

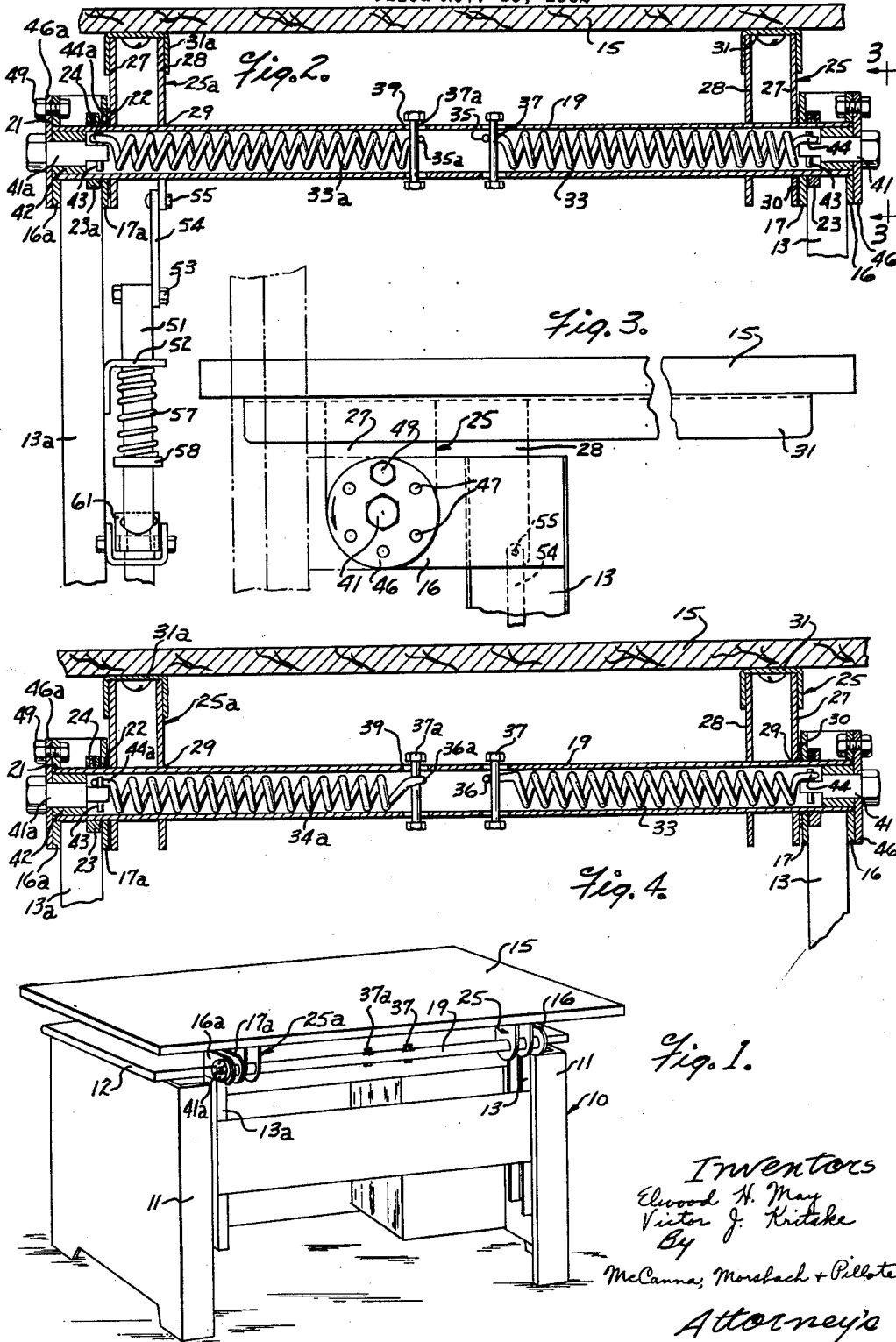
May 5, 1964

E. H. MAY ETAL

3,131,654

COUNTERBALANCED TILTABLE TABLE

Filed Nov. 13, 1962



Inventors
Elwood H. May
Victor J. Kitcher
By
McCanna, Mosbach + Pillate
Attorneys

1

3,131,654

COUNTERBALANCED TILTABLE TABLE

Ellwood H. May and Victor J. Kritske, Sheboygan, Wis.,
assignors to Mayline Company, Inc., Sheboygan, Wis., a
corporation of Wisconsin

Filed Nov. 13, 1962, Ser. No. 237,021

6 Claims. (Cl. 108—2)

This invention relates to improvements in tiltable tables and particularly to a table having a counterbalanced tilt-
able top.

An important object of this invention is to provide a table having a tiltable top and an improved arrange-
ment for counterbalancing the table top and any appa-
ratus mounted thereon, to facilitate movement of the
table top between a horizontal and an upright position.

Another object of this invention is to provide a tiltable
table having an improved arrangement for mounting the
table top and the counterbalance to avoid twisting and
distortion of the table top.

Yet another object of this invention is to provide a
tiltable table which employs counterbalancing springs
and wherein the springs are completely enclosed in the
shaft which supports the tiltable table top.

Still another object of this invention is to provide a
tiltable table wherein the table has a first spring arrange-
ment for counterbalancing the tiltable table top as it
moves toward a horizontal position and a second spring
arrangement for counterbalancing the table top as it moves
to an upright position, and wherein the springs are inde-
pendently adjustable to provide substantially complete
counterbalance of the table top as it is moved between
a horizontal and an upright position.

Still another object of this invention is to provide a
counterbalanced tiltable table which is of simple and
economical construction; which is neat in appearance;
and which is durable and reliable in use.

These, together with other objects and advantages of
this invention will be more readily appreciated as the
same becomes better understood by reference to the fol-
lowing detailed description when taken in connection
with the accompanying drawings wherein:

FIG. 1 is a perspective view of a table employing the
improved table top mounting and counterbalancing
arrangement;

FIG. 2 is a fragmentary longitudinal sectional view
through the table top mounting and counterbalancing
arrangement;

FIG. 3 is a fragmentary end elevational view taken
on the plane 3—3 of FIG. 2; and

FIG. 4 is a fragmentary longitudinal sectional view
through a modified form of the device.

The table top mounting and counterbalancing arrange-
ment of the present invention is particularly adapted for
use in a drafting table. As shown in FIG. 1, the table
includes a base 10 having end sections 11 and a prefer-
ably desk level top 12 supported on the end sections
and extending therebetween. The table 10 also includes
spaced support members or posts 13 and 13a mounted
on the end sections 11. The support members are prefer-
ably mounted for vertical movement with respect to
the base to enable adjustment of the height of the table
top and may, for example, be adjustably supported in
the manner shown in the patent to May, No. 2,982,050.
A drafting table top or board 15 is mounted on the
support members 13 and 13a for vertical adjustment
therewith, and also for tilting movement relative thereto
between a generally horizontal and an upright position.
As shown in FIG. 1, the tilting axis for the table is
located adjacent one edge of the board 15, and is later-
ally offset at the underside of the board. With this

2

arrangement, the board is balanced only when the center
of mass of the board and the apparatus mounted thereon
is disposed vertically above the tilt axis of the board.
In accordance with the present invention, a counter-
balancing apparatus is provided for counterbalancing the
weight of the board and the apparatus thereon as the
board moves from the aforementioned balance position
toward a horizontal position, and for also counterbalanc-
ing the board as it moves from the aforesaid balance
position toward an upright position, to prevent rapid
movement of the board to either a horizontal or to an
upright position, and to facilitate adjustment of the board.

The pivot axis for the board 15 is advantageously
rearwardly offset from the posts 13, 13a to provide addi-
tional knee room and, as best shown in FIG. 3, the
support plates or brackets 16, 16a and 17, 17a are
attached to relatively opposite sides of each of the posts
13 and 13a and project rearwardly therefrom. A tubu-
lar shaft 19 has opposite end portions thereof extending
through aligned openings 21 and 22 in the plates 16, 16a
and 17, 17a respectively, and is rotatably supported
thereby on the brackets. Collars 23, 23a are attached
to the shaft 19 as by set screws 24 and engage a respec-
tive one of the brackets 17, 17a to retain the shaft against
axial movement. Table top support brackets 25, 25a are
non rotatably mounted on the shaft adjacent opposite
ends and, as shown, the brackets each include spaced
plates 27 and 28 which are secured to the shaft as by
welding, indicated at 29. The brackets 25 and 25a are
advantageously positioned closely adjacent the plates 17,
17a of the support brackets and a thin washer 30 is
preferably disposed therebetween to minimize wear and
abrasion. The board mounting brackets 25 and 25a
are attached to the board in any desired manner and, as
shown, are secured to rails 31 and 31a that extend along
the underside of the drafting board. Since the board
mounting brackets 25 and 25a are rigidly secured to the
tubular shaft 19, both board brackets move in unison
with the shaft and there is no tendency for the board to
twist or distort during adjustment of the tiltable table.

In accordance with the present invention, at least one,
and preferably two, counterbalancing springs designated
33 and 33a are disposed inside the tubular shaft. The
springs 33 and 33a have hooks 35 and 35a at one end
which engage pins 37 and 37a carried by the shaft. The
springs are preferably in the form of an elongated helix
and the pins 37 and 37a extend through preferably elon-
gated openings 39 in the shaft to allow axial expansion
and contraction of the springs. The outer ends of the
springs 33 and 33a are anchored to the support brackets.
For this purpose, bolts 41 and 41a are rotatably supported
in a bushing 42 in each end of the shaft, and the bolts
carry pins 43 which are arranged to engage hook portions
44 and 44a on the outer ends of the springs. Index plates
46 and 46a are welded or otherwise non-rotatably secured
to the bolts 41 and 41a, and, as shown in FIG. 3, the index
plates each have a plurality of circumferentially spaced
openings 47. The bolts 41 and 41a are advantageously
provided with a non-circular head to receive a wrench, to
enable turning of the springs to adjust the torque applied
by the springs to the shaft. The sector plates are fast-
ened in their adjusted position, as by fasteners 49 which
extend through the openings 47 in the sector plates and
through an opening in the outer plate 16 of the support
brackets.

In the embodiment shown in FIGS. 2 and 3, both
springs 33 and 33a are utilized to aid in lifting the board
from its horizontal position and the twist in the springs
is preferably adjusted by first moving the board to its
horizontal position with all instruments mounted thereon,
to determine if the spring is applying the proper counter-

3

balance force. If the counterbalance force must be changed, the board is then moved to its vertical position to relieve most of the twist in the spring, and the spring is then turned in the proper direction and the sector plate relocked in the adjusted position. In order to increase the counterbalance force, the bolt 41 is turned in a counter-clockwise direction as shown in FIG. 3 and the bolt 41a is turned in clockwise direction as viewed from the other end of the table, to twist the springs in a direction such that both springs apply a torque to the shaft in a direction to aid in lifting the table top from its horizontal position. The springs are advantageously wound in a direction such that the twist applied to the springs is in the same direction as the convolutions of the springs so that the twisting of the springs produced by adjusting the bolts 41 and 41a tends to tighten the convolutions. As shown, spring 33 has clockwise convolutions and the spring 33a has counter-clockwise convolutions. While both springs can be twisted equal amounts so that each spring counterbalances substantially one-half of the unbalanced weight of the board, it is also possible to adjust the springs relatively different amounts. Thus, one spring can be used to apply a relatively light counterbalance force to the board, as the latter moves from its balanced position toward the horizontal position, and the second spring can be adjusted so as to supplement the first spring after the board moves downwardly beyond a preselected angle.

Since the pivot axis is laterally offset below the underside of the board 15, the board also tends to be overbalanced as it approaches its upright position. In the embodiment of FIGS. 2 and 3, a separate spring is utilized to prevent dropping of the board overcenter to a vertical position. As best shown in FIG. 2, a brake rod 51 is slidably mounted in a bracket 52 on one of the posts 14. The upper end of the rod is connected by a pivot pin 53, link 54 and pin 55 to one of the plates 28 of the board mounting bracket 25a. As shown in FIG. 3, the link 54 is attached to the plate 28 at a point offset from the pivot axis. A spring such as 57 is disposed around the brake rod 51, between the stationary guide bracket and a collar 58 on the brake rod. The spring 57 is selected so as to apply a downward pressure to the brake rod, and yieldably oppose movement of the board to a vertical position, and the collar 58 is adjusted along the brake rod to adjust the pressure applied by the spring. A locking block 61 is mounted on the post 14 and engages the brake rod 51, to releasably lock the table in its adjusted position. Alternatively, any other suitable locking arrangement could be provided if desired.

In the embodiment of FIG. 4, only one of the springs 33 is utilized to counterbalance the table as it moves toward its horizontal position, and the other spring designated 34a, is used to counterbalance the table as it moves from its balanced position toward a vertical position. When using only a single spring 33 to counterbalance the board against movement to a horizontal position, the spring 33 must either be somewhat heavier or the bolt 41 must be turned to twist the spring 33 a somewhat greater extent to apply sufficient spring pressure to counterbalance the weight of the board and the instruments thereon, when the board is in its horizontal position. The bolt 41a connected to the other spring 34a is turned in a counter-clockwise direction as viewed from the left in FIG. 4, to twist the spring 34a and apply torque to the shaft in a direction to yieldably oppose movement of the board from its balance position toward an upright position. The spring 34a is advantageously wound with clockwise convolutions so that the initial twisting of the spring tends to tighten the convolutions of the coil. Thus, in the embodiment of FIGS. 3 and 4, the spring 34a yieldably opposes movement of the board toward its upright position and, as the board moves downwardly, the pressure applied by the spring 34a decreases while the pressure applied by the spring 33 increases and,

4

the latter force predominates as the board approaches its horizontal position to yieldably oppose movement of the board toward its horizontal position.

From the foregoing, it will be seen that the board mounting brackets 25 and 25a are rigidly secured to the tubular shaft 19 to form a rigid framework which avoids twisting or distortion of the drafting board. The counterbalancing springs are disposed in the shaft and are connected to the shaft intermediate the ends of the latter so as to minimize the tendency of the shaft to twist. With the springs disposed inside the shaft, the drafting board has a neat appearance and moreover, the likelihood of catching clothing or other foreign objects is minimized. In the embodiment of FIGS. 2 and 3, both springs 33 and 33a are utilized to counterbalance the board as it moves toward a horizontal position, and a separate spring 57 is used to counterbalance the board as it moves to its upright position. In the embodiment of FIG. 4, one spring 33 is used to counterbalance the board as it moves from its "balanced" position toward a horizontal position and the other spring 34a arranged to counterbalance the board as it moves from its "balance" position toward an upright position.

The springs are preferably made very stiff so that only a small twist, of the order of one-quarter to one-half turn, is required for the springs to apply sufficient torque to the shaft to counterbalance the weight of the board and the instruments on the board. As the board moved upwardly toward its "balance" position, the twist in the springs 33 and 33a of FIG. 2 and in spring 33 of FIG. 4, will decrease so that the spring will apply a decreasing counterbalancing force. As the board moves past the "balance" position toward its upright position, the twist in spring 34a of FIG. 4 will increase to prevent dropping of the board to an upright position. Preferably, the hook portions on at least one end of each spring is arranged to disengage the respective pin when all twist in the spring is relieved to avoid twisting of the spring in a direction opposite the direction of the convolutions of the springs.

We claim:

1. A drafting table comprising;
 - a base having first and second spaced supports;
 - a drafting board having mounting brackets adjacent opposite ends extending laterally from the underside of the board;
 - a tube rotatably mounted in said first and second supports and extending horizontally therebetween;
 - said tube being non-rotatably attached to each of said mounting brackets to substantially equalize the torque applied to the mounting brackets at opposite ends of the board and thereby minimize twisting of the board, said tube being spaced laterally from the underside of the board and supporting the board for movement between a generally horizontal and a generally upright position, said tube being located intermediate the edges of the board but relatively closer to the side edge of said board that is lowermost when the board is upright whereby the board is overbalanced as it approaches said horizontal position, the offset between the board and the tube axis causing the board to be normally overbalanced as it approaches said upright position;
 - first and second torque applying springs inside the tube;
 - first and second anchor means connecting one end of each spring to said tube at points located intermediate the ends of the tube to apply the torsion in the springs to the tube;
 - a third anchor means at one end of the tube connected to the other end of said first spring and engaging said first support providing an angularly adjustable anchor for said other end of said first spring;
 - a fourth anchor means at the other end of the tube connected to the other end of said second spring and engaging said second support providing an angularly

5

adjustable anchor for said other end of said second spring;

said third and fourth anchor means being independently adjustable to enable individual adjustment of the torsion in each spring for counterbalancing the board;

5 and selectively operable means for locking said board in different angularly adjusted positions between said horizontal and upright positions.

2. A drafting table comprising;

a base having first and second spaced supports;

10 a drafting board having mounting brackets adjacent opposite ends extending laterally from the underside of the board;

a tube rotatably mounted in said first and second supports and extending horizontally therebetween;

15 said tube being non-rotatably attached to each of said mounting brackets to substantially equalize the torque applied to the mounting brackets at opposite ends of the board and thereby minimizing twisting of the board, said tube being spaced laterally from the underside of the board and supporting the board for movement between a generally horizontal and a generally upright position, said tube being located intermediate the edges of the board but relatively closer to the side edge of said board that is lowermost when the board is upright whereby the board is overbalanced as it approaches said horizontal position, the offset between the board and the tube axis causing the board to be normally overbalanced as it approaches said upright position;

20 first and second torque applying springs inside the tube;

first and second anchor means connecting one end of each spring to said tube at points located intermediate the ends of the tube to apply the torsion in the springs to the tube;

25 a third anchor means at one end of the tube connected to the other end of said first spring and engaging said first support providing an angularly adjustable anchor for said other end of said first spring;

a fourth anchor means at the other end of the tube connected to the other end of said second spring and engaging said second support providing an angularly adjustable anchor for said other end of said second spring;

30 said third and fourth anchor means being independently adjustable to enable individual adjustment of the torsion in each spring for counterbalancing the board;

said first spring being twisted, when said board is in a horizontal position, in a first direction to yieldably urge the board upwardly away from said horizontal position;

35 said second spring being twisted, when the board is in an upright position, in a second direction opposite said first direction to yieldably urge said board downwardly away from said upright position;

and selectively operable means for locking said board in different angularly adjusted positions between said horizontal and said upright positions.

3. The combination of claim 2 wherein the anchor means for at least one end of the second spring is arranged to disengage the second spring as the board is moved from the upright to the horizontal position to avoid twisting of said second spring in a direction opposite said second direction.

4. A drafting table comprising;

a base having first and second spaced supports;

a drafting board having mounting brackets adjacent opposite ends extending laterally from the underside of the board;

40 a tube rotatably mounted in said first and second supports and extending horizontally therebetween;

said tube being non-rotatably attached to each of said mounting brackets to substantially equalize the torque applied to the mounting brackets at opposite ends of the board and thereby minimize twisting of

6

the board, said tube being spaced laterally from the underside of the board and supporting the board for movement between a generally horizontal and a generally upright position, said tube being located intermediate the edges of the board but relatively closer to the side edge of said board that is lowermost when the board is upright whereby the board is overbalanced as it approaches said horizontal position, the offset between the board and the tube axis causing the board to be normally overbalanced as it approaches said upright position;

first and second helical torque applying springs disposed inside said tube;

a first anchor means connecting one end of said first spring to said tube intermediate the ends of the latter and a second anchor means connecting one end of said second spring to said tube intermediate the ends of the latter;

a third anchor means connecting the other end of said first spring to said first support and a fourth anchor means connecting the other end of said second spring to said second support;

said first and second helical springs having the convolutions thereof extending in the same direction, said first spring being twisted in the direction of the convolutions thereof, when the board is in said horizontal position, to yieldably urge the board upwardly away from said horizontal position;

said second spring being twisted in the direction of the convolutions thereof, when the board is in said upright position, to yieldably urge the board upwardly away from said horizontal position;

and selectively operable locking means for locking said board in different angularly adjusted positions between said horizontal and upright positions.

5. The combination of claim 4 wherein said anchor means for at least one end of said second spring is arranged to disengage the second spring as the board is moved from the upright to the horizontal position to avoid twisting of said second spring in a direction opposite the direction of the convolutions of said second spring.

6. A drafting table comprising;

a base having first and second spaced supports;

a tube having the ends thereof rotatably mounted in said first and second supports and extending horizontally therebetween;

a drafting board having first and second mounting brackets attached to the underside of said board adjacent opposite ends thereof, said first and second mounting brackets each being rigidly secured to said tube at points located between said supports and respectively disposed alongside said first and second supports;

said tube supporting said board for swinging movement between a generally horizontal and a generally upright position, said tube being located intermediate the edges of the board but relatively closer to the edge of said board that is lowermost when the board is upright whereby the board is overbalanced as it approaches said horizontal position, said tube being offset below the underside of the board whereby the board is normally overbalanced as it approaches said upright position;

first and second helical torque applying springs inside the tube;

first and second anchor means connecting one end of each spring to said tube at points located intermediate the ends of the tube to apply the torsion in the springs to the tube;

a third anchor means connecting the other end of the first spring to said first support member and a fourth anchor means connecting the other end of said second spring to said second support member;

at least one of the anchor means for each of the first
and second springs supporting the respective end of
that spring for limited movement in a direction axially
of the tube to allow free elongation and contraction
of the springs while controlling turning of the ends 5
of the springs;
and means for selectively locking said board in different
angularly adjusted positions between said horizontal
and upright positions.

736,714
1,759,878
1,856,297
1,859,456
1,953,026
1,956,546
2,972,207

References Cited in the file of this patent

UNITED STATES PATENTS

Gendron ----- Aug. 18, 1903
Zizzo ----- May 27, 1930
Marie et al. ----- May 3, 1932
Nestler ----- May 24, 1932
Scheuer ----- Mar. 27, 1934
Froelich ----- Apr. 24, 1934
Hiers ----- Feb. 21, 1961