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DRAFTING BOARD MECHANISM WITH AUTOMATIC RETRACTION MEANS

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Fig. 1

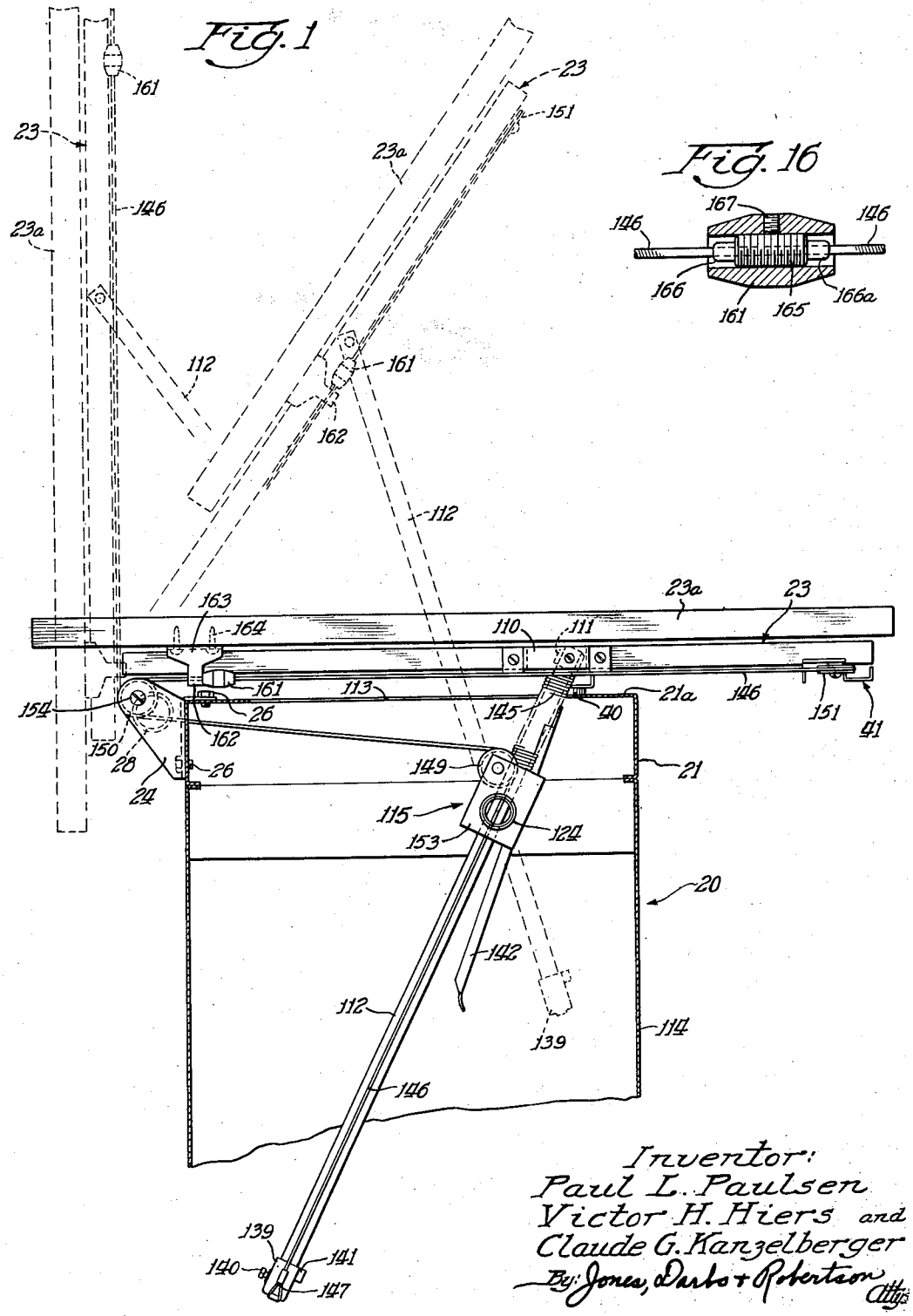


Fig. 16

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DRAFTING BOARD MECHANISM WITH AUTOMATIC RETRACTION MEANS

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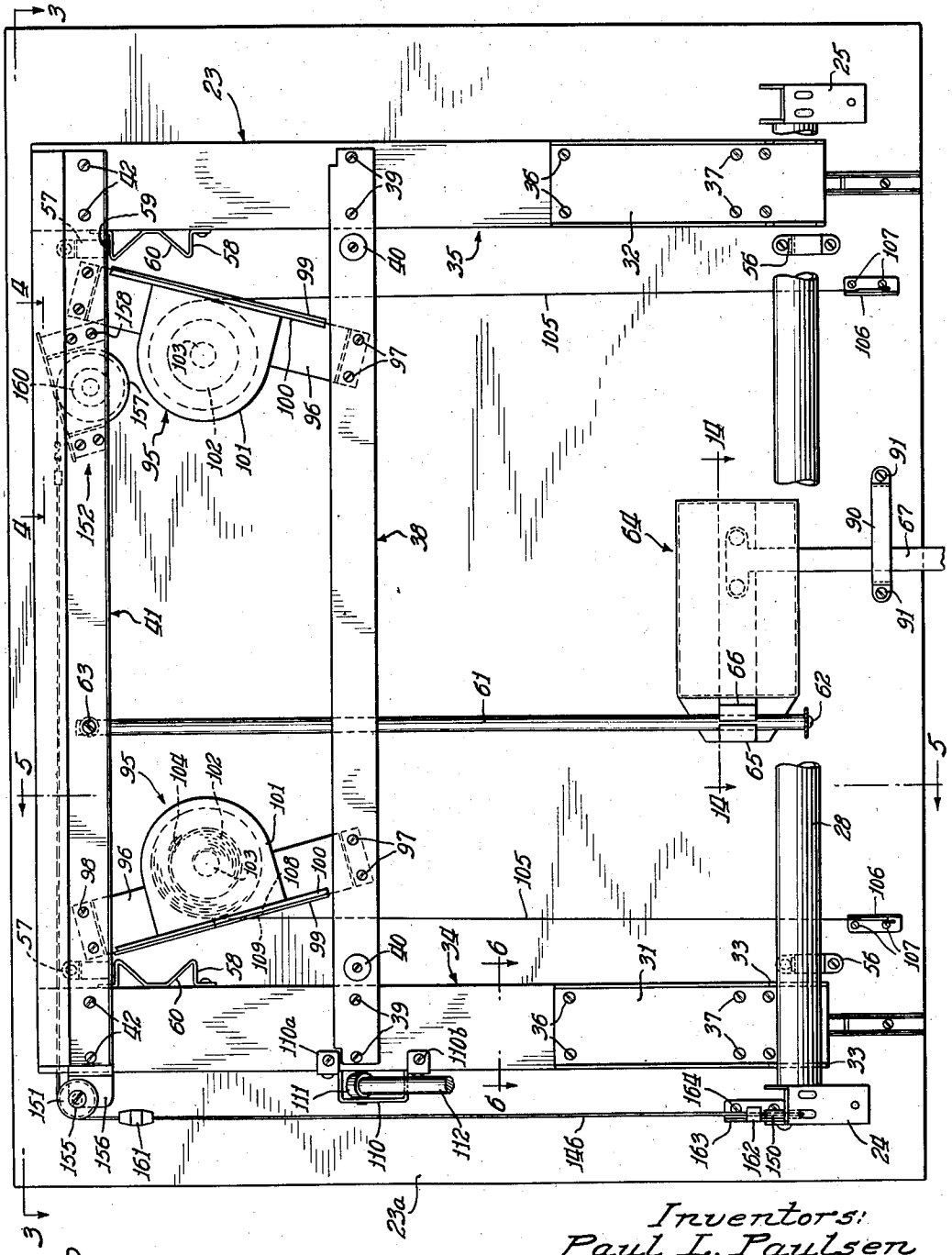


Fig. 2

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DRAFTING BOARD MECHANISM WITH AUTOMATIC RETRACTION MEANS

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Fig. 3

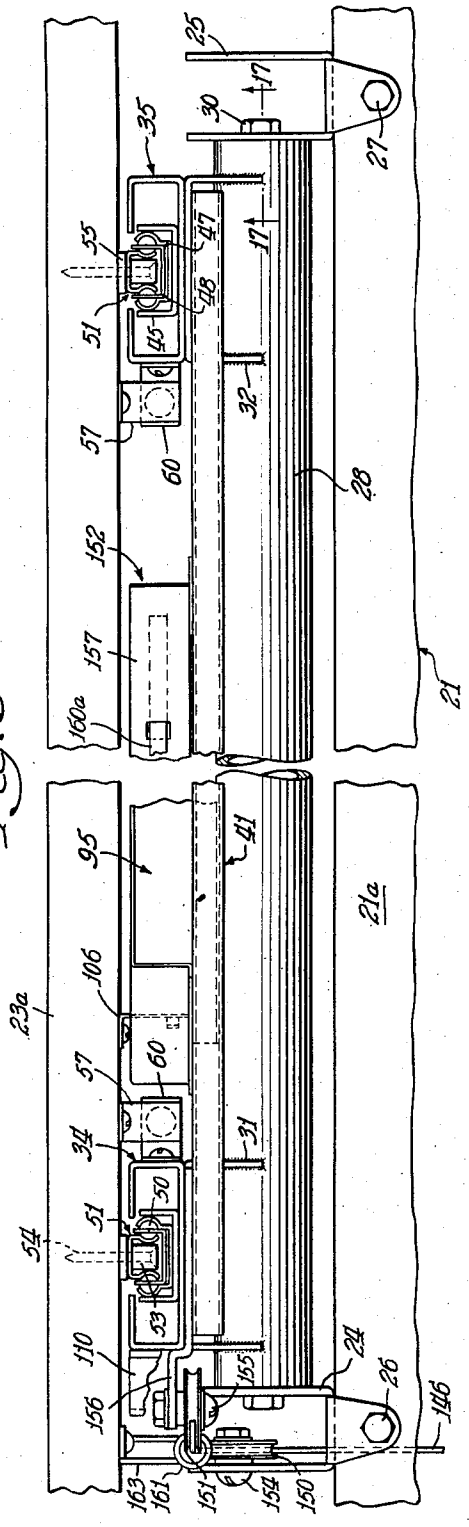


Fig. 17

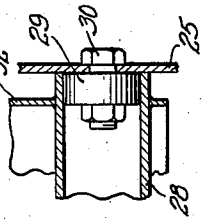


Fig. 4

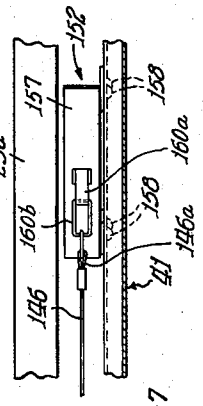
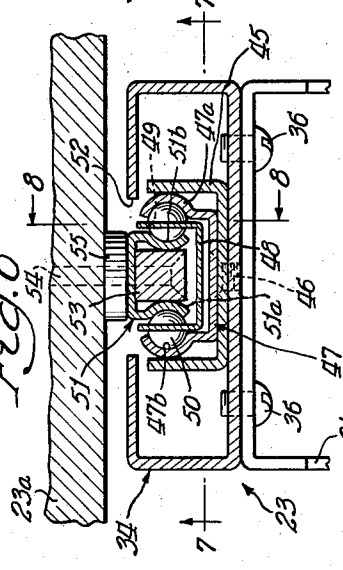


Fig. 6



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DRAFTING BOARD MECHANISM WITH AUTOMATIC RETRACTION MEANS

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Fig. 5

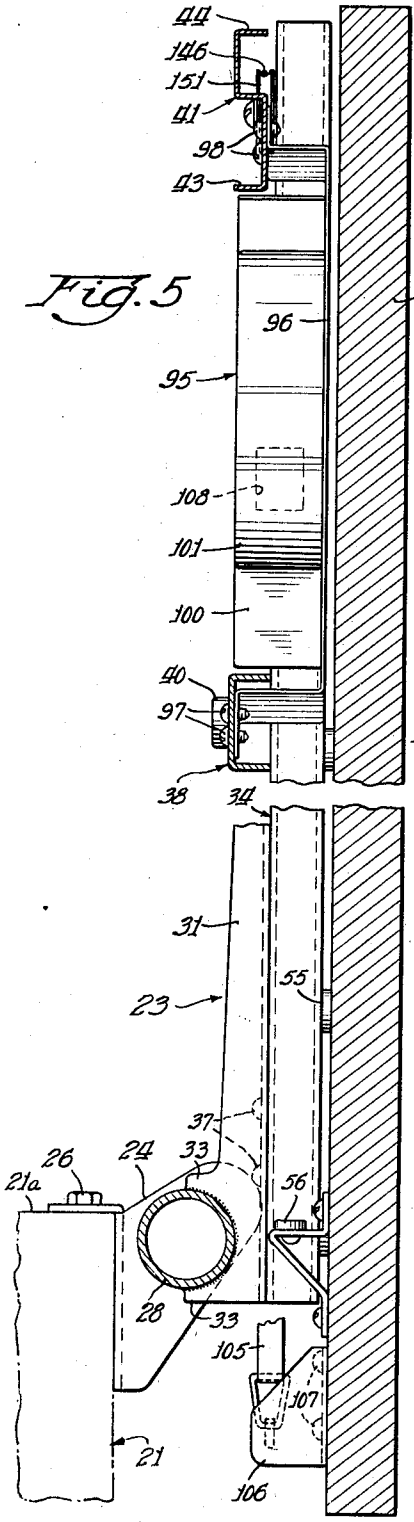


Fig. 13

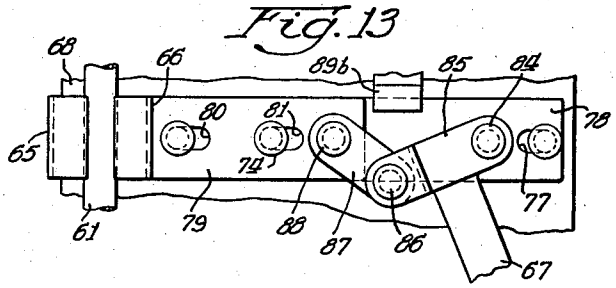


Fig. 14

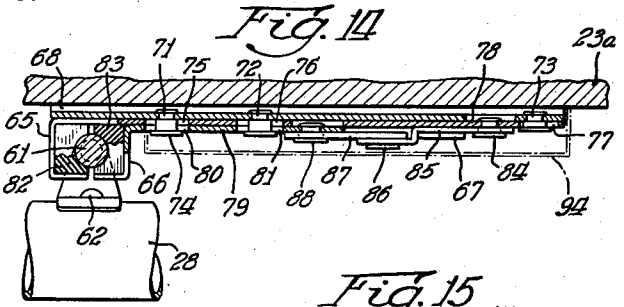
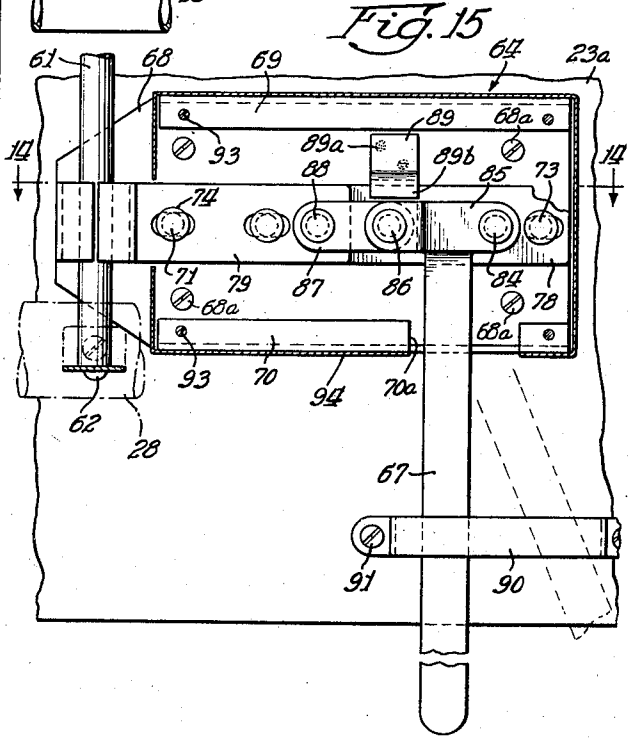


Fig. 15



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DRAFTING BOARD MECHANISM WITH AUTOMATIC RETRACTION MEANS

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Fig. 7

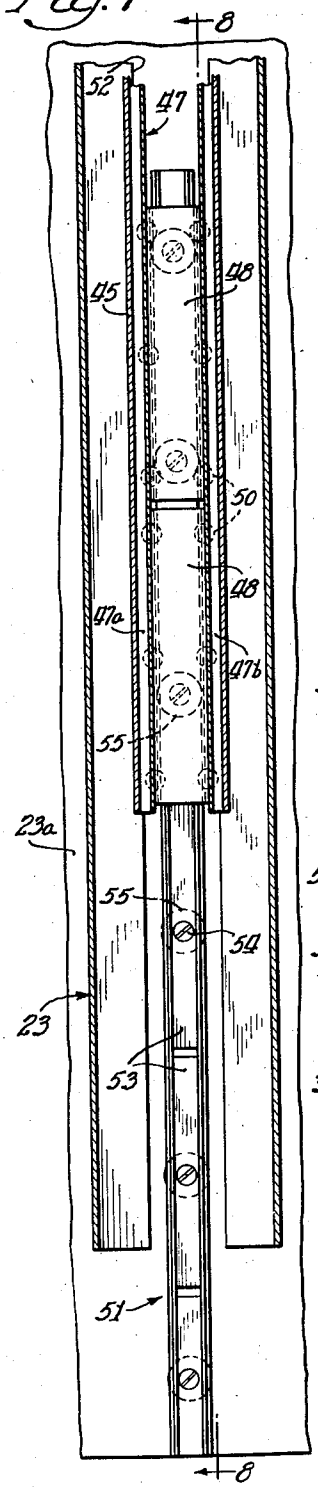


Fig. 8

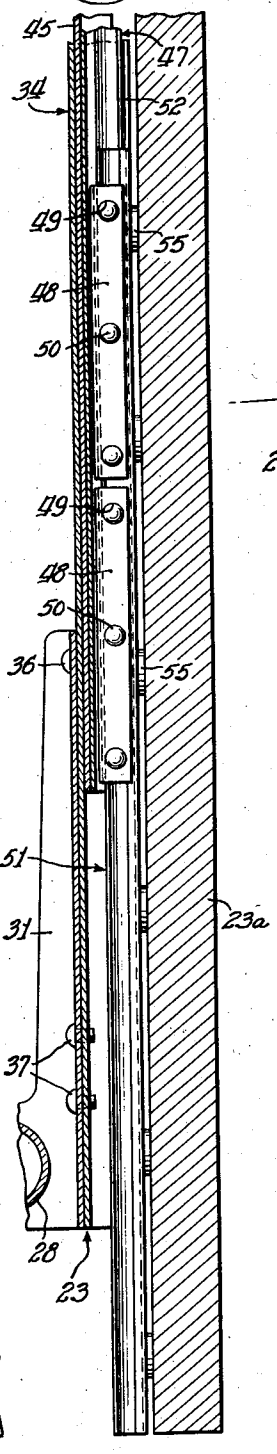


Fig. 18

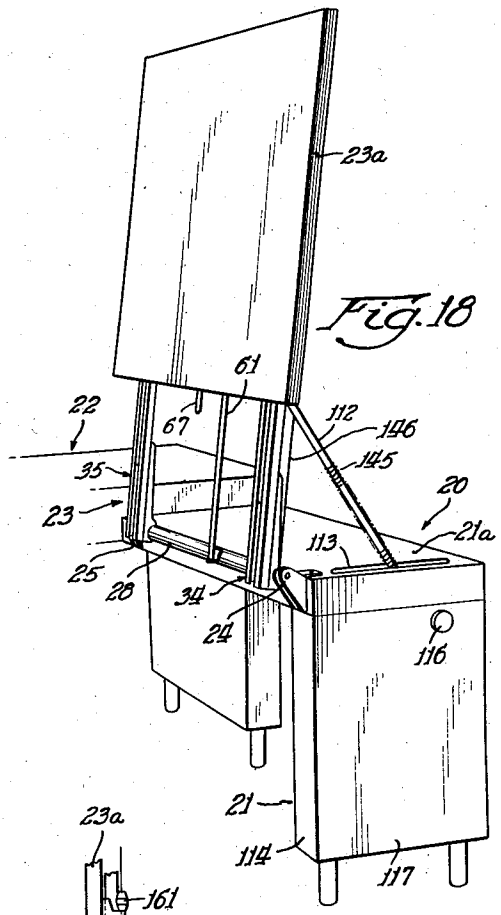
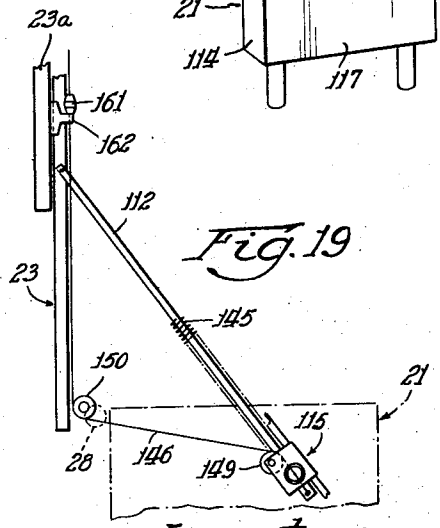


Fig. 19



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DRAFTING BOARD MECHANISM WITH AUTOMATIC RETRACTION MEANS

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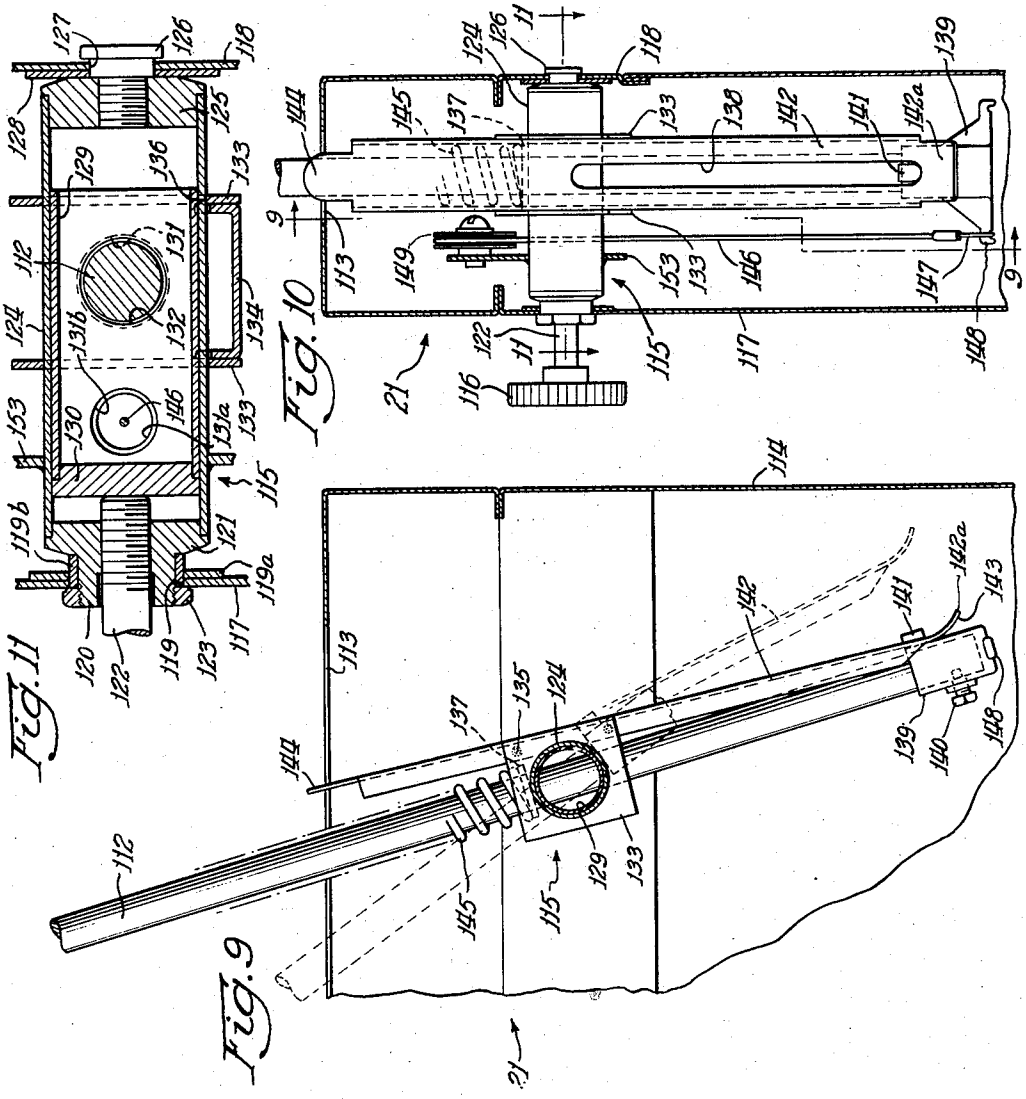


Fig. 11

Fig. 10

Fig. 9

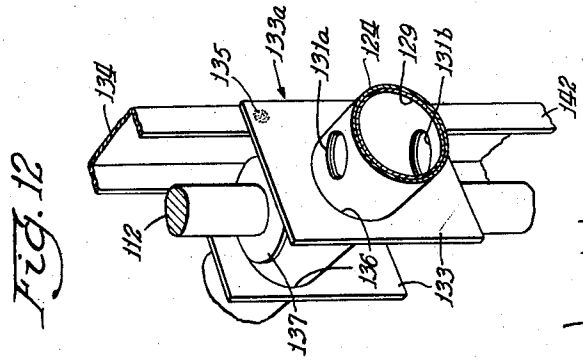


Fig. 12

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United States Patent Office 2,899,772 Patented Aug. 18, 1959

2,899,772

DRAFTING BOARD MECHANISM WITH AUTOMATIC RETRACTION MEANS

Paul L. Paulsen, Victor H. Hiers, and Claude G. Kanzelberger, Two Rivers, Wis., assignors to Hamilton Manufacturing Company, Two Rivers, Wis., a corporation of Wisconsin

Application February 6, 1958, Serial No. 713,677

14 Claims. (Cl. 45—131)

This invention relates to drafting board mechanism.

For some time past there has been a demand for a desk and drawing board unit for engineers and draftsmen that permits the worker to sit at a desk while having a drawing board readily available and accessible and to which he may turn by merely rotating his chair without interference by the desk. Features of such a unit are disclosed and claimed in copending patent application of Paul L. Paulson et al. Serial No. 691,774 filed October 22, 1957.

The present invention is a further development of and improvement on the disclosure of said patent application and aims to provide a drawing board in such an arrangement which may not only be rotated angularly but may also be moved inwardly and outwardly on a pivoted frame so as to elevate the board, in vertical or near vertical positions thereof, sufficiently to permit working thereon in a standing position, if desired, degrees of elevation being made possible by improved and simplified mechanism therefor.

An important object of the present invention is the provision that when the drawing board and its frame are rotated toward the horizontal position the board is positively and automatically retracted on the frame.

Further objects of the invention are improved counterbalancing means for the board in its selective reciprocal adjustments on the frame, and means counterbalancing the frame and board in angular movements thereof.

A still further object of the invention is a provision for releasably locking the frame and board in a predetermined reciprocable position and for locking the frame in a predetermined angular position on the stand.

These and other objects of the invention will be apparent from the following description taken together with the accompanying drawings, showing an illustrative embodiment of the invention, and in which drawings:

Figure 1 is a side elevational view, of a drawing board and mechanism therefor, a stand being shown in section, a horizontal position of the board and frame being shown in full line and selective angular position in broken lines;

Figure 2 is a back view of the board and frame in vertical position, the board being retracted on the frame;

Figure 3 is an enlarged view, broken away to save space, taken on the line 3—3 of Fig. 2;

Fig. 4 is a further detailed section on the scale of Fig. 2 taken on the line 4—4 of Fig. 2;

Figure 5 is an enlarged vertical section on the line 5—5 of Fig. 2;

Figure 6 is a further enlarged cross-section of one of the tracks, taken on the line 6—6 of Fig. 2;

Figure 7 is a vertical section on the scale of Fig. 3, taken on the line 7—7 of Fig. 6;

Figure 8 is a vertical section, at right angles to Fig. 7, taken on the line 8—8 of Fig. 6, and being also a section taken on the line 8—8 of Fig. 7;

Figure 9 is an enlarged fragmentary side elevational view of the support rod and frame locking mechanism, showing in broken lines adjustable selective positions of the parts;

Figure 10 is a face view of parts shown in Fig. 9;

Figure 11 is an axial section taken on the line 11—11 of Fig. 10 still further enlarged;

Figure 12 is a perspective view of parts shown in Figs. 9, 10 and 11;

Figure 13 is an enlarged fragmentary face view of parts of the board locking mechanism generally shown also in Fig. 2, with the mechanism in released position;

Figure 14 is a plan view of the locking mechanism of Fig. 13 in locked position, being a section taken on the line 14—14 of Fig. 2 and also a section on the line 14—14 of Fig. 15;

Figure 15 is a face view of the board locking mechanism in locked position with the cover cut away;

Figure 16 is an enlarged longitudinal sectional view of the cable bob;

Figure 17 is a fragmentary enlarged axial view taken on the line 17—17 of Fig. 3;

Figure 18 is a reduced perspective view showing the board and the frame therefor mounted on the stand; and

Figure 19 is a somewhat schematic view showing the retractor cable for the drawing board.

Referring in detail to the illustrative construction shown in the drawings, the numeral 20 indicates a base for the drafting board which in this instance is shown in the form of a stand 21 that is angularly related to a draftsman's or engineer's desk 22 (Fig. 18). The stand 21 mounts the angularly adjustable or rotatable frame 23 that slidingly carries the drawing board 23*a*, the combination of the desk, angled stand and drafting board being described, and features thereof claimed, in said pending application Serial No. 691,774.

The stand 21 rotatably mounts the frame 23 thereon by means of bifurcated brackets 24 and 25 each secured to a corner of the stand as at 26 and 27 (Fig. 3) and which at each end, on their inner furcations, journal the torque tube 28. The latter is an operative integral part of and rigid with the frame 23, the whole providing distortion resisting structural support for the drawing board. As best seen in Fig. 17, the torque tube 28 rotates on bearings 29 that are bolted to the brackets 24 and 25 as at 30, on inner furcations thereof.

Welded to the torque tube 28, adjacent each end thereof, and between the brackets 24 and 25 are a pair of leg members 31 and 32 that have attachment fingers 33 that embrace and are rigidly secured to the torque tube 28. Rigidly secured to the leg members 31 and 32 are the frame track members 34 and 35 respectively that are shown screwed to the leg members as at 36 and 37. The track members 34 and 35 are therefore also rigid with the torque tube 28 to constitute a non-distortable U-structure with the torque tube. To enhance the rigidity of the frame parts referred to and for other purposes later pointed out, a cross bar 38 connects the track members 34 and 35 intermediately of their length, secured thereto as by screws 39, the bar 38 being in the form of a channel member with its channel facing the members 34 and 35 and its outer face conveniently carrying rubber bumpers 40 that may engage the top surface 21*a* of the stand 21 (Fig. 18). At the outer ends of the track members 34 and 35 is another cross bar 41 screwed to the track members as at 42 and being of reverse channel formation in cross-section, the one of the said channel formations through which the screws 42 pass facing outwardly as at 43 (Fig. 5) and the other facing inwardly as at 44, that is, toward the track members 34 and 35.

The track members 34 and 35 as seen in Figs. 6, 7 and 8, are of box form and carry channel members 45 secured within the track as by screws 46 and which in turn receive an outer ball race channel 47 also secured by

the same screws 46. The outer race 47 has transversely curved sides 47*a* providing inwardly facing longitudinal grooves 47*b* and slidingly contains a ball cage channel 48 that has at intervals spaced therealong, in its opposite side walls, round holes 49 for anti-friction bearing balls 50. An inner race channel for the balls 50 is provided by the channel member 51 attached to the drawing board 23*a* and that has transversely curved sides 51*a* that provide outwardly facing longitudinal grooves 51*b*. The longitudinal grooves 47*b* in the outer race and the longitudinal grooves 51*b* in the inner race provide complementary raceways for the balls 50 guided by the ball cage 48. Channel members 51 project into the track members 34 or 35 through a longitudinal opening 52 in the latter. Channel member 45 reinforces the outer race 47 and an inner filler strip 53, of wood, reinforces the inner race 51. Screws 54 pass through the filler strip 53, through the channel 51, through spacing washers 55 and into the drawing board 23*a* to secure the inner race channel rigidly to the board. It will be understood that the ball cage 48 rides back and forth in the tracks and channels on the frame and board respectively in response to relative movement thereof to minimize friction therebetween.

By means of the two anti-friction track means thus provided on the frame 23, at each side of the drawing board 23*a*, the board is reciprocable by sliding movements with respect to the frame within the limits of a pair of stops 56 on the board adjacent its inner edge and 57 adjacent its outer edge, at each side of the board, for engagement respectively with faces 58 and 59 alternatively on a bumper 60 fixed on each of the track members 34 and 35 on the frame. Figure 2 shows the board in its innermost or retracted position with respect to the frame with the outer board stops 57 abutting the faces 59 of the bumpers 60. It will be understood that in the outermost reciprocated position of the board on the frame, the stops 56 of the board will contact the opposite faces 58 of the track bumpers.

To releasably lock the board in selective reciprocated or sliding adjustment with respect to the frame, the frame carries a central cylindrical bar 61 secured at its inner end to the torque tube 28, as at 62, and at its outer end secured to the frame cross-bar 41, as at 63, and thus extending in the direction of reciprocation of the drawing board. For cooperation with the bar 61, the drawing board carries manually releasable clamping mechanism indicated generally by the numeral 64 and which includes a pair of pressure jaws 65 and 66 actuatable by a hand lever 67. Details of the mechanism are shown in Figs. 13, 14 and 15, as next described.

Secured to the board 23*a*, as by screws 68*a*, adjacent the rod 61 is a base plate 68 having return bent flanges 69 and 70 along its upper and lower edges respectively. On the base plate 68 are fixed a plurality of studs 71, 72 and 73 having heads 74 that pass respectively through laterally elongated slots 75, 76, and 77 in a sliding plate 78 carried on the face of the base plate. Over the sliding plate 78 is another sliding plate 79 that has elongated slots 80 and 81 therein registering with the slots 75 and 76, the heads 74 of the studs being large enough to hold the sliding plates together in relatively slidable arrangement on the studs 71 and 72. The sliding plate 78 is rigid with and carries the pressure jaw 65 and the sliding plate 79 is rigid with and carries the pressure jaw 66. These jaws desirably are lined with a yielding elastic material such as rubber or plastic, as indicated at 82 and 83 respectively (Fig. 14) for frictionally engaging the rod 61. By relatively moving the sliding plates 78 and 79 in given opposite directions it will be apparent that the jaws will be moved together and will be clamped onto the rod, while, by relatively moving them in the reverse opposite directions, the rod will be released for sliding movement of the drawing board. For manipulation of the sliding plates 78 and 79, the hand lever 67 is pivoted as at 84 on the sliding plate 78 by one end of T-head 85 of the lever, the other end of the T-head being articulated as at 86 with a link 87 that is pivoted as at 88 on the sliding plate 79, thus constituting a toggle device. When the lever 67 is swung to the right as shown in full lines in Fig. 13 and in dotted lines in Fig. 15, the sliding plates 78 and 79 are moved relatively oppositely to open the jaws 65—66, while, when the lever 67 is moved to the left, in this instance, to a vertical position, the sliding plates 78 and 79 are moved relatively in opposite directions to clamp the jaws 65—66 together as by a toggle action of the lever head 85 and link 87. A stop 89 welded to the base plate 68 as at 89*a* and having a portion 89*b* overlapping the sliding plates 78 and 79 in adjacency with the lever head 85 and link 87 when the latter are in clamping position prevents the lever from being further moved to the left from the vertical position to overrun the dead center of the lever head. The proximal end of the lever 67 desirably passes under a metal guard 90 secured to the drawing board by screws 91 at each end, which further limits undesired movement of the lever. The overhanging flanges 69 and 70 of the base plate 67 have holes 93 drilled therein at each end respectively for screw securement thereto of a cover plate 94, the lower flange 70 and the cover being interrupted as at 70*a* to permit the lever 67 to pass oscillatably therethrough. When it is desired to move the drawing board with respect to the frame, the lever 67 is swung to the right, the board is then moved, and then the lever is brought back to the normal position with respect to the clamping device 64 thereby locking the drawing board to the frame in a given adjusted sliding position. The lower end of lever 67 desirably depends below the lower edge of the drawing board for ready accessibility from the front of the board, as seen in Fig. 18.

Since the frame and drawing board are rotatable as a unit on the stand 21 to tilt the board to a desired angle and since in vertical positions of the unit with respect to the stand, or positions approaching the vertical, the weight of the drawing board is considerable, thus tending to retract the drawing board toward the proximal or pivoted end of the frame, counterbalancing means are provided for offsetting at least a part of the weight of the drawing board, such means being here represented by the strap and spiral spring mechanisms 95 carried at the back of the board on struts 96 affixed to and between the cross bars 38 and 41 of the frame, as by screws 97 to the cross bars 38 and screws 98 to the cross bar 41, the struts 96 having an angular portion 99 to which the flange 100 of the spring mechanism housing 101 is suitably secured as by welding. Within the housing 101 is the usual clock type spring 102, one end of which is centrally anchored to a housing post 103 and to the free end of which as at 104 is secured one end of a flexible strap 105. The outer ends of the flexible straps 105 are led to clips 106 secured as by screws 107 to the back of the board adjacent its lower or inner end and to which the strap ends are respectively anchored. The struts 96 are desirably permanently tilted toward the clips 106 so as to facilitate free play of the strap 105 in the opening 108 in the base 100 of the spring housing and a registering slot 109 in the flange 99 through which the strap 105 passes into and out of the housing as it is wound up or released by its spring. The springs 102 of the mechanisms respectively are pre-tensioned so as to be under greater potential stress when the drawing board is at its innermost position with respect to the frame as seen in Fig. 2, and so as to wind up the straps 105 as the drawing board is moved outwardly on the frame, but desirably the springs are also under tension when the board is in its outermost position on the frame so as at all times to tend to resist inward movement thereof which might cause the drawing board to drop suddenly when the board and the frame are in

vertical position and the lever **67** is released. The clamping mechanism **64** of course overcomes the tendency of the spring mechanism to move the board outwardly when such outward movement is not desired.

Turning now to the means for supporting the drawing board and frame in selective angular or tilted position with respect to the stand **21**, the frame **23** has secured thereto at one side and intermediately thereof, in this instance on the track member **34**, a bail **110** that rotatably journals a thimble **111** that is secured to the upper end of a support rod **112**, the bail **110** being secured by ears **110***a* and screws **110***b* to the track member extending laterally therefrom. The other or lower end of the support rod **112** passes downwardly through an elongated opening **113** in the stand top **21***a*, and, downwardly into the pedestal part **114** of the stand, where it passes through a clamping mechanism indicated generally by the numeral **115** (Fig. 9) that is carried by and within the stand pedestal and which is manually actuatable by a knob or hand wheel **116** accessible on the outer face **117** of the stand pedestal **114** as next more particularly described.

The upright or pedestal part **114** of the stand **21** is of box formation and has the parallel side walls **117** and **118**. In the wall **117** is an opening **119** (Fig. 11) reinforced by the collar **119***a* in which is a bushing **119***b*. Journaled in bushing **119***b* is the reduced end **120** of an arbor **121** that has passed threadedly therethrough the screw shank **122** of knob **116**. A retaining nut **123** is screwed onto the threaded reduced arbor end **120** on the outer face of wall **117**. The inner end of the arbor **121** has secured thereto one end of a tubular bearing member **124**, the other end of which is secured to a plug **125** that is centrally tapped to receive a cap screw **126** carried by the pedestal wall **118**. Cap screw **126** turns in opening **127** that is reinforced by collar **128** on the inner face of the wall **118**. Tube **124** may thus rotate in the walls **117** and **118** while the knob **116** may be at the same time rotated with respect to the tubular member **124**. Telescoped within the tubular member **124** is an inner tube **129** that has a closure **130** at its end adjacent the screw shank **122** and normally abutting the inner end of the latter. In the telescoped tubes **124** and **129** are pairs of registering diametrically opposite holes **131** and **132** through which the lower end of the support rod **112** passes. When the knob **116** is rotated in a counterclockwise direction (Fig. 18), the shank **122** is unscrewed from the arbor **120** and the inner tube **129** is then free to move, under the influence of the support rod **112** to register the pair of holes **131** with the pair of holes **132**, respectively, so that the support rod may move freely therethrough. Since the tubes **124**—**129** are rotatable in the stand walls **117** and **118** they adjust themselves to angular movements of support rod **112**, as indicated in Figs. 1 and 9. When, however, the knob **116** is rotated in a clockwise direction the shank **122** is screwed inwardly into abutment with the closure **130** of the inner tube **129**, which moves the latter axially of the outer tube **124** to tend to place the pairs of holes **131** and the pairs of holes **132**, respectively, out of register and thus to pinch the support rod **112** and grip it against movement, thereby causing it to support the frame and drawing board in any selective angular or tilted position, from a horizontal position as shown in full lines in Fig. 1 to a vertical position as shown in broken lines in Fig. 1. Other registering pairs of holes **131***a* and **132***a* in tubes **124** and **129** permit free and ready passage therethrough of a cable **146** later described.

An intermediate angular position for the frame and drawing board also shown in broken lines in Fig. 1 is one at say 55° from the horizontal, this being an angular or tilted adjustment frequently used, and its has been found desirable to provide a releasable stop for the frame and drawing board in this position. To this end, the rotatable tube **124** has passed thereonto a hanger member **133***a* having two parallel sides **133** and a front piece **134** that is of channel shape and is welded to the sides **133** as at **135**. Circular perforations **136** in the sides **133** permit the hanger **133***a* to ride loosely on the cylindrical tube **124**, the sides **133** of the hanger straddling the support rod **112**. A washer **137** on the rod **112** that rides between the sides **133** keeps the hanger **133***a* aligned with the rod. The front piece **134** of the hanger is continued longitudinally in the direction of the rod **112**, in both directions from the tube **124**, and has an elongated slot **138** in its lower face. At the lower end of the rod **112** is a ferrule **139** that is held on the rod by a set screw **140** and that carries a button **141**. Slot **138** is in the path of the button **141**, the portion of the hanger front **134** that has the slot **138** therein thus providing a detent portion **142** for cooperation with the button **141**. The lower end of this detent portion **142** is turned outwardly as at **142***a* so that as the frame and drawing board are raised from the horizontal position shown in full lines in Fig. 1 to the 55° or more position shown in broken lines in Fig. 1, the button **141** engages the cam surface **143** of the detent and swings the detent away from the support rod until the button **141** rides in the slot **138**. Since the lower end of the detent is heavier than its upper end and since in this angular position of the board the support rod oscillates at its lower end on its bearing **124** in the direction of the detent, the slot **138** and the button **121** are interengaged so that the board may then be lowered to the 55° position and held in that position so long as the detent **142** is engaged with button **141** as best seen in full lines in Figs. 9 and 10. Slot **138** is long enough so that the button **141** may ride therein while permitting raising of the drawing board to the vertical position. When it is desired to lower the drawing board to less than a 55° angle from the horizontal, the upper end of the detent **142** is manipulated by a finger of the draftsman acting upon the fingerpiece **144** of the detent **142** to rock detent **142** into dotted line position in Fig. 9. Fingerpiece **144** extends upwardly through the opening **113** in the stand in the 55 degree position of the frame (Fig. 9). By drawing the fingerpiece **144** toward the rod the button **141** is released from the slot **138**, permitting lowering of the drawing board further toward the horizontal. As the drawing board moves toward the horizontal from the 55° angle the rod **112** oscillates in the opposite direction depressing the finger piece **144** below the upper surface of the stand, but this is not objectionable since the finger piece **144** need only be manipulated when the support rod **112** is in the position which it occupies when the drawing board is at the 55° angle.

In the lowermost position of the drawing board and frame as shown in full lines in Fig. 1, the detent **142** may, by gravity, swing away from the support rod **112**, the lower end of the support rod **112** being at this time swung to the left from its position shown in Fig. 9 to its position as shown in full lines in Fig. 1.

Since a large size board is here contemplated, having considerable weight, means are provided for counterbalancing at least a part of the weight of the drawing board and frame as the board and frame are lowered to the horizontal, such means being here illustrated by the coil spring **145** carried by encirclement on the rod **112** in abutment with the washer **137** which is between the hanger sides **133**, this washer **137** thereby serving a dual purpose. At its other end the coil spring **145** in its expanded state, extends upwardly on the rod **112** in position to be contacted by the thimble **111** with which the upper end of the support rod **112** is articulated with the frame **23**, so that, when the frame and board are dropped, the spring **145** is placed under compression, resisting but not preventing downward movement of the frame and board and thereby cushioning the drop of the latter, spring **145** being placed under further compression as the frame is moved to the horizontal.

Moreover, for the reason that the drawing board may

be of large area as here contemplated, it is desirable to provide positive and automatic means for retracting the drawing board on the frame **23**, if it be in outwardly extended position thereon when the drawing board and frame are lowered from the vertical to the horizontal position, and representative means for this purpose will next be described.

A cable **146** or other flexible strand having at its lower end a stirrup **147** is hooked thereby onto a lug **148** carried by the ferrule **139** at the lower end of the rod **112**, the cable **146** from there running up parallel with the support rod **112** and passing over an idler pulley **149**, to another idler pulley **150**, from thence parallel with the frame **23** and board **23***a*, then over another idler pulley **151** at the outer end of the frame **23**, and thence across the frame to a spring takeup device **152** carried on the frame **23**. Pulley **149** as best shown in Figs. 9 and 10 is rotatively carried on a bracket **153** welded or otherwise secured to the rotatable tube **124**, the pulley **149** thus oscillating with the tube **124** and with the support rod **112** in their movements in accommodation to the angle of the drawing board and frame. Pulley **150** is rotatable on a pintle **154** carried on the outer furcation of bracket **24**, the other furcation of which supports one end of the torque tube **28** of the frame **23**. Pulley **151** is axled as at **155** on an extension **156** of the frame cross-bar **41**. The takeup device **152** includes a spring housing **157** that is screwed as at **158** to the end of the frame cross-bar **41** opposite pulley **151** and to the reverse channel part **43** of the cross-bar. The terminal **146***a* (Fig. 4) of the cable **146** is connected to the clew **160***b* of the flat spiral spring **160** of the takeup mechanism and runs from there to the pulley **151** through the reverse channel portion **44** of the cross-bar **41**. Strap **160***a* connects clew **160***b* to spring **160**.

Fixed on the cable **146**, between the pulleys **150** and **151** is a bob stop **161**, that, in the outermost position of the drawing board **23***a* with respect to the frame **23**, is abutted by a finger **162** on the drawing board that has an eye therein passing the cable **146** freely therethrough and which is rigid with a bracket **163** secured as by screws **164** to the underface of the drawing board **23***a*. As best seen in Fig. 16, the bob **161** has limited adjustability with respect to the cable **146** by being threaded onto the screw spool **165** through which the cable **146** passes, the spool having reduced ends **166** and **166***a* that are crimped onto the cable to firmly secure the spool and cable together. A set screw **167** in the bob engages the spool **165** to fix the adjustment of the bob **161** thereon. Since the lower end of the cable **146** moves with the lower end of support rod **112**, as illustrated in Fig. 19, when the frame **23** is swung from the vertical position toward the horizontal, the bob **161** is drawn toward the pivot of the frame or torque tube **28** by the lower end of the support rod **112** acting through the cable **146**. If the drawing board is projected outwardly on the frame as in Fig. 19, the bob **161** engages the finger **162** and simultaneously draws the drawing board toward the pivot. By the adjustability of the bob **161**, minor variations may be made in the point at which the bob engages the finger **162** and the point to which the drawing board is retracted, to coincide with the action of board stops **56** and **57** and frame bumper **58** that determines the extreme positions of the board with respect to the frame. By the arrangement just described the board is retracted as it is swung down, thus avoiding hitting another adjacent object, which might be the head of another draftsman, where the desks are closely arranged in groups. Also, since the board is under tension by reason of the spring mechanisms **95** accidental outward movement of the board by release of lever **67** in the horizontal position, that might otherwise cause the board to strike an extraneous object by being propelled outwardly thereagainst, is prevented.

In angular movements of the frame and drawing board, the spring takeup mechanism **152** not only maintains tension on the cable **146** at all times but also moves the bob **161** out of the way of finger **162** to the limit permitted by the position of the lower end of the support rod **112**. It will be observed from Fig. 1, that only in the vertical position of frame **23** can the board be slid outwardly on the frame to its outer limit of movement thereon. In all other positions, outward movement of the board is limited by the bob **161**. In the 55° tilt for example, shown intermediately in Fig. 1, further outward movement of the board is prevented by the bob stop **161** engaging the finger **162**, while, in the horizontal position of the frame, no outward movement of the board is permitted. In the innermost position of the board it desirably overhangs the pivot of the frame for enhanced convenience of the draftsman. In the vertical position of the frame full upward and downward (outward and inward) movement of the board is permitted while the outward position of the board is progressively limited as the frame is moved nearer the horizontal. At the same time, the frame and board may be locked in selected positions, both with respect to the board and frame relatively to the stand and also with respect to the board and frame relatively to each other. In the locking means for the last mentioned purpose, the slots **80**, **81** and **77** (Figs. 13, 14 and 15) are so arranged as to require reciprocal movement of both plates **79** and **78** in order to equalize pressure on jaws **65** and **66** to ensure maximum efficiency.

The invention is not intended to be limited to details of construction shown for purposes of illustration. Furthermore, it may not be essential in all aspects of the invention to use all features thereof conjointly since various combinations and sub-combinations may at times be advantageously employed. For example, the stand and drawing board may be used without the desk, by providing any suitable support therefor.

Such changes may be made as fall within the scope of the appended claims without departing from the invention.

See also application of Victor H. Hiers and Claude G. Kanzelberger, Serial No. 790,743, filed February 2, 1959, for "Tiltable Drafting Board Support Means."

What we claim as our invention and desire to secure by Letters Patent is:

1. In drafting board mechanism, an angularly rotatable frame tiltable from a horizontal to a vertical position, a drawing board slidably mounted on said frame for inward and outward movement thereon, whereby the drawing board may be elevated in vertical positions of the frame, and means for automatically retracting the board on the frame in angular movements of the frame from the vertical toward the horizontal, wherein the retractive movement of the board is effected progressively, whereby the board may be moved outwardly a progressively less distance, from full movement in the vertical position of the frame to substantially no movement in the horizontal position of the frame.

2. The structure of claim 1 wherein the frame and board are supported in selective angular positions by a support rod and a traction cable is secured at one end to the lower end of said rod and at its other end to the outer end of said frame and said traction cable is carried on the frame through the intermediation of a spring that takes up the cable as the lower end of the support rod moves upwardly, said cable carrying intermediately thereon a stop that engages a finger on the board to effect said retraction in downward movements of the support rod.

3. Drafting board mechanism comprising a stand, an angularly rotatable frame on said stand, a pair of tracks carried by said frame, a drawing board movably mounted on said tracks, counterbalancing means carried jointly by said frame and board resisting movement in one direction of the board on said tracks, means carried jointly by said board and said frame for selectively locking the board in position on said tracks, and means carried jointly

by said stand and frame for retracting the board on said tracks as the frame is lowered to horizontal position.

4. The structure of claim 3 wherein said counterbalancing means includes a pair of flat spiral springs carried by said frame, and straps extending therefrom and secured to the board.

5. The structure of claim 3 wherein the locking means includes a cylindrical bar carried by the frame and a pair of gripping jaws carried by the board for gripping said bar.

6. The structure of claim 5 wherein said jaws are manipulated by a manual toggle lever carried by the board, said toggle lever being articulated with a pair of sliding plates each of which carries one of said jaws respectively.

7. The structure of claim 3 wherein the board and frame jointly carry stop elements limiting movement of the board on said track, one of said stop elements being carried by a track.

8. The structure of claim 3 including means carried jointly by said stand and frame for counterbalancing at least a portion of the weight of the frame and board in angular positions thereof.

9. In drawing board mechanism, a stand, a frame pivotally mounted on the stand for selective angular adjustments with respect thereto, a drawing board movably mounted on the frame for inward and outward positions thereon, a support rod articulated with the frame, means carried by the stand for releasably gripping the rod to hold the frame and board in selective angular positions, said gripping means being rotatable with respect to the stand to accommodate oscillatory movement of the rod with respect to the frame, a cable anchored to the lower end of said rod passing upwardly therealong, an idler pulley on said gripping means passing the cable thereover, another idler pulley of the stand adjacent said pivot, and a third idler pulley on the frame adjacent the outer end thereof, the side of the frame opposite said pulley carrying a spring takeup mechanism for retracting the cable as the rod is moved upwardly toward the vertical position of the frame and board, a stop member fixed on the cable, and a finger on the drawing board engageable by said stop member whereby the drawing board is retracted inwardly as the frame and board are moved from the vertical to the horizontal position.

10. The structure of claim 9 wherein the gripping means passes the cable freely therethrough.

11. The structure of claim 9 wherein the finger passes the cable freely therethrough.

12. The structure of claim 9 wherein the stop member carried by the cable is adjustable longitudinally thereon.

13. The structure of claim 9 wherein the stop member on the cable is screw threadedly sleeved on a spool to which sections of the cable are secured and a set screw in the side wall of the stop member engages said spool.

14. In drafting board mechanism, a base, a frame angularly rotatably mounted on said base whereby to be tiltably elevatable thereon from a somewhat horizontal to a somewhat vertical position, a drawing board slidably mounted on said frame for inward and outward movement thereon in elevated positions of the frame, and means responsive to rotation of the frame toward the horizontal for automatically inwardly retracting the board on the frame.

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