outer members and engageable with said rolling element on the side opposite said releasing section, and means for locking said locking member and said locking section together at a first relative position therebetween which retracts said locking section from said rolling element, and means for selectively unlocking said locking section from said locking member at a second relative position therebetween which disposes said locking section into engagement with said rolling element.

16. For use in combination with a stool or the like, two relatively movable telescoped members, a tapered cam surface on the inner member extending inwardly from the periphery thereof, at least one rolling element

lockingly engageable with said cam surface and the inner wall of the outer telescoped member, means yieldably urging said rolling element into engagement with said cam surface, a friction element on the inner member which projects radially into the space between said inner and outer members, a locking sleeve surrounding said inner member and said friction element, said sleeve being engageable at one end with said rolling element, the inner wall of said locking sleeve being divided axially into two

different diameter lengths, the larger diameter length having a clearance fit with said friction element and the smaller diameter length having a frictional fit with said friction element, and means selectively moving said locking sleeve into and out of frictional engagement with said friction element for locking and unlocking said rolling element respectively.

No references cited.