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[54] COUNTERBALANCE FOR GYMNASTIC APPARATUS

13 Claims, 4 Drawing Figs.

[52] U.S. Cl. 248/162, 272/63
[51] Int. Cl. A63b 13/00
[50] Field of Search 248/162, 123, 297; 108/146, 136; 272/62, 63

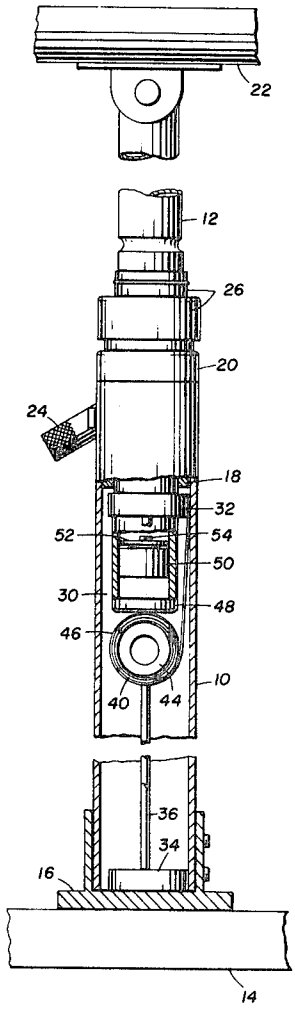
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ABSTRACT: A counterbalance for gymnastic apparatus, such as parallel bars, having one or more upright tubular columns, each of which in turn is provided with a piston telescopically adjustable therewithin. In the preferred forms of the invention, one or more spirally rolled springs of flat spring material are located within each column, the outer ends of the springs being fixed therein so that the spring axes are disposed transversely of the column axis. The lower end of the piston is in continuous contact with one of the springs so that as the piston is lowered that spring, together with any others, are unrolled thereby and vice versa. The strength of the spring or springs is selected so that it or they alone will maintain the piston at any desired elevation independently of any other mechanism employed for adjusting its elevation or for locking it to the column.



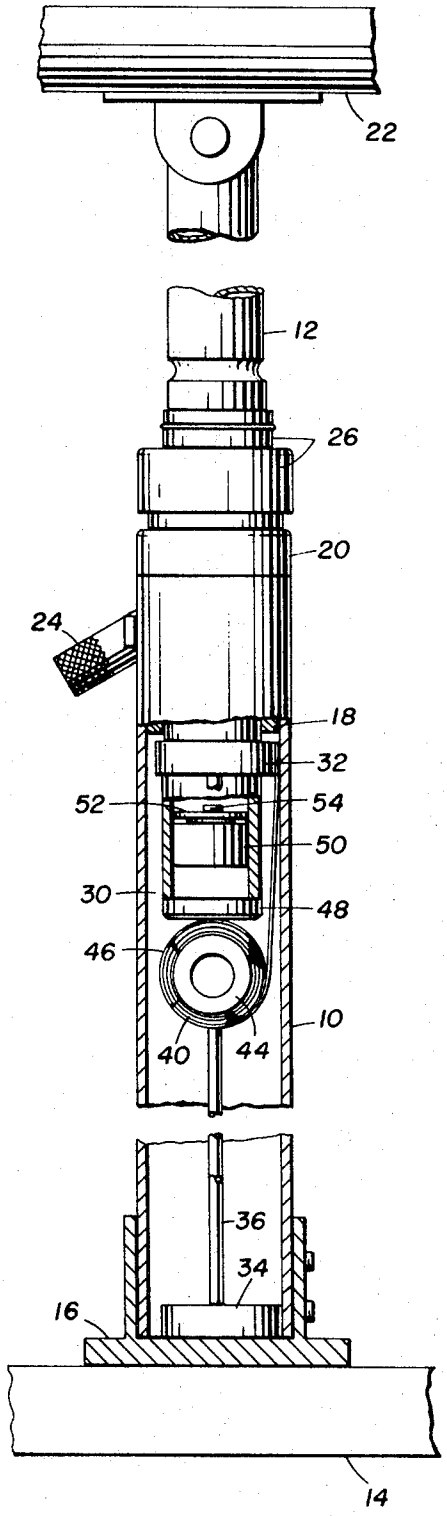
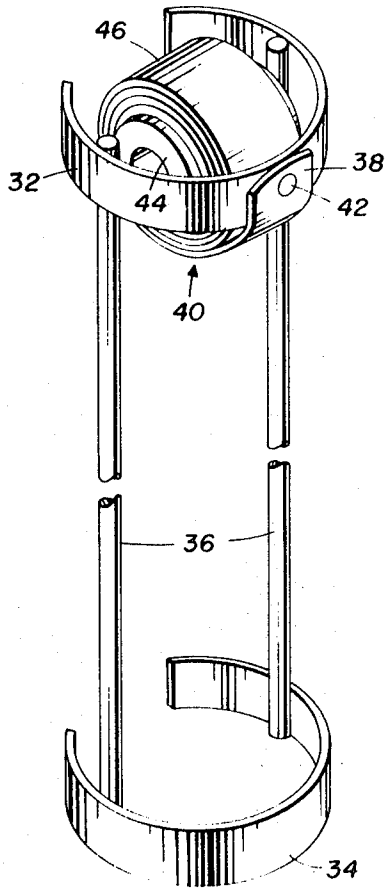


FIG 1

FIG 2



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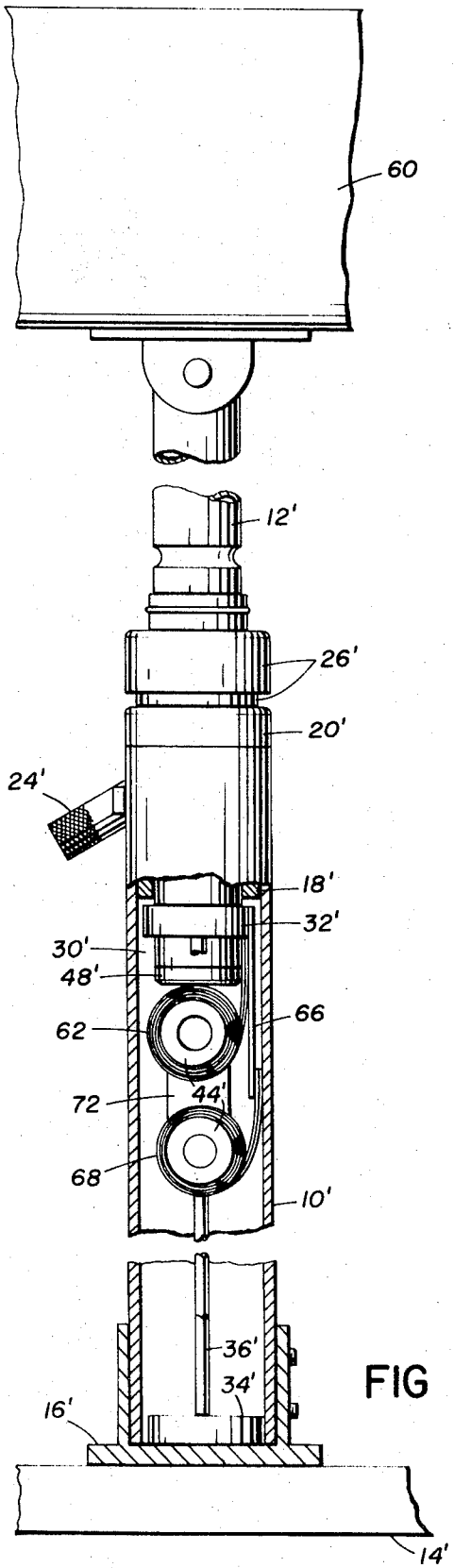


FIG 3

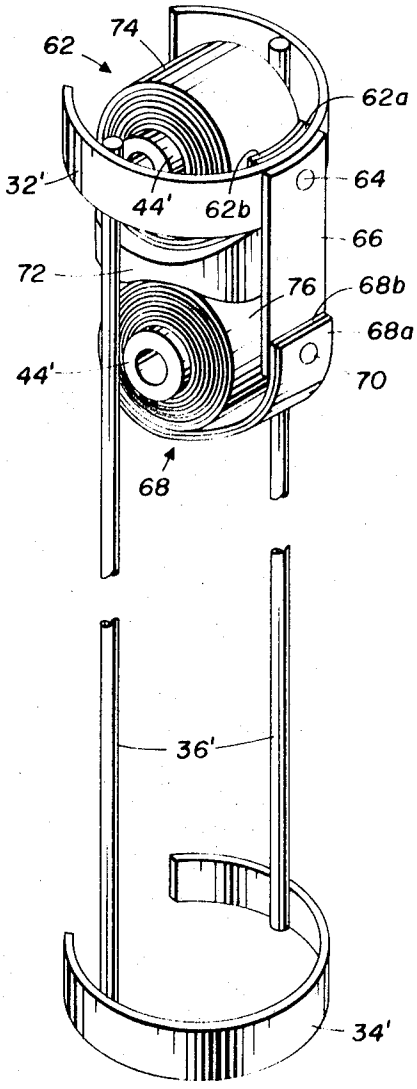


FIG 4

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COUNTERBALANCE FOR GYMNASTIC APPARATUS

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation of application Ser. No. 668,137, filed Sept. 15, 1967, and now abandoned.

BACKGROUND OF THE INVENTION

As is well known, much gymnastic apparatus, such as even and uneven parallel bars, balance beams, side horses and vaulting bucks typically employs one or more upright supporting members, each in the form of an outer stationary column and an inner telescoping piston to whose upper end is attached the apparatus concerned. By adjustment of the pistons up or down in their columns the height of the apparatus may be varied to suit the occasion. Each such column is also necessarily equipped with some device for locking the piston to the column once the proper height has been established. A wide variety of such devices are known and used for this purpose, most of them being some form of clamp. It is also desirable to include additional means which, even when the clamp is released, prevents the piston from collapsing into the column and yet at the same time readily permits its height to be selectively adjusted over a number of fixed positions or intervals and there maintained without need of the clamp. Furthermore, especially in the case of parallel bars in order to vary the spacing therebetween, such adjusting means should also permit the piston to be rotated relative to the column while so maintained at any such position. One such combination of a clamp and additional adjusting means is disclosed in U.S. Pat. No. 3,402,952 to George P. Nissen et al.

Even when both the foregoing mechanisms are employed, there still exists the danger during the adjusting procedure that the piston, which of course is weighted by the particular apparatus it supports, may accidentally collapse into the column. For instance, particularly in the case of parallel bars, the bars themselves, which are carried by the pistons, are frequently at or above the height of the typical performer, especially in the case of children. During the adjusting procedure, each piston must be grasped in such a manner that the head and shoulders of the person are directly below the elevated bar. Should the piston slip or be inadvertently released for one reason or another, it and the bar it carries will drop downwardly with great force and can, and in fact often has, produced substantial personal injury. Or the sudden collapse of the piston into the column can badly pinch, or even sever, the fingers in addition to striking the head or shoulders. The same danger is also present during the height adjustment of a balance beam, a side horse or a vaulting buck, especially a balance beam because of its great weight, inasmuch as it is necessary to stoop down beneath the apparatus in order to make the adjustment. Obviously, therefore, especially where children are involved, it is most desirable to provide a support for the piston which will maintain it at any height, even when all other clamps and devices have been released, and yet will permit the piston to be moved up or down with little effort and no hazard. This is the chief object of the present invention.

In order to accomplish the foregoing, some form of counterbalance suggests itself. But whatever the form of counterbalance, it should meet certain definite specifications. In the first place, it should be as simple and as reliable as possible. Preferably, it should also be wholly contained within the column itself in order both not to mar the overall appearance of the apparatus and not to present any undue projections which may accidentally injure performers. Nor must it significantly reduce the range of piston travel. Finally, it should be easily adaptable to apparatus already in use as well as to that of new manufacture. These requirements, however, have not been heretofore met in a desirable and practical fashion. For instance, if a typical compressible coil spring assembly is employed, disposed both within the piston as well as within the column, the working force of the spring is not constant enough over the entire range of piston travel. That is to say, the counterbalancing will be inadequate in the upper positions of the piston and excessive in the lower. In neither of those positions will the piston maintain its elevation when the lockup clamp and any additional adjusting mechanism are released, but will either drop until the counterforce of the spring becomes effective or, as the case may be, will leap up until the counterforce of the spring diminishes sufficiently to equal the weight on the piston. The foregoing would be even more true were a shorter spring to be placed between the bottom of the column and the lower end of the piston, instead of also up within the piston, and in addition would prohibitively restrict the range of piston travel owing to binding of the spring coils. In short, what is needed is something which will provide substantially constant and adequate counterbalancing action over a comparatively long range of piston movement.

SUMMARY OF THE INVENTION

The solution to the foregoing problems has been achieved by means which are both effective and at the same time meet the other criteria listed above. The heart of the invention, in its preferred forms, is the employment of one or more springs, each of flat, ribbonlike spring material spirally rolled up upon itself. These are wholly disposed in each column in such a manner that as the piston is lowered from its uppermost position, it causes the spring or springs to be unrolled. A particular characteristic of such springs, which distinguishes them from the spiral clock-type spring, is that their inner ends are not fixed to any pin or centerpiece but are unsecured with respect to their outer ends. Thus, they do not "unwind" and "rewind" in the manner of a clock spring but merely unroll and reroll up. Owing to their nature the springs exert a substantially constant counterbalancing force over substantially the entire range of piston travel and can easily be so chosen that only a slight effort up or down on the piston will cause it to move, inertia and friction being sufficient to maintain it without more at whatever elevation is desired. Furthermore, owing to the fact that typically the interior diameter of the lower part of the column is materially greater than the outer diameter of the piston, the spring or springs are attached to a retaining assembly which can be easily inserted as a unit into the column in the annular space formed between the piston and the lower column portion. Thus the counterbalance can be readily applied to older apparatus as well as to new.

The retaining assembly comprises a pair of laterally spaced, C-shaped clips, connected by a pair of rods, which are compressible to resiliently engage the inner wall of the lower column portion so that they spacedly surround the piston. The outer end of the spring or springs is attached to the upper clip, the axis of the springs lying at a right angle to the axis of the column, and the lower clip abuts the bottom of the column, thus locating the assembly and the springs. The lower end of the piston, in turn, preferably directly engages the face of the spring or springs and causes the same to unroll as the piston descends. Accordingly, since the spring or springs when unrolled form merely a straight strip or ribbon, which then lies in the annular space between the pistons and the inner wall of the lower column portion, substantially the full range of piston travel is preserved.

A single, spirally rolled-up flat spring of dimensions suitable for accommodation within each column has been found sufficient for use in each of the four columns which are typically employed in parallel bar apparatus, both even and uneven. When heavier apparatus must be counterbalanced, such as a vaulting buck or the smaller side horses, two such springs may be spirally rolled up together in laminate fashion and attached at their outer ends to the retaining assembly. In the case of still heavier apparatus, such as the large side horses, a pair of such double rolled-up springs may be disposed in tandem one above the other and separated by a follower block, the lower end of the piston bearing against the upper double spring and transmitting the weight through it and the follower directly to the lower double spring. Since the springs are essentially annular in shape, they are provided with nylon cores whose ends

closely abut the spacer rods of the retaining assembly, thus preventing undue lateral movement of the springs during their unrolling and rerolling-up movements. An effective, simple and reliable counterbalance is therefore provided. It is wholly contained within the column, thereby presenting no exterior protuberances, is easily inserted or removed from the apparatus, imposes a uniform force upon the piston at all times and substantially unimpairs the range of piston travel.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a truncated, elevational view of one column and piston assembly as employed in typical parallel bar apparatus, certain portions being broken away, showing located therein a single spring counterbalancing assembly according to the present invention.

FIG. 2 is an isometric view of the counterbalancing assembly of FIG. 1 shown removed from the column.

FIG. 3 is similar to FIG. 1 but illustrates a counterbalancing assembly employing a pair of double rolled-up laminar springs in tandem as applied to a typcial balance beam.

FIG. 4 is similar to FIG. 2 and illustrates the counterbalancing assembly of FIG. 3 removed.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the form of the invention shown in FIGS. 1 and 2, 10 and 12 illustrate one of the four tubular columns and pistons, respectively, of a typical parallel bar apparatus of the form shown in U.S. Pat. No. 3,232,609 to George P. Nissen et al. The latter includes abase 14 fabricated of flattened steel tubing which supports four rectangularly spaced pedestals 16 having flanged bases into which are secured the lower ends of the columns 10. The upper ends of columns 10 are fitted with sleeved inserts 18, having shouldered collars 20 abutting the upper ends of columns 10, which slidably and rotatably receive and guide the removable pistons 12 to whose upper ends in turn are attached the bars 22. The clamp or lockup device 24 and the additional adjusting mechanism 26 are as described in the aforesaid U.S. Pat. No. 3,402,952 but they are not further described herein inasmuch as the present invention is quite independent of whatever lockup or other adjusting mechanism may be employed. Further details of the parallel bar apparatus generally are found in the aforesaid U.S. Pat. No. 3,232,609.

Owing to the sleeved inserts 18, an annular space 30 is formed between the inner wall of each column 10 below its sleeved insert 18 and the outer wall of its piston 12. That space in turn accommodates a counterbalance retaining assembly comprising a pair of aligned, upper and lower C-shaped spring clips 32 and 34, respectively, which resiliently engage the inner walls of the column 10 circumferentially thereof. The upper clip 32 is disposed just below the lower end of the sleeved insert 18 while the lower clip 34 sits on the flanged base of the pedestal 16. The two clips 32 and 34 are jointed by a pair of parallel connecting rods 36 whose ends are welded to the respective inner faces of clips 32 and 34 both so that the rods 36 are equally disposed from the spaced ends of each clip and lie roughly in an axial plane through column 10. Since the clips 32 and 34 and the connecting rods 36 lie wholly in the annular space 30, they do not interfere with the travel of piston 12. Opposite the spaced ends of the upper clip 32 and midway between the ends of rods 36 the outer end 38 of a spiral spring 40, of flat or ribbonlike spring material rolled up upon itself, in the manner described above is suitably fixed at 42 to the clip 32 so that the axis of the spring itself unrolls in a direction toward the lower clip 34, that is, downwardly. The hollow core of spring 40 is fitted with a guide bushing 44, which as shown may be in the form of a short length of nylon tubing or other appropriate material, whose ends closely abut the connecting rods 36, thus preventing undue lateral movement of the spring 40 during its unrolling and rerolling-up movements.

When each bar 22 and its two pistons 12 are removed from their columns 10 and the latter in turn from their pedestals 16, each counterbalance assembly can be readily inserted into the position in its column 10 as shown in FIG. 1 upon compression of its clips 32 and 34. The counterbalance can, therefore, be adapted as easily to apparatus already in the field as to that newly produced. When in position, the outer face 46 of each spring 40 will be in contact with the lower end of its respective piston 12 throughout the latter's travel in either direction during which it will cause spring 40 to unroll or reroll up, as the case may be, the unrolled portion lying in the annular space 30. In order to provide a suitable rubbing surface at the lower end of each piston 12 to rotatably bear against the outer face 46 of its spring 40, a capped plug 48 of suitable material such as nylon is inserted in the lower end of each piston 12 and retained by a compression bushing 50 sandwiched between plug 48 and a nut-and-washer assembly 52. A suitable screw 54, whose head is recessed within the outer end of plug 48, activates the compression bushing 50 and securely retains the plug 48 in position. When the clamps 24 and the additional adjusting mechanism 26 are released, the height of each bar 22 in maintained without more. A slight effort up or down on the bar 22 or its pistons 12 will easily move the same, and yet once the effort is removed each bar will remain at whatever height is selected owing to the constant working force of the springs 40 throughout substantially their entire deflection or travel. At the same time, there is no significant restriction in the range of piston movement.

It is, of course, understood that four counterbalance assemblies of the foregoing nature are employed in each set of parallel bars. In the case of the parallel bars particularly referred to, the total weight of each bar and its tow attached pistons is approximately 32 lbs. Thus in order to counterbalance the same, each spring 40 acting upon its piston 12 must have a working force of approximately 16 lbs. Springs of the foregoing nature are disclosed in U.S. Pat. Nos. 2,609,191 and 2,609,192 and those used are manufactured by the Hunter Spring Division of Ametek, Inc., Hatfield, Pennsylvania, whose Bulletin 310–66, which describes such springs generally and their various applications, may be referred to for further information. The particular spring employed has a material thickness of 0.020 inches, a width of 1.25 inches, an overall diameter of approximately 1.75 inches, and a working deflection of approximately 24 inches, the overall length of the unrolled spring being approximately 34 inches. In the cases of parallel bar apparatus other than that specifically mentioned, the weight of each bar and its two pistons will not vary significantly from the foregoing so that springs of comparatively little different specifications from the above would be suitable. In any event, the most important thing is that the columns of the apparatus be of sufficient internal diameter to accommodate the wound springs.

The form of the invention shown in FIGS. 3 and 4, which is suitable for heavier apparatus such as balance beams and the larger side horses, is basically like that of FIGS. 1 and 2 and since supports similar to those for parallel bars are employed in the case of both balance beams and side horses, the like components of the balance beam 60 are given identical but primed reference numerals. Likewise, each counterbalance retaining assembly is also essentially the same except as to its overall length (owing to the fact that the two columns 10' of the balance beam are each shorter than the four columns 10 of the parallel bars) so that again the same but primed reference numerals are used. The difference lies in the springs themselves. Two such springs are concurrently rolled up together in spiral fashion to provide in effect an upper double, laminar spring 62 in each column 10' whose outer ends 62*a* and 62*b* are secured at 64 to the upper retaining clip 32' in the same manner as the single spring 40 to the clip 32. A depending plate 66 is secured at its upper end also at 64 to clip 32' and extends downwardly a sufficient distance in order that the outer ends 68*a* and 68*b* of a lower double, laminar spring 68, identical to spring 62, may be secured at 70 to the lower end of plate 66 such that the spring 68 is disposed in spaced tan-

dem relationship to and below spring 62, both springs 62 and 68 unrolling in the same downwardly direction toward the clip 34'. The hollow cores of springs 62 and 68 are each fitted with guide bushings 44' similar to bushings 44 and for the same purpose. A cylindrical follower 72 of similar material, dished at its upper and lower ends concentric with the outer faces 74 and 76 of springs 62 and 68, respectively, is fitted between the latter so that unrolling and rerolling-up movements are transmitted therethrough from one spring to the other. The lower end of each piston 12' rides on the outer face 74 of spring 62 and is provided with a capped end plug 48' similar to plugs 48 and secured in the same manner. The insertion of each counterbalance assembly into its column 10' and its operation is otherwise the same as in the embodiment of FIGS. 1 and 2.

In the case of the particular balance beam illustrated, the weight of the beam 60 and its two pistons 12' is such that each half of each of the double, laminar springs 62 and 68 may be substantially identical to the springs 40 in working force and other dimensions except unrolled length, owing to the lesser height of columns 10'. That is to say, each double spring 62 ad 68 exerts a force of approximately 32 lbs. throughout its working length or a total of about 128 lbs. divided equally between the two pistons 10'. The reason the tandem arrangement is employed in this particular instance is because the internal diameter of each column 10' is insufficient to accommodate a single, much wider and so stronger spring, or two double springs disposed side by side, for instance, though of course in other applications where sufficient room is available some such alternate arrangement may be feasible. In any event, the spring arrangements and combinations disclosed above have proved the most satisfactory under the circumstances.

Apparatus of weights between that of parallel bars and balance beams, such as the lighter side horses and vaulting bucks, can also be readily accommodated by modifications of the present invention. For instance, a single double rolled-up spring can be used, or a single rolled-up spring and a double rolled-up spring in tandem. By employing various multiples and arrangements of a single basic or modular spring a proper spring strength can be found to fit most any requirement. Furthermore, it is not necessary that the bottom ends of the pistons directly contact the springs inasmuch as obviously some other, though more elaborate, scheme could be devised by which the weight of the suspended apparatus is transmitted to the springs. Likewise, other means of installation of the springs in the apparatus could also readily be arranged, even in a case where there is insufficient space or none at all between the piston and the interior column wall. In that case, the outer end of the spring could be secured directly to the wall in a recess and a channel provided therebelow to receive the unrolled portion of the spring as the piston descends. Finally, other embodiments of the springs could also conceivably be employed so long as they may unroll and reroll up upon movement of the piston. That is to say, each spring must unroll when forces transversely with respect to a central axis about which the spring is rolled up are imposed upon its outer end and the rolled-up body of the spring. For example, a spring, helically rolled up on a cylinder or bobbin, or spirally rolled up in a storage drum, could be used In such cases, the bobbin or drum could be disposed below the piston and would travel up and down therewith. The ends of the springs would thus be fixed relative to the column and the piston so that descent of the latter would impart unrolling movement to the springs. However, such arrangements as these and others would be necessarily more complex and costly and so are not preferred to the simpler and more direct arrangements disclosed in detail herein.

Accordingly, though the invention has been disclosed in form of two particularly embodiments, being the best modes known of carrying it out, it is not by any means limited thereto. Instead, the following claims are to be read as covering all modifications and adaptations of the invention falling within the spirit and scope thereof.

We claim:

1. A counterbalance for use in an upright hollow column forming part of gymnastic apparatus and adapted to act between the column and the lower end of a piston received in a d movable along the column and the lower end of a piston received in and movable along the column, said counterbalance comprising: a self-contained assembly separate from the column and piston adapted to be removably inserted as a unit and wholly contained in the column, said assembly including at least one rolled-up spring of flat ribbonlike spring material carried by said assembly and secured at its outer end to said assembly to fix said spring end relative thereto, said spring being unrollable about an axis against its resiliency relative to said spring end upon movement of said spring in a direction corresponding to downward movement of the piston in the column, said spring axis being disposed transversely of said direction of spring movement and intersecting a line generally corresponding to the axis of movement of the piston in the column, said spring being guided during said movement thereof by guide means formed in part by said assembly and carried by the rolled-up portion of said spring, said guide means resisting lateral axial movement of the rolled-up portion of said spring and rotation of the axis thereof in planes parallel to said direction of spring movement to restrain twisting of said spring, and means adapted to fix said assembly relative to the column, said means including a pair of compressible retainers and spacing means holding said retainers in spaced relationship, the outer end of said spring being fixed adjacent one of said retainers so that said direction of spring movement is toward the other of said retainers, said spacing means comprising a pair of parallel members lying in a plane substantially through said spring axis.

2. The counterbalance of claim 1 wherein said spring in its rolled-up state includes a hollow core, said core having a guide member disposed therein constituting said guide means carried by said spring, the axial ends of said guide member closely abutting said parallel members and together therewith constituting part of said guide means.

3. The counterbalance of claim 1 wherein said spring is a double spring comprising two elements of said spring material rolled up together in laminate face-to-face contact.

4. A counterbalance for use in an upright hollow column forming part of gymnastic apparatus and adapted to act between the column and the lower end of a piston received in and movable along the column, said counterbalance comprising: a self-contained assembly separate from the column and piston adapted to be removably inserted as a unit and wholly contained in the column, said assembly being adapted to be fixed relative to the column and including at least two rolled-up springs of flat ribbonlike spring material carried by said assembly and secured at their outer ends to said assembly to fix said spring ends relative thereto, said springs being unrollable about their axes against their resiliency relative to said spring ends upon movement of said springs in a direction corresponding to downward movement of the piston in the column, the axes of said springs being laterally spaced from each other in and disposed transversely of said direction of spring movement and intersecting a line generally corresponding to the axis of movement of the piston in the column, said springs being guided during said movement thereof by guide means formed in part by said assembly and carried by the rolled-up portions of said springs, said guide means resisting lateral axial movement of the rolled-up portions of said springs and rotation of the axes thereof in planes parallel to said direction of spring movement to restrain twisting of said springs, and means disposed between said springs for transmitting said spring movement from one to the other of said springs.

5. The counterbalance of claim 4 wherein said assembly includes means adapted to engage the inner wall face of the column to locate said assembly therein and to permit slidable insertion and removal of said assembly from the column.

6. The counterbalance of claim 4 wherein at least one of said springs is a double spring comprising two elements of said

spring material rolled up together in laminate face-to-face contact; and wherein said transmitting means comprises a follower disposed between the adjacent outer faces of said springs.

7. In gymnastic apparatus having one or more upright supports, each of said supports including a hollow column and a piston received in and movable along said column, the improvement in each of said supports comprising: a self-contained assembly separate from the column and piston and inserted and removable as a unit through an end of said column and wholly contained therein, said assembly including at least one rolled-up spring of flat ribbonlike spring material carried by said assembly and disposed within said column but at all times outside of said piston, said spring being secured at its outer end to fix said spring end against movement relative to said column, said spring being operatively associated with the lower end of said piston and unrollable about an axis against its resiliency relative to said spring end in the event and in the direction of downward movement of said piston, said spring axis being disposed transversely of said direction of spring movement and generally intersecting the axis of movement of said piston, the strength of said spring being effective to independently maintain said piston at any selected position between upper and lower most positions thereof in said column; and means to guide said spring to resist lateral axial movement of the rolled up portion of said spring and rotation of the axis thereof in planes parallel to said direction of spring movement to restrain twisting of said spring, said guide means including the inner wall of said column and means carried by said assembly and by the rolled-up portion of said spring.

8. The apparatus of claim 7 including means retaining said assembly in said column, said retaining means being carried by said assembly and engaging said inner column wall.

9. The apparatus of claim 8 wherein said retaining means comprises a pair of upper and lower compressible retainers and spacing means holding said retainers in spaced relationship, the outer end of said spring being fixed adjacent the upper of said retainers so that said direction of spring movement is toward the lower of said retainers.

10. The apparatus of claim 9 wherein said spacing means comprises a pair of parallel members and wherein said spring in its rolled-up state includes a hollow core at its axis having a guide member disposed therein, said guide member constituting said guide means carried by said spring portion, said spacing members lying in a plane substantially through said spring axis and closely abutting the axial ends of said guide member, said axial ends and parallel members constituting a part of said guide means.

11. The apparatus of claim 7 wherein said spring is a double spring comprising two elements of said spring material rolled up together in laminate face-to-face contact.

12. The apparatus of claim 7 including two of said springs, each of said springs having their outer ends secured against movement relative to said column and disposed in spaced tandem relationship one below the other, both of said springs unrolling in said direction of spring movement, the lower end of said piston being operatively associated with the upper of said springs; and including means disposed between said springs for transmitting said spring movement from the upper to the lower of said springs.

13. The apparatus of claim 12 wherein at least one of said springs is a double spring comprising two elements of said spring material rolled up together in laminate face-to-face contact; and wherein said transmitting means comprises a follower disposed between the adjacent outer faces of said springs.

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