United States Patent

[11] **3,625,160**

[72] Inventor **Per G. Bergman**
Hyggevagen 21, 163 54 Spanga, Sweden

[21] Appl. No. **17,052**
[22] Filed **Mar. 6, 1970**
[45] Patented **Dec. 7, 1971**
[32] Priority **Mar. 14, 1969**
[33] **Sweden**
[31] **3551/69**

[54] **SYSTEM FOR BALANCING A TABLETOP THAT MAY BE ADJUSTABLY SET IN POSITION**
3 Claims, 12 Drawing Figs.

[52] **U.S. Cl.** **108/2,** 108/6
[51] **Int. Cl.** **A47f 5/12**
[50] **Field of Search** 108/1–10, 50

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Primary Examiner—Bobby R. Gay
Assistant Examiner—Glenn O. Finch
Attorney—Berman, Davidson and Berman

ABSTRACT: A torsion spring system for balancing a tiltable tabletop so that it will be retained in any rotative position to which it is set. One or more torsion spring elements are non-rotatively positioned in a rotatable tube carrying two arms for engaging the lower side of the tabletop. Means are provided for locking the torsion spring elements and the rotatable tube into definite rotative positions with respect to each other, and additional means are provided for clamping the tabletop into position after it has been set.

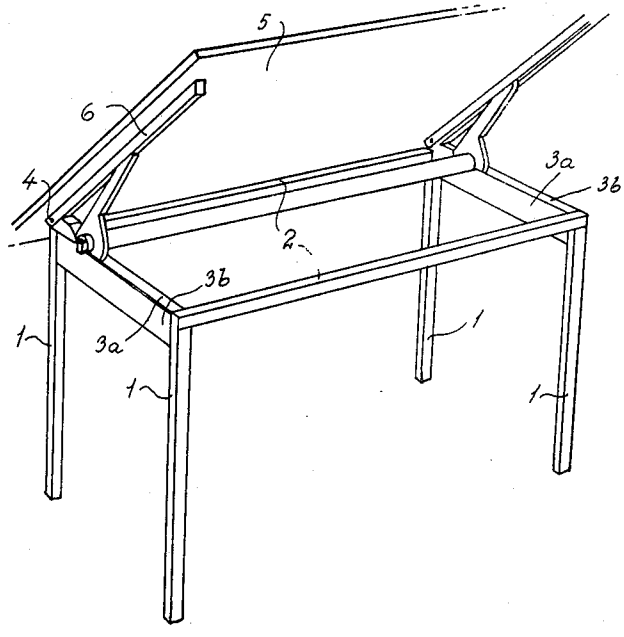

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Fig. 1

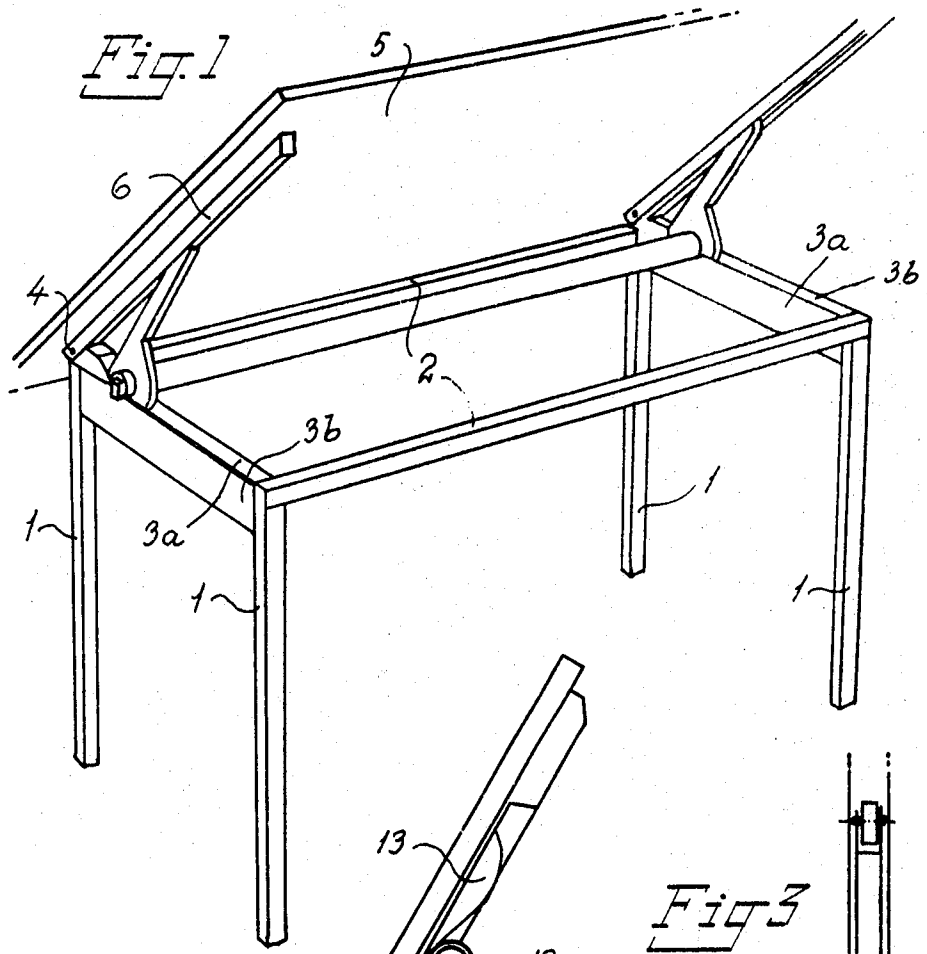


Fig. 2

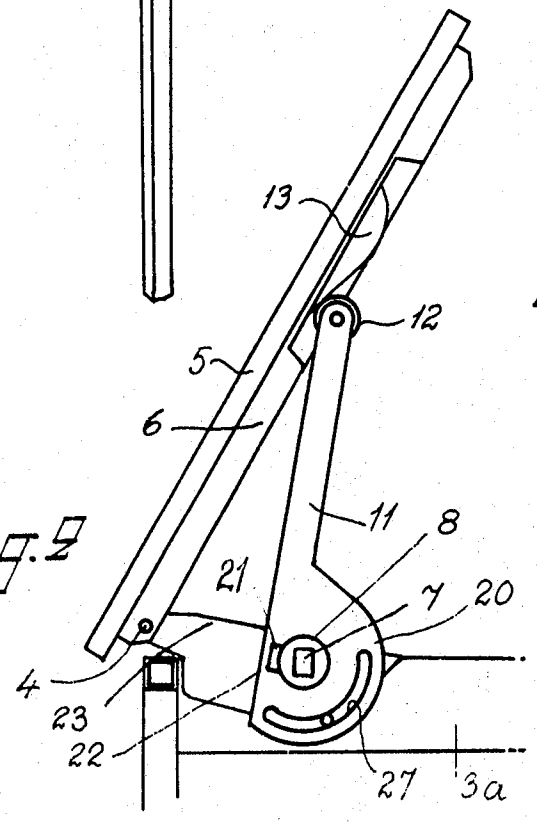
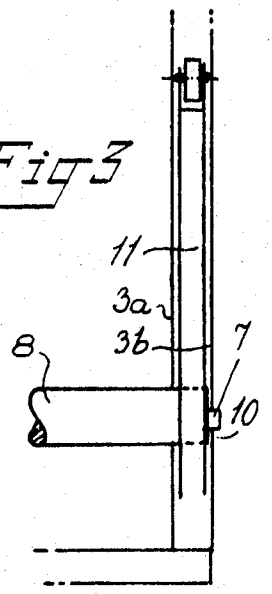


Fig 3



INVENTOR.
PER G. BERGMAN
BY
Berman, Davidson & Berman,
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Fig. 4

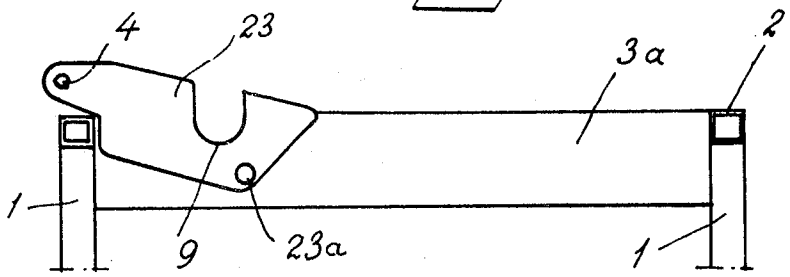


Fig. 5

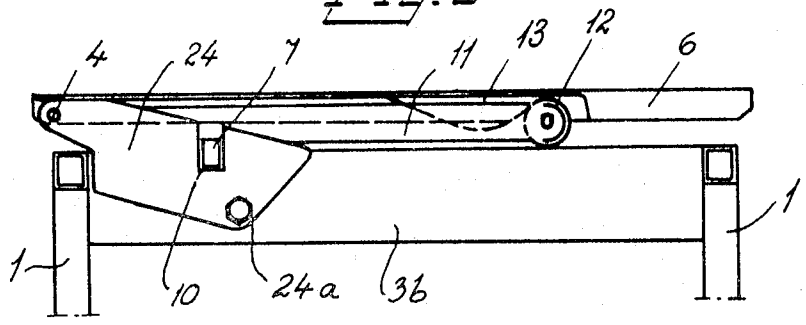


Fig. 6

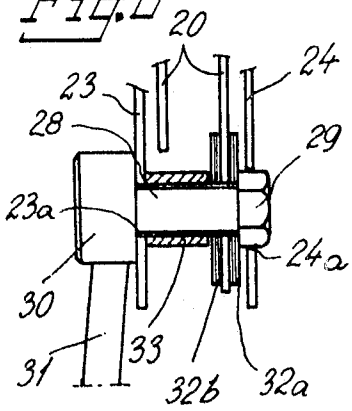
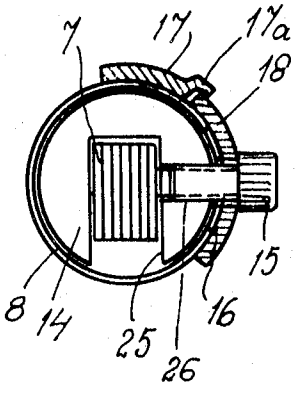


Fig. 7



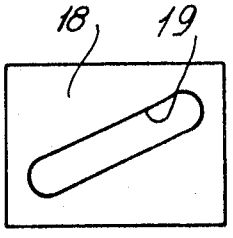


Fig. 8

INVENTOR.
PER G. BERGMAN,
BY
Berman, Davidson & Berman,
ATTORNEYS.

Fig. 9

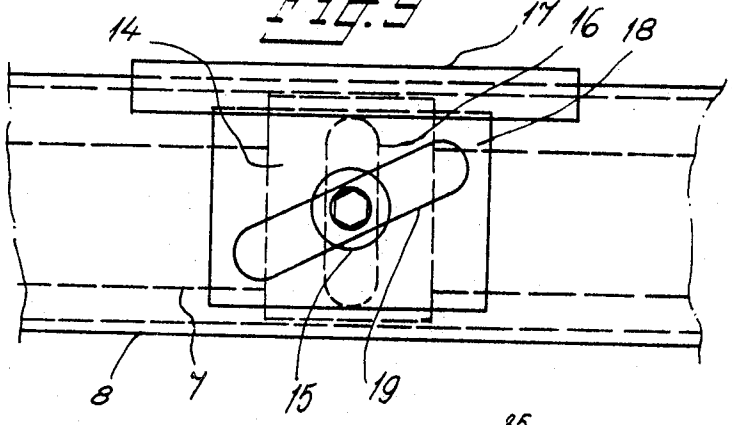
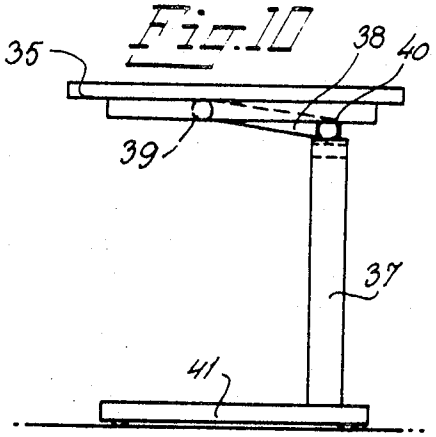


Fig. 10



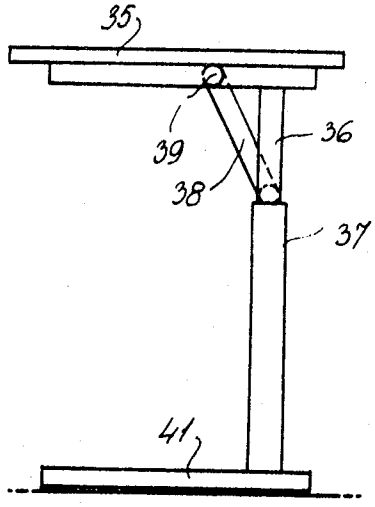


Fig. 11

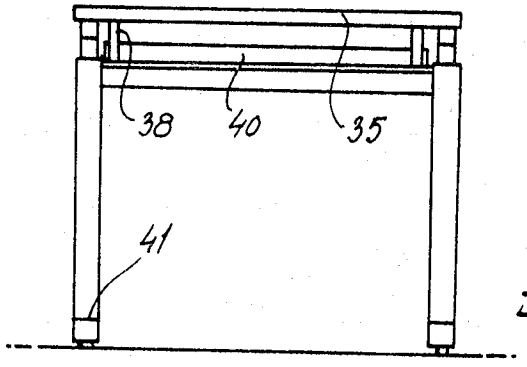


Fig. 12

INVENTOR.
PER G. BERGMAN,
BY
Berman, Davidson & Berman,
ATTORNEYS.

SYSTEM FOR BALANCING A TABLETOP THAT MAY BE ADJUSTABLY SET IN POSITION

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention refers to a system for balancing a tabletop that may be adjustably set in position, and use may particularly be made of the invention in connection with tables having tiltable tabletops or tabletops that may be vertically raised and lowered, respectively, for instance drafting tables and desks.

2. Description of the Prior Art

With certain types of tables, for instance tables utilized as drafting tables, it is desirable that the entire tabletop be able to serve as a drafting board, wherein said tabletop should be able to pivot around a supporting shaft that preferably is positioned parallel to the longitudinal direction of the table and in the proximity of the front edge of the drafting board. Existing tables of this type have had the drawback that with different initial positions of the tabletop it has been necessary to exert different forces for pivoting the tabletop, i.e., when resetting the latter from one position to another.

This invention has the object of eliminating the above-mentioned drawback by providing a torsion spring system effecting balance in each set position of a tabletop, wherein the force necessary to manually pivot the tabletop from one position to another is substantially constant and furthermore very small. The system disclosed by the invention may also to advantage be utilized with tables having tabletops that may be raised and lowered, respectively, in vertical direction, including desks, worktables and workbenches of various types.

SUMMARY OF THE INVENTION

In accordance with the invention, the power for pivoting and raising the tabletop is primarily provided by at least one torsion spring, with the tabletop being provided with locking means so that it may be affixed in a desired raised position.

With tables of the above-mentioned type in which the tabletop serves as a drafting board, the torque of the tabletop or drafting board around the supporting shaft follows a sine curve when the inclination of the drafting board is changed. However, the mathematical curve of the torque of a torsion spring with respect to the angular rotation thereof is a straight line, and this means that it is not possible to introduce a torsion spring directly between the drafting board and the table frame without substantial faults occuring in the balancing. In order that satisfactory balancing be achieved the torsion spring will have to be provided with compensating qualities. In accordance with the invention, the torsion spring is for this reason positioned slightly below the drafting board in the horizontal position of the latter and rearwardly of the supporting shaft of the drafting board, and said spring is connected to one or more, preferably two, lifting arms which actuate the drafting board by means of rollers and cam disks.

One preferred form of the invention is shown by way of example in the accompanying drawings and is described in detail without any attempt to show all of the various forms and modifications in which the invention might be embodied. Hence, the invention should be measured by the appended claims and not by the details of the specification.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a perspective view taken from the rear and side of an embodiment of the balancing system of the invention utilized with a drafting table having its tabletop fashioned as a drafting board,

FIGS. 2, 4 and 5, respectively, show side views of the table in accordance with FIG. 1 with various portions removed,

FIG. 3 shows one end of the frame of the table of FIG. 1 in a horizontal view with the tabletop removed,

FIG. 6 shows an embodiment of clamping means for the tabletop of the drafting board of FIG. 1,

FIG. 7 is a cross section of the torsion spring tube, with said cross section being taken at a position for locking a set of torsion springs in the tube,

FIG. 8 shows a component associated with the cross section of FIG. 7,

FIG. 9 is a front view illustrating the torsion spring tube and the component of FIG. 8 in cooperation,

FIGS. 10 and 11 are side views of the balancing system in accordance with the invention applied to a desk, with the tabletop of said desk being in lowered and raised position, respectively, and

FIG. 12 is a front view of the desk in accordance with FIGS. 10 and 11, respectively.

Identical reference numerals have been utilized in the various figures wherever possible.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows a perspective view of a drafting table having a frame comprising four legs 1, two horizontal top rails 2 and two twin-walled endpieces having the walls 3*a* and 3*b*. As may be seen from FIGS. 2, 4, and 5, respectively, a shaft support is provided at the front ends of the respective endpieces, with mounting rails 6 for the tabletop 5 that serves as a drawing board being pivotally mounted therein by means of individual pivots 4.

As may be seen more specifically from FIG. 2, a torsion spring or a number of torsion springs in a set 7 of torsion springs are positioned inside a tube 8, which in turn is mounted in a disk 20 that for example may be made of sheet metal, with said tube being locked to the disk 20 by means of a protrusion 21 extending into a corresponding recess 22 in the disk 20. As has been mentioned above, the drafting table has two walls 3*a*, 3*b* at each end, and these walls may also consist of sheet metal. The internal end wall 3*a* is provided with a U-shaped recess 9, which serves as a bearing for torsion spring tube 8, with said tube extending beyond said end wall. This may be seen from FIGS. 3 and 4, which show a horizontal view of the end walls 3*a*, 3*b* at one end of the table and a side view of the end wall 3*a* and the recess arranged therein, respectively, with said recess being provided in a bracket 23 supporting one of the above-mentioned pivots 4 in the illustrated embodiment. The torsion spring 7 positioned inside tube 8 is longer than tube 8 and is anchored in U-shaped recesses 10 in the end walls 3*b*. This is more specifically shown by FIGS. 3 and 5, respectively, with the last-mentioned figure also showing that recess 10 continues in a bracket 24 affixed to the end wall 3*b*, with said bracket 24 providing a support for pivot 4 in the same fashion as bracket 23. In consequence of the recesses in the respective end walls 3*a* and 3*b* being open upwards, the unit consisting of the tube 8 and the torsion spring 7 may very simply be laid in place or lifted out without the assistance of tools.

Each of the disks 20 positioned at the respective ends of the torsion spring tube 8 is provided with an individual lifting arm 11, with said arms being positioned between and above the end walls 3*a* and 3*b*. In the illustrated embodiment, the lifting arms 11 are arranged integrally with the disks 20, and the lifting arms 11 are thus detachably mounted on tube 8. Each lifting arm 11 is provided with a roller 12 at its free end, with said roller rolling on a cam disk 13 when the inclination of the drafting board is changed, said cam disk having a predetermined shape of its cam and being affixed in the mounting rail 6 on the bottom side of the drafting board.

The torsion spring tube 8 is positioned at a distance of approximately half the length of lifting arm 11, counting in horizontal direction, from the fulcrum of the drafting board, i.e., from the pivot 4, which has proved to be appropriate in order for cam disk 13 to have suitable dimensions. If lifting arm 11 were too short or too long with respect to said distance, cam disk 13 would have such dimensions that the cam disk, lifting arm and roller would not be able to be accommodated between the tabletop 5 and the endpieces 3*a*, 3*b*.

The object of the invention, viz, balancing the tabletop to a substantial extent and, in consequence of this, attaining small adjusting forces in repositioning the tabletop between various stable positions of inclination, is achieved as the result of appropriate selection of the location of torsion spring tube **8** with respect to the fulcrum **4** of the drafting board and with respect to the length of lifting arm **11** as disclosed above.

Torsion spring tube **8** is positioned so low that it does not interfere with the accommodation of the mounting rail **6** and that it does not extend below the lower edge of the top rails **2**, which latter makes it possible to hang drawer casings, etc., immediately below the top rails **2**.

A device for tensioning and affixing torsion spring **7** in tube **8** is positioned at an appropriate location along tube **8**, for instance at its center, and in the illustrated embodiment said device consists of a cylindrical spring-holding disk **14** having a U-shaped recess **25** (compare FIG. 7) into which torsion spring **7** is introduced. The spring-holding disk is affixed by tightening a radially displaceable screw **15** which may slide in a groove **16** in the tube (see FIG. 9) in the transversal direction of the tube when spring-holding disk **14** is rotated (thus when the screw is not tightened), wherein groove **16** preferably covers between 30° and 90° of the circumference of the tube. A shoulder plate **17** is mounted on the outside of tube **8** at one end of groove **16**, as may be seen in FIGS. 7 and 9, respectively. An adjusting collar **18** illustrated in FIGS. 7–9 and having its internal radius of curvature equal to the external radius of curvature of tube **8** may be located on the outside of tube **8** and is provided with a groove **19**, which for example may be inclined between 15° and 50°, preferably approximately 30°, with respect to the longitudinal axis of tube **8**. Adjusting collar **18** engages shoulder plate **17** when screw **15** is tightened. At the place of engagement between collar **18** and plate **17** the latter may suitably be provided with a rib **17***a* lying over the corresponding edge of collar **18** and thus preventing the latter from being released from the engagement. Alternatively, the respective edges of plate **17** and collar **18** engaging each other may be tapered in appropriate manner. Counting from outside, screw **15** thus extends in through groove **19**, furthermore through groove **16**, and into a threaded aperture **26** in spring-holding disk **14**. If adjusting collar **18** is slid along tube **8** while concurrently being retained in engagement against plate **17**, spring-holding disk **14** will be rotated in consequence of the inclination of groove **19**, thereby making it possible to set the torsion spring in a desired position of operation so as to provide the spring or the set of springs with the desired mechanical tension, whereafter said position may be made permanent by tightening screw **15**.

If tube **8** is lifted out of the two end walls **3***a* and **3***b*, respectively, at one end of said tube it will be possible to introduce or to extract an arbitrary number of individual torsion springs into and out of, respectively, said set of torsion springs, so that a number of spring elements adapted to each individual case of operation may be provided.

FIG. **6** illustrates appropriate clamping means operative on disk **20** in accordance with FIG. **2**. FIG. **2** shows that disk **20** is provided with a groove **27** in the form of an arc of a circle. Furthermore, FIG. **4** shows that bracket **23** is provided with a round aperture **23***a*, and FIG. **5** shows that bracket **24** is provided with a hexagonal aperture **24***a*. The screw **28** illustrated in FIG. **6** and provided with a hexagonal head is axially displaced into the two apertures **23***a* and **24***a*, respectively, and is locked against rotation by its head **29** being introduced into aperture **24***a*. The following elements are positioned in turn between brackets **24** and **23**, viz, a friction washer **32***a*, a disk **20** with its groove **27** in the form of an arc of a circle, through which groove screw **28** extends with a play, furthermore an additional friction washer **32***b* and a spacer tube **33**. A nut **30** is threaded onto screw **28** on the remote side of bracket **23**, counting from the head **29** of screw **28**, with said nut **30** being provided with a lever **31**. Disk **20** may be clamped by frictional engagement so as to lock lifting arm **11** as the result of nut **30** being tightened by means of lever **31**. It may be advantageous to provide spring **7** with a tension such, that the tabletop is automatically set to its uppermost position when the clamping device disclosed above is released, and then it will be an easy matter to set the tabletop to a desired position by depressing the same slightly with one's hand.

FIGS. **10** and **11** are side views of a desk, with FIG. **10** illustrating the top **35** of said desk in its lowermost position and with FIG. **11** illustrating the top **35** in its uppermost position. The desk top **35** is balancedly displaceable in vertical direction as the result of internal legs **36** being able to slide upwards and downwards, respectively, in external legs **37** under the simultaneous actuation of rollers **39** on lifting arms **38** mounted on a tube **40** in manner disclosed by the instant invention, after locking means arranged in appropriate manner have been released. The designation **41** refers to a horizontal floor rail to plus the external legs **37** are fastened. FIG. **12** illustrates the arrangement of FIGS. **10** and **11** as viewed from in front.

As indicated above, the invention is not restricted to the embodiment described above and illustrated in the drawings, and the same may be altered within the scope of the appended claims.

What is claimed is:

1. A system for balancing tabletops in repositioning the latter in a pivotal movement around a first substantially horizontal axis, wherein said system comprises the combination of a frame provided with four legs, two elongate side rails, and a pair of spaced apart internal and external end walls at each end; a unit including an elongate tube having open ends; upwardly open recesses in said internal end walls in alignment with said elongate tube, said tube being rotative in said recesses around a second substantially horizontal axis parallel to said first axis; a pair of parallel lifting arms secured to said tube for engaging the bottom side of said table top; a set of torsion springs comprising a plurality of laminated spring elements disposed in said tube with their ends extending through the respective open ends of said tube; and means for clamping said elongate tube and said set of torsion springs to each other in different rotative positions with respect to each other to vary the torque of said springs; and slots in said external end walls in alignment with said set of torsion springs for receiving the extending ends of said torsion springs, with the torque of said set of torsion springs being also adjustable by varying the number of individual laminated spring elements.

2. A system in accordance with claim **1**, wherein said means for clamping the set of torsion springs and said elongate tube to each other in different rotative positions comprises a displaceable collar provided with a groove at an angle of between approximately 15° and 50° to the longitudinal axis of said tube and a retainer plate secured to said tube; said system including a rotative disk in said elongate tube provided with a U-shaped recess for receiving said torsion springs and a setscrew threaded into said disk through said groove in said collar and through a groove passing through said tube at right angles to the longitudinal axis of said tube.

3. A system in accordance with claim **1**, wherein said tube is disposed below the tabletop and at a horizontal distance from said first axis equal to substantially half the length of one of the lifting arms and wherein each free end of the two lifting arms engages an individual cam surface on the bottom side of said tabletop.

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