United States Patent

Hasbrouck et al.

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[45] **Aug. 29, 1972**

[54] **DRAFTING TABLE WITH IMPROVED VERTICAL CONTROL MECHANISM**

[72] Inventors: **Gene B. Hasbrouck,** Corry; **Alan L. Green,** Centerville, both of Pa.

[73] Assignee: **Corry Jamestown Corporation,** Corry, Pa.

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[21] Appl. No.: **823,447**

[52] **U.S. Cl.** **108/2,** 108/136

[51] **Int. Cl.** **A47b 27/18**

[58] **Field of Search** 108/1, 2, 6, 10, 5, 136, 148; 248/162, 410

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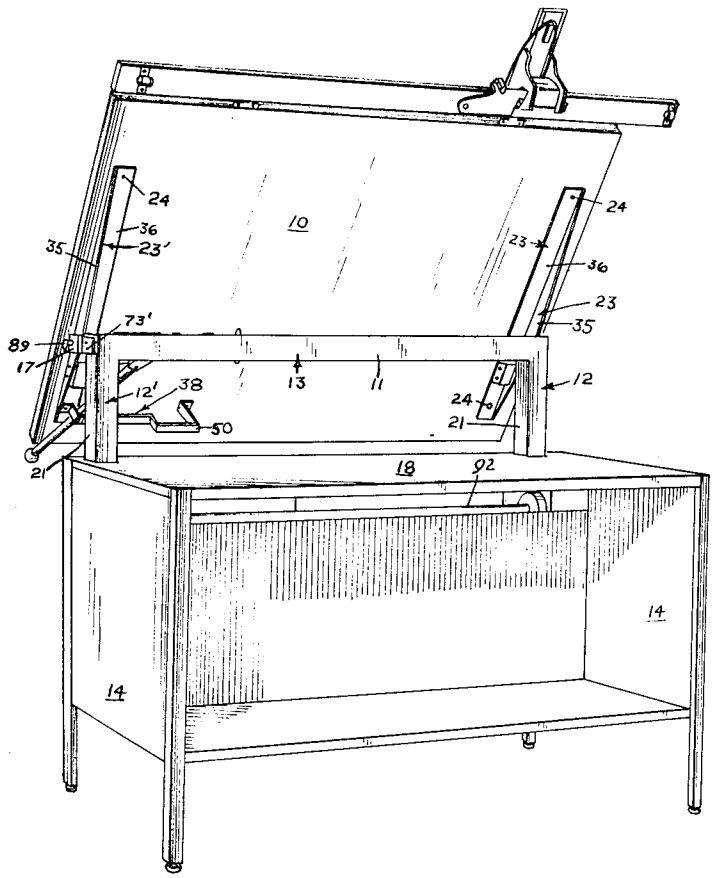
Primary Examiner—Francis K. Zugel

Attorney—Charles L. Lovercheck

[57] **ABSTRACT**

A drafting table is disclosed in the specification that has a drafting board supported on a desk for vertical movement. The board is supported on a yoke having vertically extending legs connected to a counterbalance and locking mechanism. The locking mechanism is made up of two upwardly extending rods each fixed to a side of the table adjacent one of the legs on the yoke. Each leg has a helical spring which slides on one of the rods and may be moved relative to the rod to lock the leg from sliding, thereby locking the board in the desired vertical position. A counterbalance mechanism made up of two energy cells is supported at each side of the table and interconnected by two concentric tubes which restrain the two energy cells to exert a force on the legs of the yoke which will move the yoke in translation.

9 Claims, 17 Drawing Figures



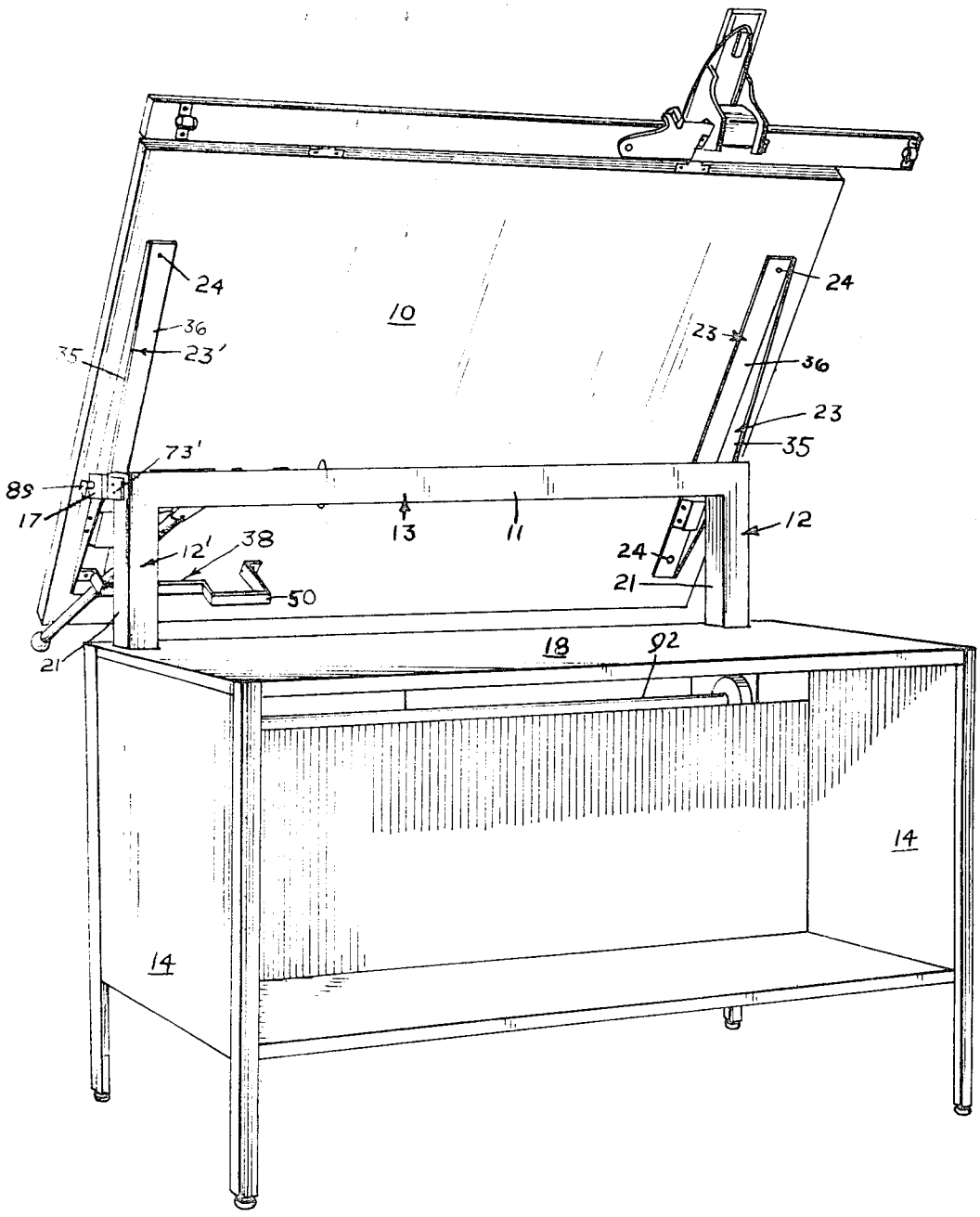


FIG. 1

INVENTOR.
GENE B. HASBROUCK
BY ALAN L. GREEN

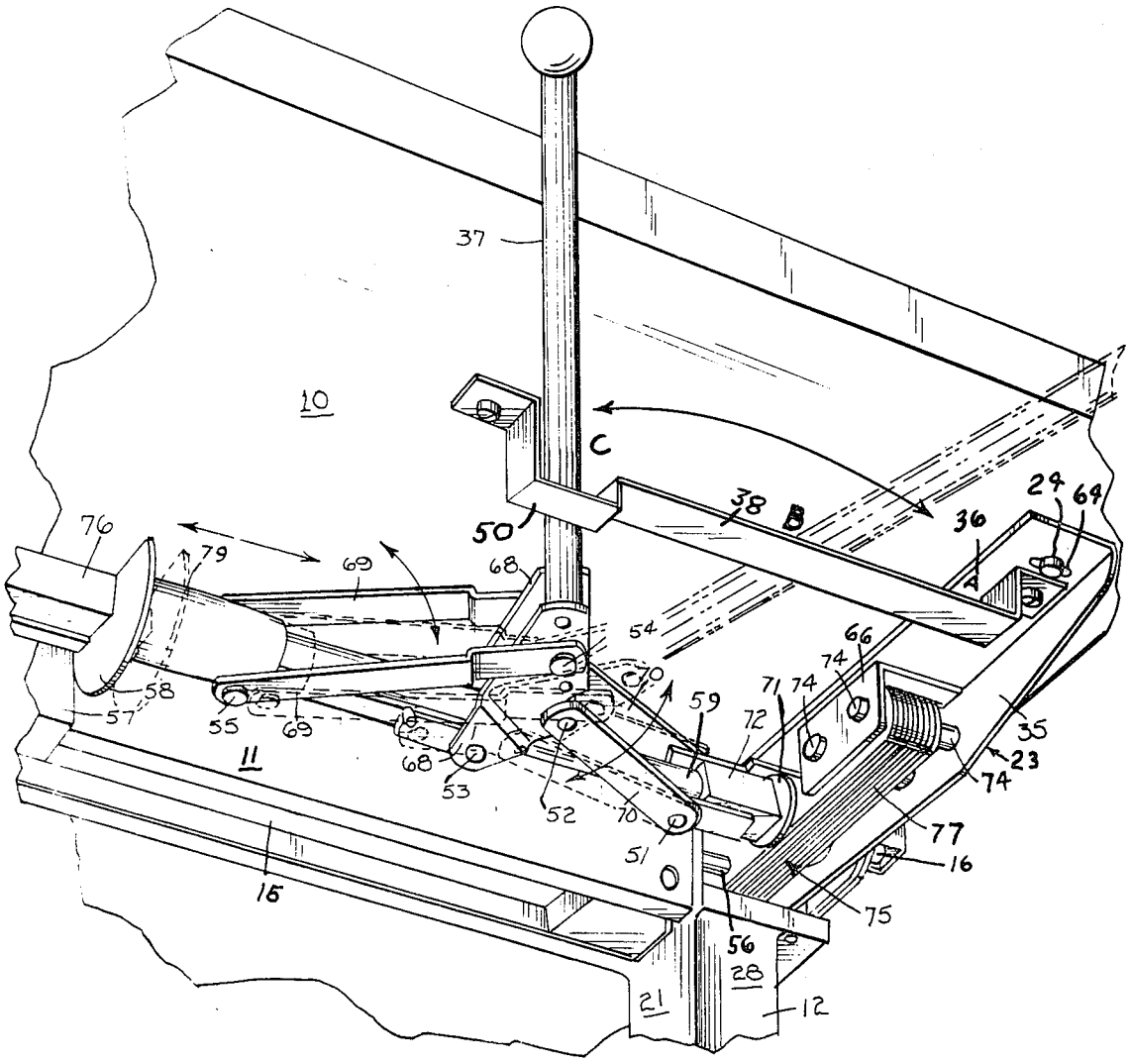
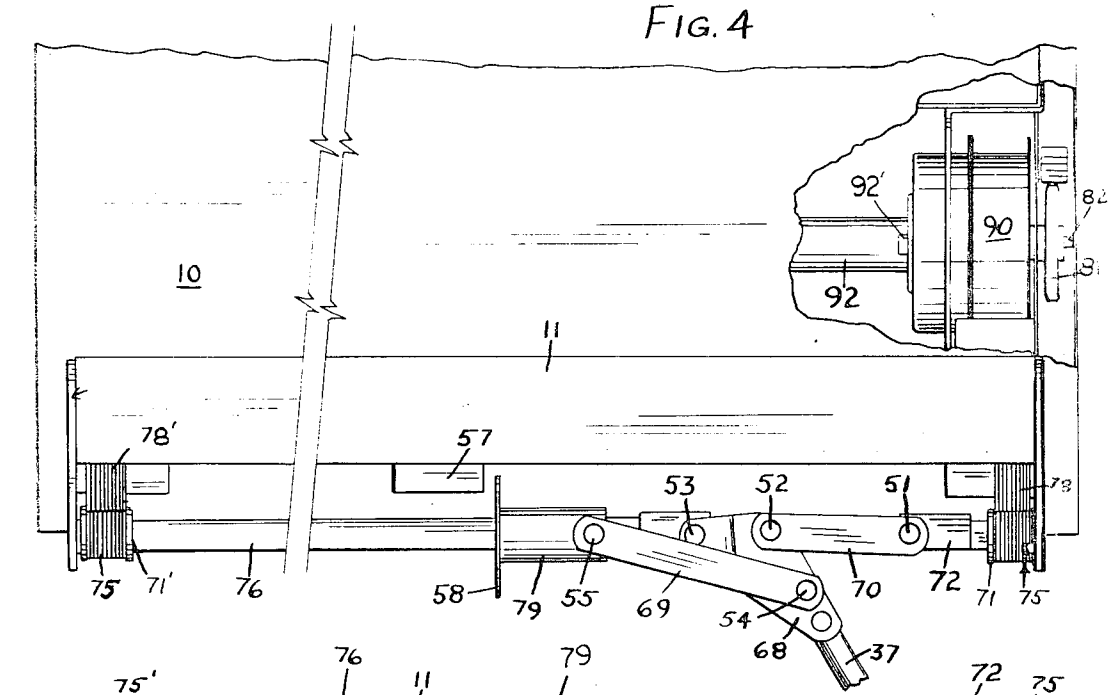


FIG. 2

INVENTOR.
GENE B. HASBROUCK
ALAN L. GREEN

BY

FIG. 4



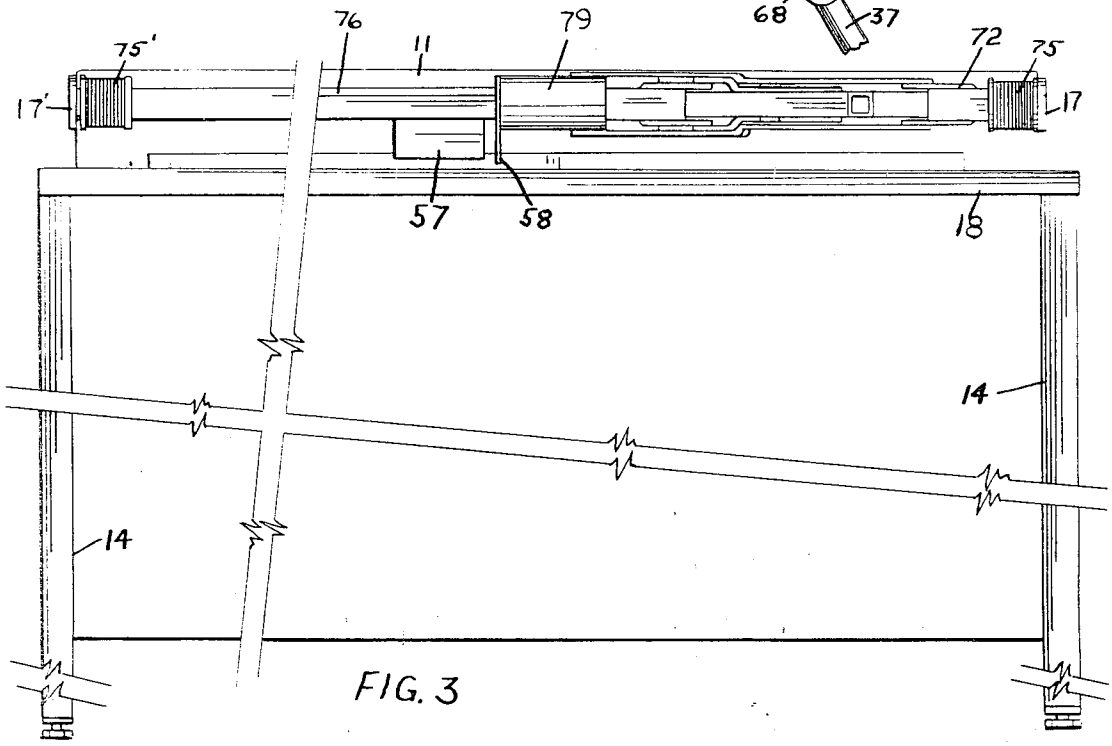


FIG. 3

INVENTOR
GENE B. HASBROUCK
ALAN L. GREEN
By

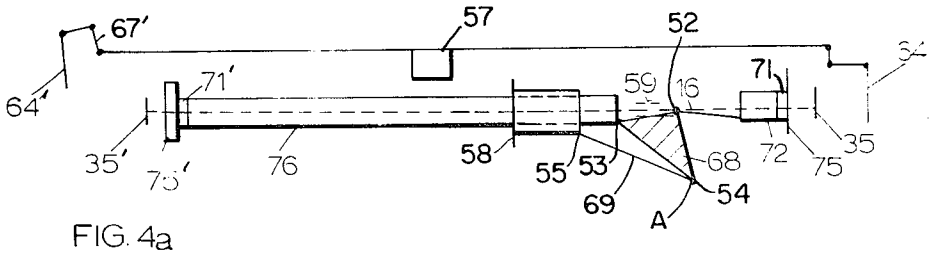


FIG. 4a

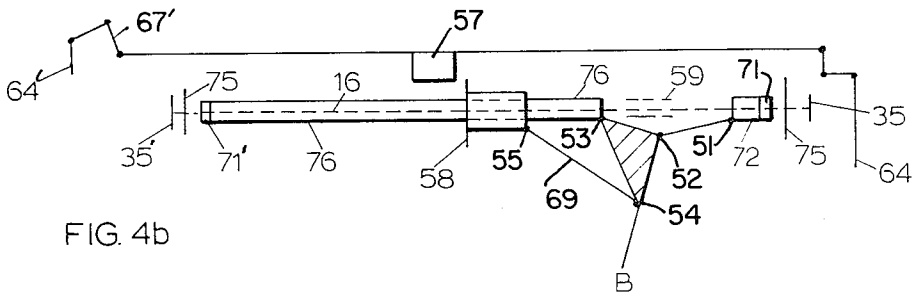


FIG. 4b

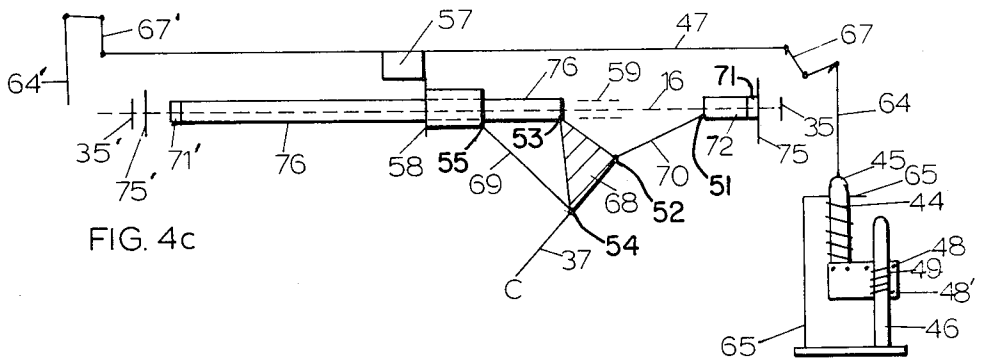


FIG. 4c

Inventor

GENE B. HASBROUCK

ALAN L. GREEN

By

Charles L. Lovelace Attorney

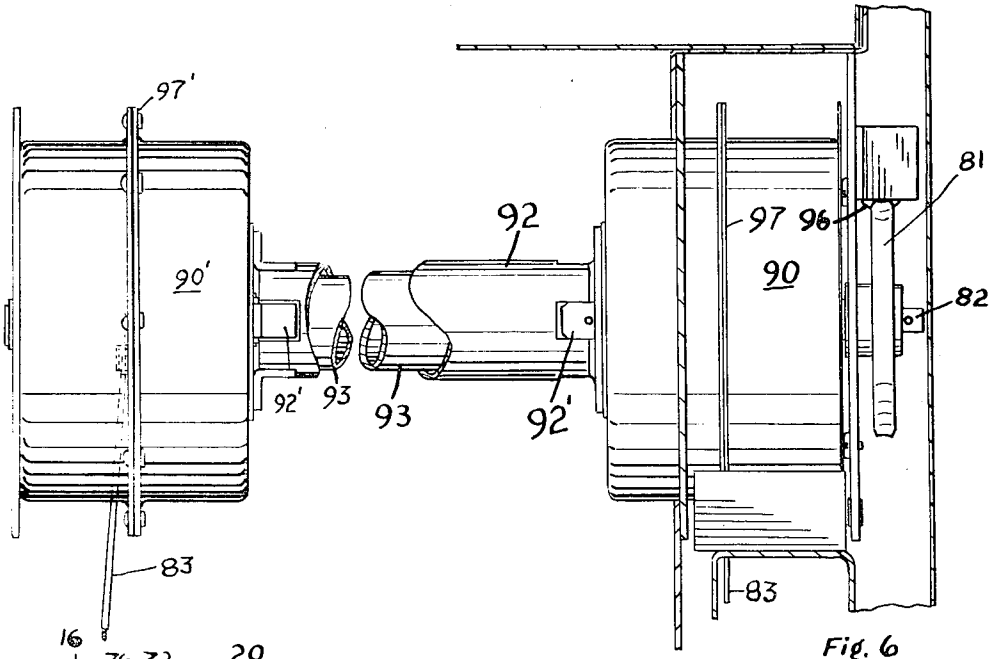


Fig. 6

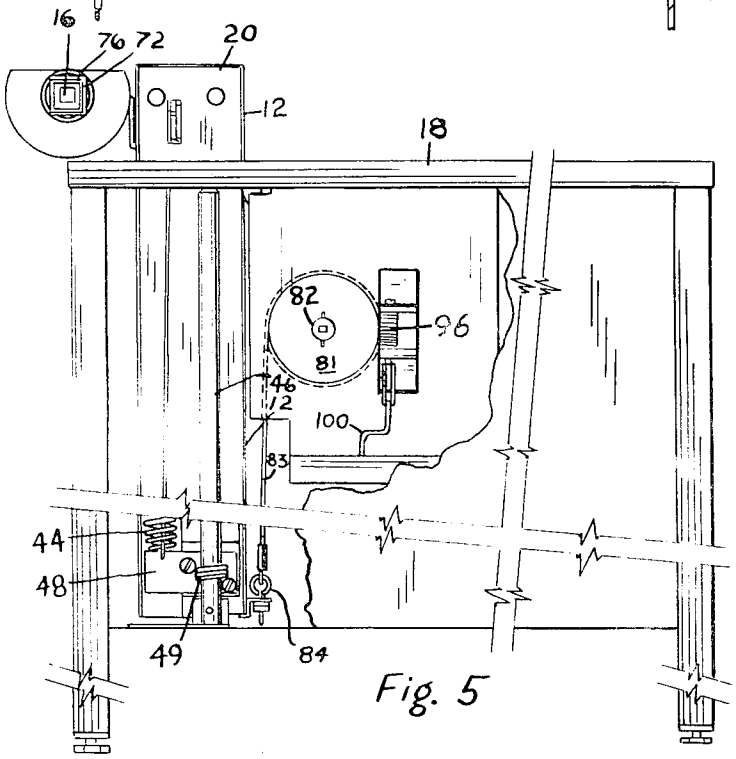


Fig. 5

INVENTOR
GENE B. HASBROUCK
ALAN L. GREEN

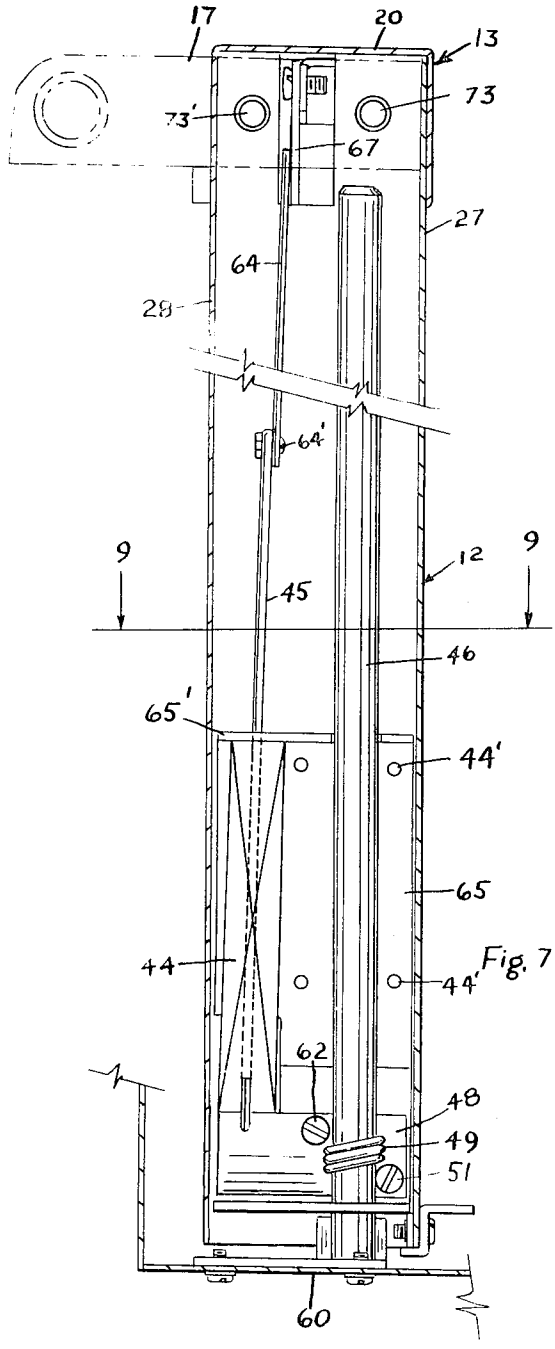


Fig. 7

INVENTOR
GENE B. HASBROUCK
ALAN L. GREEN

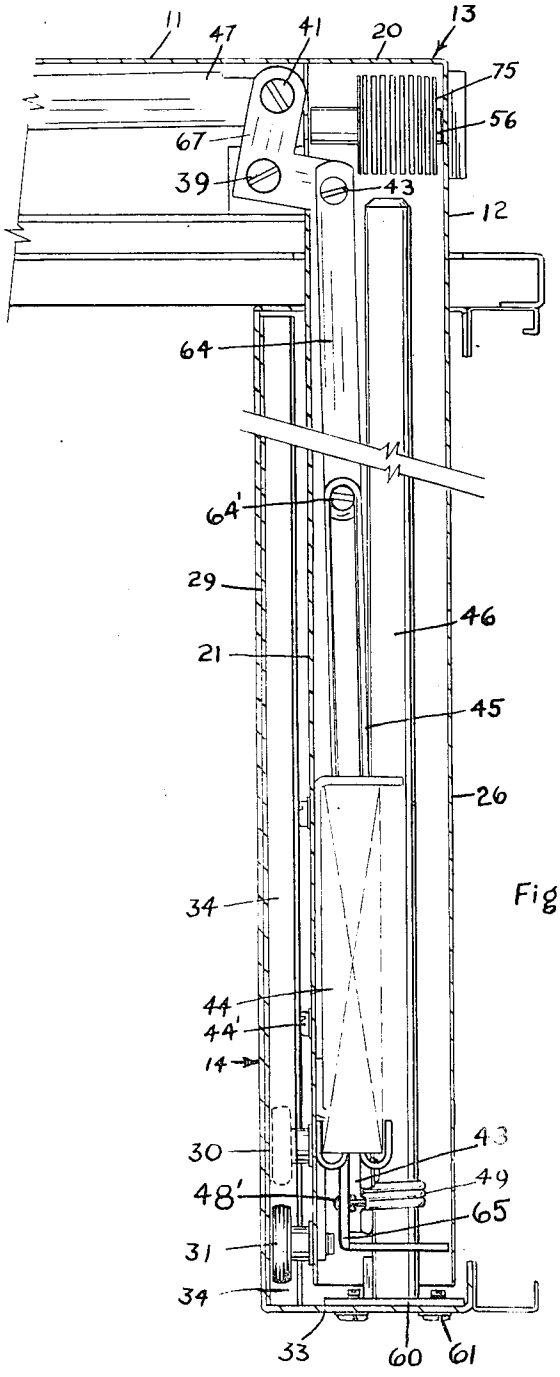


Fig. 8

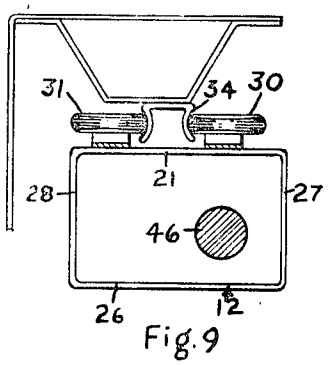


Fig. 9

INVENTOR
GENE B. HASBROUCK
ALAN L. GREEN

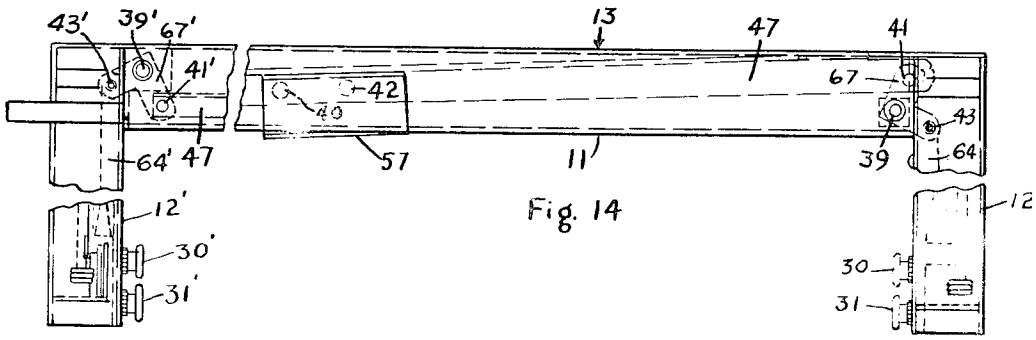


Fig. 14

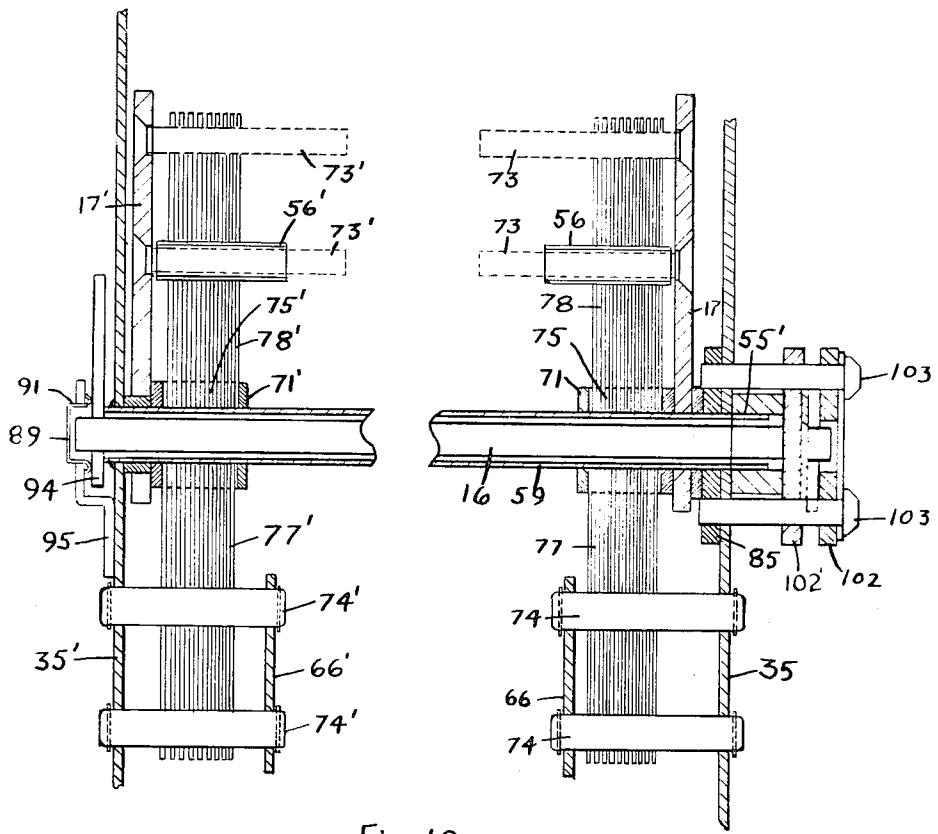


Fig. 10

Inventor
GENE B. HASBROUCK
ALAN L. GREEN

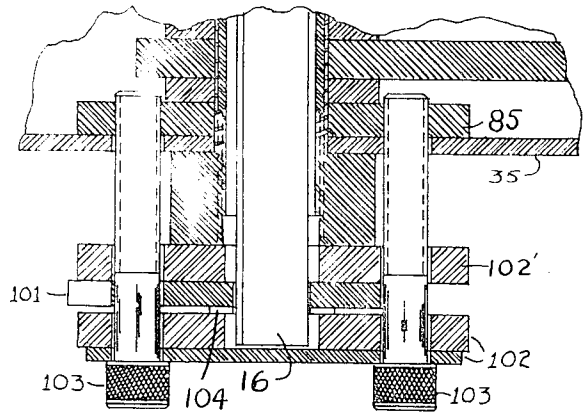


FIG. 11

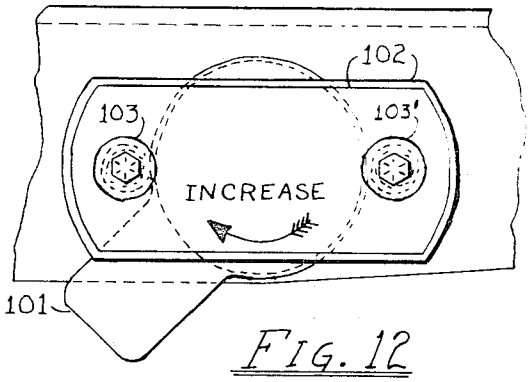


FIG. 12

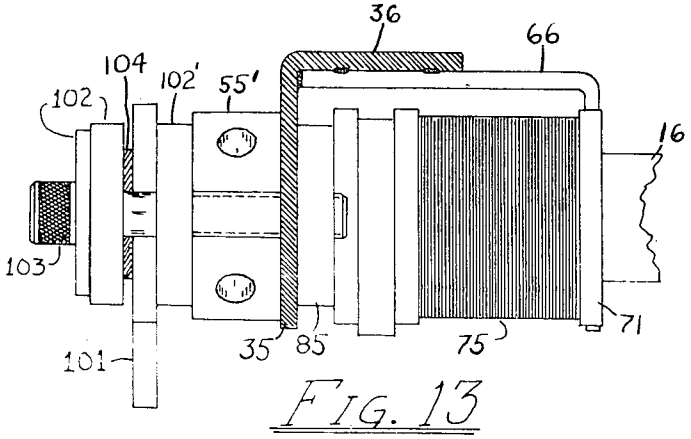


FIG. 13

INVENTOR
GENE B. HASBROUCK
ALAN L. GREEN

DRAFTING TABLE WITH IMPROVED VERTICAL CONTROL MECHANISM

DESCRIPTION OF PRIOR ART

The drafting table disclosed herein constitutes an improvement over U.S. Pat. No. 3,140,559 issued July 14, 1964 to H. N. Grow et al and over Amthor U. S. Pat. No. 3,273,517 issued Sept. 20, 1966.

STATEMENT OF INVENTION

This invention relates to drafting boards and, more particularly, a drafting board with an improved counterbalance and lock mechanism by which the board is adjustable in vertical relation to a support.

CROSS REFERENCE TO OTHER PATENTS

This application contains claims which cover a drafting table wherein the drafting board is supported by a mechanism which will permit the board to be adjusted in selected vertical positions. Application, Ser. No. 823,452, contains a similar disclosure and claims drawn to the combination of a drafting table and a control to adjust the table in selected tilted positions and in selected vertical positions. Application, Ser. No. 823,451, contains a similar disclosure and claims drawn to the combination of a drafting table and a control mechanism to control the board in selected tilted positions.

OBJECTS OF THE INVENTION

It is an object of the invention to provide an improved drafting table with an adjusting counterbalance and locking mechanism for controlling the movement of the table in vertical translation.

Another object of the invention is to provide an improved drafting table.

Another object of the invention is to provide an improved locking mechanism to control the vertical movement of a drafting table.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an isometric view of the drafting board according to the invention.

FIG. 2 is an enlarged view of the handle and associated linkage for locking both the tilting mechanism and the elevation mechanism.

FIG. 3 is a rear view of the drafting board.

FIG. 4 is a view similar to FIG. 3, taken from another direction, with certain parts broken away.

FIG. 4*a* is a schematic view of the linkage in locked position for use.

FIG. 4*b* is a schematic view of the linkage with lever moved to adjust for tilt.

FIG. 4*c* is a schematic view of the linkage with lever in position to adjust the board for elevation.

FIG. 5 is a side view of the desk with parts broken away to better show the vertical locking mechanism.

FIG. 6 is an enlarged partial cross sectional view showing the energy cells used to counterbalance the drafting board in elevation.

FIG. 7 is an enlarged longitudinal cross sectional view through one of the legs of the yoke showing the columns which enclose the locking mechanism for locking the board in vertical position.

FIG. 8 is a cross sectional view taken at right angles to the section of FIG. 7.

FIG. 9 is a cross section view taken on line 9—9 of FIG. 7.

FIG. 10 is an enlarged cross sectional view showing certain parts of the brake mechanism.

FIGS. 11, 12, and 13 are views of the tilt counterbalance and brake mechanism for the table.

FIG. 14 is an enlarged view of the board supporting yoke.

DETAILED DESCRIPTION OF THE DRAWINGS

The drawings show a drafting board supported on a table. The drafting board is adjustable in elevation and may also be tilted about a horizontal axis.

The drafting board **10** is tiltably connected to the yoke **13** by a hinge connection made up of plates **17** which are fixed to the yoke **13** by cap screws **73** and support angles **23** which are fixed to the bottom of the board **10** by fasteners **24** and **24'**. Tube **59** acts as a hinge pin connecting the flanges **35** and **35'** of support angles **23** and **23'** to plates **17** and **17'**.

The yoke **13** is U-shaped, having the legs **12** and **12'** rigidly connected together by transverse member **11**. The legs are telescopically supported in the desk top **18**.

The drafting board **10**, yoke **13** and desk may be assemblied and finished as indicated in FIG. 1 to make an attractive piece of office furniture which is very convenient due to the arrangement of all of the controls including lever **37** and crank **100**, all disposed at the right hand side of the drafting board.

A guard **38** is attached to the board **10** and lever **37** moves laterally in the guard. The guard **38** has an indent **50** in it in which the lever **37** is disposed when the table is in the vertical locked mode.

YOKE AND BOARD

The board is pivoted to the yoke **13** by pivot tube **59**.

The cross member **11** and legs **12** and **12'** of the yoke **13** may be made of sheet metal and the legs **12** and cross member **11** are formed into a square tube configuration. Cross member **11** has a transverse slot **15** extending from one side to the other. The slot **15** provides a path for pickup arm **57** to move. Pickup arm **57** is secured to angle bar **47** at points **40** and **42**. The cross member **11** contains the angle bar **47** which is connected to the elevation lock. Pickup arm **57** extends through slot **15**.

Brackets **17** and **17'** are fixed to the ends of cross member **11** by cap screws **73** and **73'** which extend through spacer bushings **56** and **56'** and are fixed to the cross member **11** of the yoke at each side at the upper ends of legs **12** and **12'**. Each bracket **17** and **17'** has a hole in it which receives pivot tube **59**.

Drafting board **10** has two support angles **23** and **23'** fixed to it. The angles **23** and **23'** have horizontal flanges **36** and **36'** respectively fixed to the board **10** and vertical flanges **35** and **35'** respectively by fasteners **24** and **24'** which extend in a plane parallel to the platelike brackets **17** and **17'**. Flanges **35** and **35'** each have a hole which is aligned with a hole in brackets **17** and **17'**. Pivot tube **59** extend through the holes in brackets **17** and **17'** and through the holes in flanges **35** and **35'** and form a hinge pin for the board **10** to tilt about. The drafting board **10** is thus tiltably supported on the yoke **13**.

TILT COUNTERBALANCE

The left hand end of pivot tube 59 is welded to vertical flange 35' of support angle 23'. The right hand end of tube 59 has a nut 55' threadably received on it. Thus the flanges 35 and 35' may be held from spreading apart and moving away from each other by pivot tube 59. The support angles 23 and 23' may be adjusted toward and away from each other by loosening the fasteners 24 by which the support angles 23 and 23' are held to board 10. Slots 64 will then allow support angles 23 and 23' to be moved laterally on board 10 to adjust the support angles relative to the two groups of brake leaves 75 and 75'.

Torsion bar 16 extends through pivot tube 59 and limit plate 94 is fixed to the left hand end of bar 16. Torsion lever 101 is fixed to the right hand end of torsion bar 16. Stop bracket 95 is welded to the vertical flange 35 at the left hand end of the board. A cap 89 is disposed in hole 91 in stop bracket 95. When the board 10 is tilted, lever 94 rotates with torsion bar 16 until it engages the stop bar. When the lever 94 engages the stop bar, further rotation of the left hand end of the torsion bar 16 relative to board 10 is stopped.

The right hand end of torsion bar 16 protrudes from the right hand end of the tube 59 and adjusting lever 101 is fixed to the right hand end of torsion bar 16. Two spaced studs 103 extend through plates 102 and threadably engage plate 85 which is fixed to vertical flange 35. Thus, when the drafting board is swung toward a horizontal position, the right hand end of torsion bar 16 is forced by lever 101 to rotate with the board 10. The left hand end of torsion bar 16, however, is held from rotating by limit plate 94 and the stop bar. Lever 101 is sandwiched between plates 102 and 102'. Thus tilting the board twists torsion bar 16 and a counterbalancing force tending to urge the board 10 to a vertical position results. The counterbalance force can be increased by loosening studs 103 and rotating lever 101 clockwise, in the direction of the arrow (FIG. 12) and relocking the lever 101 in its new position by retightening studs 103. Lock washer 104 will prevent lever 101 from slipping. By thus adjusting the torsional force by means of lever 101, the board may be precisely counterbalanced so that very little manual force is required to move the board 10 to different tilted positions when the tilt lock is released.

TILT-LOCKING

The board 10 may be positively locked in any tilted position by the efficient locking mechanism which is provided.

The locking mechanism is made up of two groups of brake leaves 75 and 75', one of the groups of brake leaves disposed at each side of the table. The brake leaves are squeezed together by a toggle linkage to form a positive lock for the board.

The group of brake leaves 75 is provided at the right hand side of the table. Group 75' is provided at the left hand side of the table. Group 75 is made up of first leaves 77 which have spaced holes which loosely receive pins 74 that are fixed to vertical flange 35 at the right hand side of the table. Angle brackets 66 are fixed to horizontal flange 36 of angle 23 and the brake leaves 77 are received between angle brackets 66 and flanges 35. Angle bracket 66' is attached to flange 36'. Second leaves 78 are interleaved between first leaves 77 and are freely received on spacers 56 which are fixed to yoke 13 by cap screws 73. Second group 75' of brake leaves are made up of first leaves 77' and second leaves 78' interleaved with each other in the same manner as the leaves 77 and 78 of the first group 75. Leaves 77, 78, 77' and 78' have a large hole through which pivot tube 59 extends. Bracket 17' is fixed to legs 12' of yoke 13 and is supported by cap screws 73'. Cap screws 73' are threadably received in leg 12'. Similar cap screws attach bracket 17 to leg 12.

Leaves 77 and 78, as well as leaves 77' and 78', are free to float on their respective pins 74, 74' and sleeves 56 and 56' supported on cap screws 73 and 73' at each side of the table.

Square tubes 72 and 76 are telescopically received on pivot tube 59. Washers 71 and 71' are supported between the outer ends of square tubes 72 and 76 and the respective groups 75 and 75' of brake leaves. Links 70 are pivoted to the square tube 72 at 51. Crank links 68 are pivoted to square tube 76 at 53. Lever 37 is fixed to links 68. Links 68 are pivoted to links 70 at 52. Thus when lever 37 is in the position A shown in FIG. 4, the square tubes 72 and 76 will be moved outward from each other to their extreme outward position and they will exert a maximum clamping force on the brake leaves in groups 75 and 75', forcing their leaves into frictional engagement with each other in the group. This force may be increased by adjusting support angles 23 inward toward each other by sliding the support angles 23 and 23' on fasteners 24 in slots 64 and by loosening studs 103 and readjusting nut 55, then retightening studs 103.

ELEVATION LOCK

The drafting board is locked against movement in elevation as well as against tilting by the lever 37. When lever 37 is moved from position A to position B (FIGS. 2 and 4), the distance between points 53 and 51 is decreased and square tubes 72 and 76 move toward each other and release their force on the two groups of brake leaves 75 and 75' thus allowing the board 10 to tilt.

It will be seen that sleeve 79 is telescopically received on tube 76, and links 69 are pivoted to tubes 79 at 55 as well as to link 68 at 54. Flange 58 is fixed to sleeve 79. Therefore, when lever 37 is moved toward position C, sleeve 79 is moved toward the left and pickup arm flange 58 engages pickup lever 57. Further movement of lever 37 will cause a force by link 69 on flange 58 and thence to pickup 57. An equal and opposite reaction force will be exerted by link 70 on square sleeve 72. The reaction force will relock the group of brake plates 75 at the right hand side thereby relocking the board 10 against tilting. However, the group of brake plates 75' at the left hand side will remain unlocked. The force exerted by the single group of locked plates 75 at the right side of the table is sufficient to retain the board 10 in its tilted position while the operator is adjusting the board in elevation.

When lever 37 is in position C the elevation locking mechanism will be unlocked. This is accomplished by the force on pickup link 57 which is connected to the vertical locking mechanism through bar 47 and bell cranks 67 and 67'.

The elevation lock mechanism is basically a helical spring 49 in each leg 12 of yoke 13 which grips the vertically extending rods 46 and 46' which are fixed to the table base.

The legs 12 may be formed of sheet metal or other suitable material. The legs each have a top wall 20, side walls 21 and 26, and front and rear walls 27 and 28. The legs of the yoke 13 are slidable up and down in the table side panels 14. The vertically extending tracks 29 are supported at each side of the table and they provide guides for movement of legs 12. The tracks are in the form of a channel having each side leg of the channel bent to form grooves 34 for a wheel 30 and 31. Wheels 30 and 31 are fixed to the lower ends of legs 12 to roll in the grooves when board 10 is moved in elevation.

Each of side panels 14 has a bottom 33 which turns inward from sides 14. Lock rod 46 is fixed to plates 60 which is attached to bottom 33 by means of screws 61. Bracket 65 is in the form of a plate fixed to side wall 21 of leg 12 by scress 44'. Both the upper end and the lower end of bracket 65 are turned outward and the lower end has a hole in it through which rod 46 extends. Rock lever 48 is in the form of a plate pivoted to bracket 65 by rivet 48'. The helical spring 49 has eyelets formed on its ends which receive screws 62 and 51. The rod 46 passes through the helix of spring 49.

The upper end of compression spring 44 rests against the upper end 65' of bracket 65. The lower end of spring 44 rests against lever 48 urging lever 48 to pivot on rivet 48' thereby twisting spring 49 and causing spring 49 to grip rod 46. Spring hairpin link 45 has its lower end hooked under the lower end of spring 44 and is attached to connecting bar 64 by rivet 64'. Spring 44 is a helical compression spring. Hairpin link 45 extends through the inside of the helical spring 44 and pilots it thereby holding it in position.

Bell cranks 67 and 67' are pivoted to cross member 11 at 39 and 39' respectively. Bellcranks 67 are also pivoted to bars 64 and 64' at 43 and 43' and pivoted to angle bar 47 at 41 and 41' respectively.

Thus when lever 37 is moved to position C, flange 58 acting through pickup 57 will move angle bar 47 to the left rotating bellcranks 67 about their pivots 39 and lifting hairpin links 45. This will compress spring 44 and allow lever 48 to freely rotate and rotate spring 49 so that they can freely slide on rods 46. Thus the yoke 13 with board 10 on it can freely move up or down.

ELEVATION COUNTERBALANCE

The weight of the drafting board 10 and yoke 13 is counterbalanced in elevation by the mechanism made up of two energy cells, one located at each side of the table. (FIGS. 1, 4 and 6). Each energy cell is basically an outer drum 90 and an inner shaft 82 with a clock spring wrapped on the shaft and attached to the drum. The two energy cells, one at each side of the table, each have a drum 90 with an outer circumferential flange 97 to which an end of a cable 83 is attached. The lower end of each cable is attached to an eyebolt 84 in turn connected to a leg 12 of the yoke. Drums 90 are connected together to rotate as one by outer tube 92 which has notches in its end which receive lugs 92' on the inner ends of drums 90. Thus the drums 90 are restrained to rotate in unison by outer tube 92 and cables 83 are wrapped on drums 90 as the table is raised.

Inner tube 93 is attached to the spool connected to shaft 82 on which a clock spring is wound. The outer end of the clock spring is attached to the inner periphery of the drum 90. The spring may be tightened and thus more counterbalancing force applied to the yoke by tightening the springs.

Shaft 82 of the energy cell at the right hand side of the table is connected through inner tube 93 to the inner shaft in the energy cells at the left hand side of the table. By rotating crank 100 and its worm 96, worm gear 81 is rotated and by it, shaft 82 and the inner shafts of both energy cells and the tension on the spring inside the energy cells is thereby increased.

The board 10 and the yoke 13 can be levelled with respect to the base by adjusting the length of cables 83. This can be accomplished by adjusting the nuts on eye bolts 84.

It will be noted that handle 37, as well as crank 100, are both located at the right hand side of the table so that the operator has convenient access to them with his right hand. By adjusting the tension on the energy cells, the drafting board and yoke can be counterbalanced so that it can be moved to the desired height with a minimum of manual effort. By adjusting lever 101, the torsional force exerted by the torsion bar can be adjusted so that the board may be tilted with a minimum effort when the handle 37 is in position B. By moving lever 37 to position C into indent 50, the board is locked against tilting but is free to be moved vertically. Since both vertical and horizontal locks are actuated by a single lever 37, the operator may operate the lever 37 with one hand and at the same time have the other hand free to move the board to desired position.

FIGS. 4*a*, 4*b* and 4*c* are schematic views that show the relative positions of the locking mechanisms and associated linkages which lock and unlock the board 10 so that it may be tilted and adjusted to the desired position and elevation.

It has been stated in the preceding description that when the lever 37 is in the A position, the board 10 is locked so that it cannot be tilted or its position in elevation changed. The brake leaves 75 at both sides of the board are compressed, locking the board against tilting and the flange 58 has moved away from the pickup 57 allowing spring 44 to urge the lever 48 to swing down, pivoting around rivet 48' and causing the spring 49 to grip column 46.

When the operator desires to adjust the board 10 to a different tilted position, he moves the lever 37 to position B. In position B, the lever 37 unlocks the tilt lock. In position B, pivots 51 and 53 move toward each other, causing the tubes 72 and 76 to move toward each other and away from brakes 75 and 75'. This causes the brakes to release and allows the table to tilt. However, at this point, the elevation lock remains locked.

When the lever 37 is moved toward position C, the flange 58 engages the pickup 57. Further movement of the lever 37 brings the member 71 into engagement with the brake 75 exerting a force which has a reaction on pickup 57. This moves the link 47 to the left and rotates the bellcranks 67 about their pivot point which causes the links 64 and 64' to be lifted thereby lifting the links 48 about their pivot 48' and against the force of the compression spring 44. Thus the spring 49

releases its grip on the column 46 and the table may be adjusted in elevation while its tilting function is relocked. When the table is adjusted to the position desired, the operator will return the lever 37 to the A position, thus relocking the table against tilting and allowing the spring 44 to swing the lever 48 to the position to cause the spring 49 to again grip the column 46.

When the flange 58 engages the pickup 57, it carries the bar 47 to the left and moves the bellcranks 67 and 67' about their pivot points. This causes the bellcranks to move the links 64 and 64' upward, lifting the hairpin link 45 which is connected to the lever 48. This causes the lever 48 to swing about its pivot point 48' which is pivoted to the fixed support. The spring 44 is compressed between the upper edge of the link 48 and the leg 65' of the bracket 65. The bracket 65 is fixed to the support.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A drafting table comprising
a drafting board,
a supporting structure,
a yoke having two spaced legs mounted for vertical movement on said supporting structure,
means supporting said drafting board on said yoke,
lock means for holding said yoke at a selected vertical position, counterbalance means attached to said table
said lock means comprising a vertically extending first rod and a vertically extending second rod each being fixed to said support means, one said rod being disposed adjacent each said leg,
gripping means on each said leg adjacent each said rod and encircling each said rod,
actuating means on each leg of said yoke for moving said gripping means to a first position at which said gripping means grips each said rod,
said actuating means on said yoke being adapted to move said gripping means to a second position to permit said gripping means to freely slide over said rod to allow vertical movement of said yoke whereby said vertically extending rods also function to vertically guide said yoke in its vertical movement.

2. The drafting table recited in claim 1 wherein said counterbalance means is provided on said drafting board for counterbalancing said drafting board in elevation movement,
said counterbalance means comprises
two energy cells, one said energy cell being supported on each side of said support,
each said energy cell comprises a drum disposed adjacent each side of said table, a shaft and a spring, said spring being wrapped around said shaft and connected to said drum,
a tube extending transversely of said table connecting said drums, being disposed on said shaft, said shaft being disposed in said drum,
a transverse shaft connecting said shafts of said cells,
and a first cable wrapped on one said drum, and a second cable wrapped on the other said drum, said cables being connected to said table legs whereby said drums are rotated when said table moves in elevation.

3. The drafting table recited in claim 1 wherein said counterbalance comprises cables attached to said legs,
two energy cells are attached to said structure,
said energy cells being adapted to exert a tensile force on said cable whereby the weight of said legs and said drafting board is counterbalanced,
and means to restrict said cables to exert forces on said legs, biasing said legs upward to move said board in level relation to said support.

4. The mechanism recited in claim 1 wherein said vertical legs are supported on a support member for vertical planar movement thereon,
said gripping means comprises a helical spring extending around each said rod and adapted to slide freely on said rod when in a first position, and to grip said rod in a second position,
said helical spring being swingably fixed to each said support member,
compression springs having means connected to them engaging each said helical spring, urging said helical spring to said second position whereby said helical spring locks said support member to said rod,
means including a link connected to said helical spring to said compression spring whereby said compression spring is compressed by action of said third link and said helical spring is compressed.

5. The combination recited in claim 1 wherein said counterbalance means is provided to counterbalance said board at any selected vertical position,
said counterbalance means comprising,
two energy cells attached to said table, one at each side thereof,
a line extending from each said energy cell,
synchronizing means to restrain said lines to move the ends of said lines in unison,
the distal end of each said line being attached to said board,
said energy cells having means to exert a tension on said lines whereby said board is counterbalanced.

6. The combination recited in claim 5 wherein said energy cells have a center axis having a tension means thereon,
a rod attached to transverse axis of each said energy cell,
manual actuating means accessible from one side of said table for rotating said center axis whereby the tension of said tension means is increased,
said synchronizing means comprises a tube concentrically disposed on said transverse rod,
each said energy cell having a drum adapted to wrap said line means thereon,
said tube having each of its ends attached to one said drum.

7. The drafting table recited in claim 1 wherein counterbalance means is provided for said yoke,
said counterbalance means comprising a first energy cell and a second energy cell,
means connecting said energy cells,
said first energy cell being supported on said support at one side thereof and said second energy cell attached to the other side of said table.

8. The drafting board recited in claim 7 wherein each said energy cell comprises
a spring,
a shaft,

a spring connected to said shaft,
a first end,
and a second end,
each said spring being connected to a drum at a second end,
a cable connecting each leg of said yoke to the outside of said drum, whereby said springs urge said yoke upward,
a rod extending from one side of said table to the other and connecting the said shafts of said energy cells together,
a tube disposed concentric to said rod,
said tube connecting said drums together whereby said drums rotate in unison and said legs are moved upward evenly.

9. The drafting table recited in claim 1 wherein said counterbalance means is provided for said table, comprising

two energy cells, each having an outside drum with a shaft thereon, said energy cells being supported on said table,
a transverse tube connecting the said shafts together,
a second tube concentric with said first tube,
said second tube connecting and restraining said drums to rotate together,
a spring in each said energy cell, each said spring being wound on each said shaft and connected to the corresponding said drum,
a first cable wound on said first drum,
a second cable wound on said second drum,
each said cable being connected to a said leg of said table whereby said legs are moved up and down at the same rate whereby said legs are moved straight up and down.

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