Jan. 14, 1964 B. B. JUNKUNC 3,117,392

SELF-LEVELING DEVICES

Filed Dec. 29, 1961

2 Sheets-Sheet 1

Fig. 1

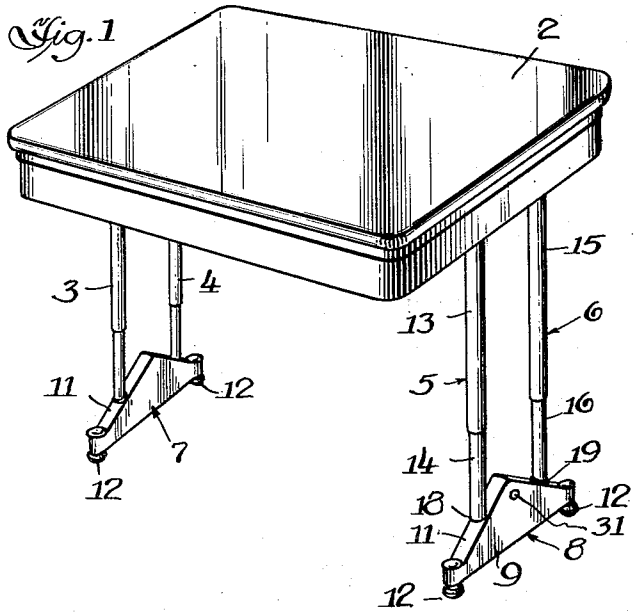


Fig. 5

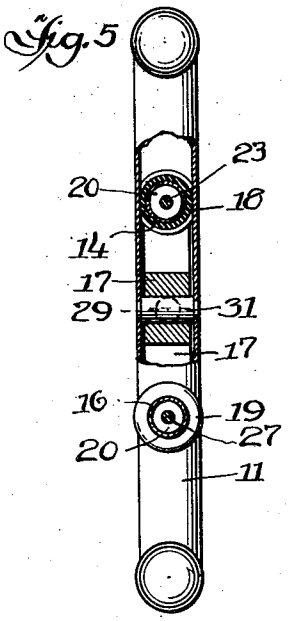


Fig. 3

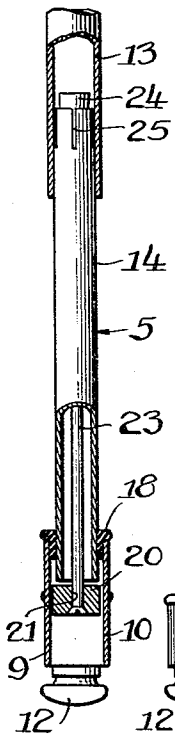


Fig. 2

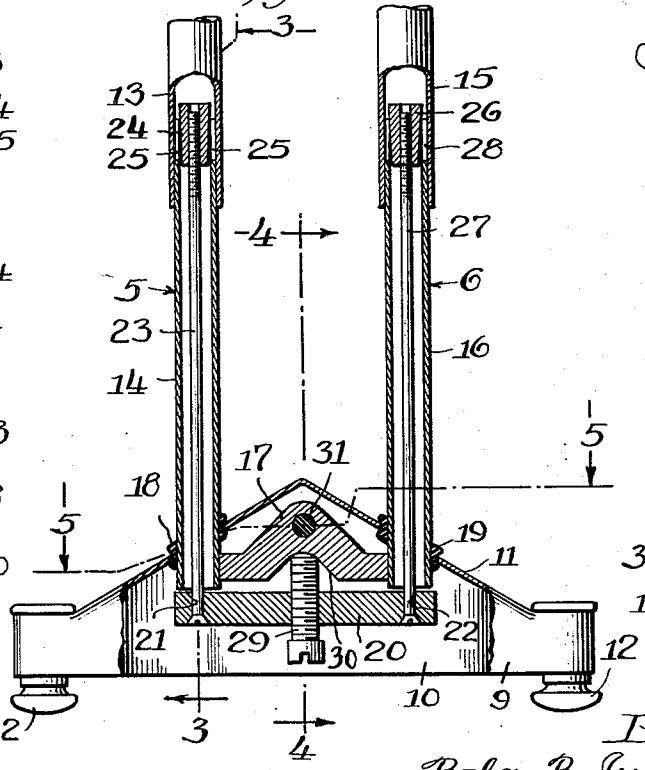
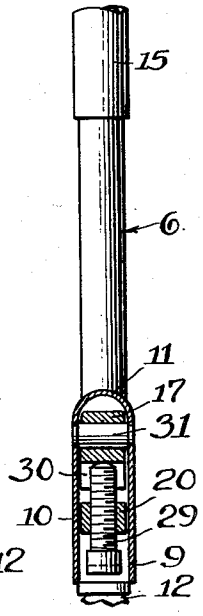


Fig. 4



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SELF-LEVELING DEVICES

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Fig. 6

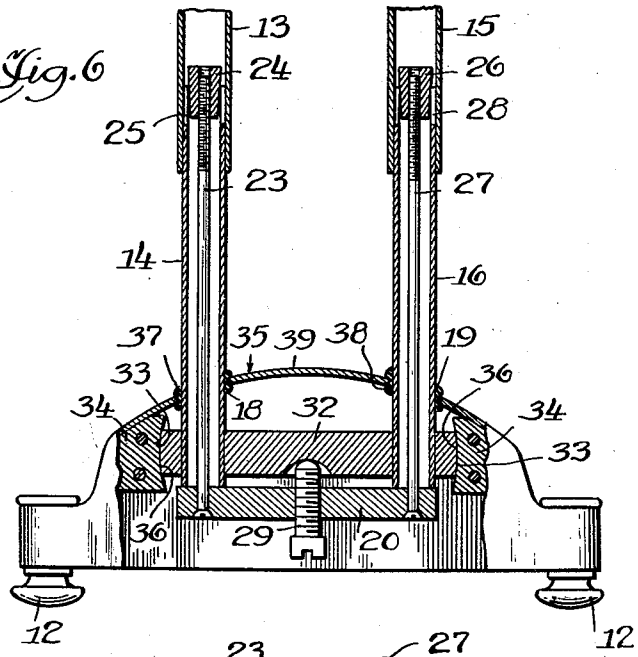


Fig. 8

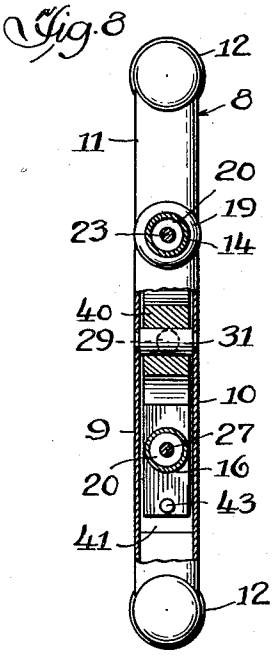


Fig. 7

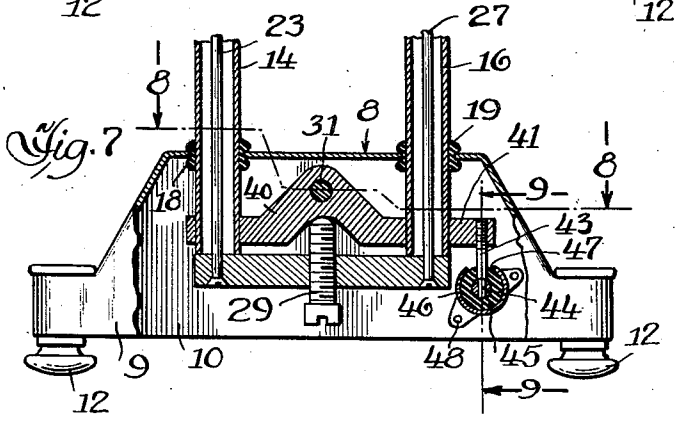


Fig. 9

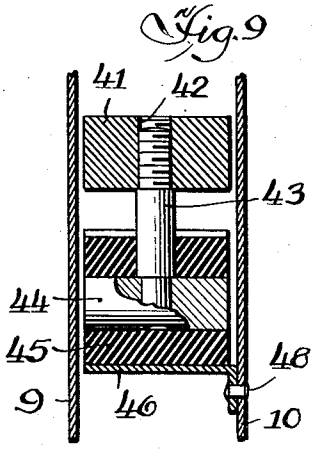
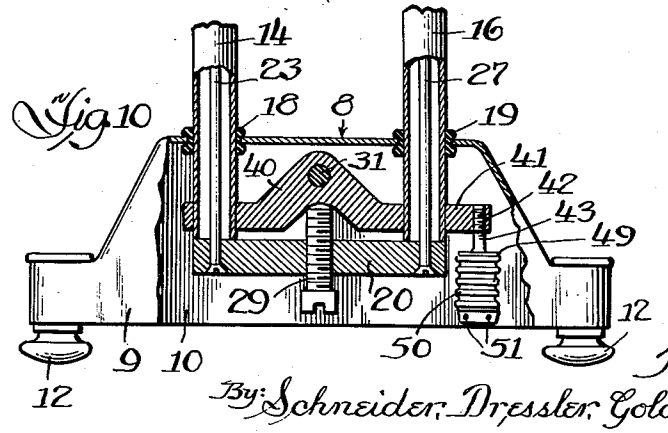


Fig. 10



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3,117,392

SELF-LEVELING DEVICES

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16 Claims. (Cl. 45—139)

This invention relates to a self-leveling structure for furniture, and is particularly concerned with means for pivotal adjustment of the base member supporting said article of furniture to provide for non-level floors.

While the self-leveling structure of the invention is designed particularly for use in connection with desks or tables of adjustable height, it may be employed with any article of furniture having a pair of legs at opposite ends, whether or not the height thereof is adjustable. Furthermore, one such leveling mechanism per article of furniture is believed sufficient to accomplish the desired end, although a second such mechanism could be used, if desired.

The self-leveling structure of the invention includes a pivotally supported base member which converts the two leg members attached thereto into a single point of support. The adjustable base member tilts about its pivot to conform with the floor angle while the two points of support affixed to the upper structure of the furniture remains level through the constant leveling horizontal support to which they are affixed. In effect, with such an arrangement on at least one side, a 3-point support is provided for the article of furniture, which has the desirable quality of greater stability.

In one embodiment of the invention, two legs depending from the top member are secured to a pivot block, contained within a base member which is pivotally supported on a pin that extends through the pivot block. At the point where each leg enters the base member, there is located a flexible bushing, preferably rubber, which encircles the leg in such fashion that action of the base member is snubbed to a substantial extent. Nevertheless, sufficient pivot action of the base member is permitted to enable it to pivot to compensate for a floor that is not level.

In another embodiment, the pivot block bears against a flexible unit such as a cushioned knuckle pin secured to the base, to snub undue pivotal action. A hydraulic or pneumatic device, such as a dashpot, may be used as a substitute for said cushioned knuckle pin.

In another embodiment, the pivot block is positioned with a minimum clearance between a pair of metallic snubbers, the block having an arcuate end surface coinciding with the convex surface of the two snubbers which are vertically disposed within and secured to the base member. To effect a minimum clearance, the ends of the pivot block and the inner surfaces of the snubbers are preferably curved on the same radius. This minimum clearance causes a binding action between the cross bar and the snubbers when the base member has adjusted to the floor level and the pivot block has pivoted to insure the constant level.

The invention is more fully described in the accompanying description taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a perspective view of a table in which the structure of this invention has been incorporated;

FIG. 2 is an enlarged elevational end view, partly in section, showing one embodiment of the pivotal mounting capable of use within the base member of the table shown in FIG. 1;

FIG. 3 is a vertical cross-sectional view of leg member 5 shown in FIG. 2, taken along line 3—3;

FIG. 4 is a partial cross-sectional view of the base member shown in FIG. 2, taken along 4—4;

FIG. 5 is a horizontal cross-sectional view, of the base member shown in FIG. 2, taken along line 5—5;

FIG. 6 is an enlarged elevational end view of a base member in which another embodiment of this invention has been incorporated;

FIG. 7 is an enlarged elevational end of a base member showing still another embodiment of the invention;

FIG. 8 is a horizontal cross-sectional view of the base member of FIG. 7 taken along line 8—8;

FIG. 9 is a partial cross-sectional view of the base member of FIG. 7 taken along line 9—9;

FIG. 10 is an enlarged elevational end view of a base member, showing a different form of snubbing device.

Referring to FIG. 1 of the drawings, a table top 2 is supported at one end by a pair of legs 3 and 4 and at the other end by a pair of legs 5 and 6. These legs are indicated to be adjustable in height, but it should be understood that the self-leveling structure of the present invention is not concerned with adjustability or non-adjustability of the legs.

The lower ends of legs 3 and 4 and of legs 5 and 6 are mounted in base members 7 and 8, respectively. Each base member comprises two triangular side walls 9 and 10 joined at their upper edges by a top wall 11. A foot 12 is mounted at each end of each base member.

Generally, base member 7 is rigidly secured to legs 3 and 4, while base member 8 is pivotally secured, in a manner hereinafter described, to a pivot block rigidly secured to legs 5 and 6. Thus, if the table is standing on a non-level floor, base member 8 can be easily adjusted to form a tri-pointed support to keep the table top in a generally horizontal plane. To accomplish this, several embodiments are possible.

As shown in the embodiment in FIGS. 2–5 in which the leg length adjustable means has been incorporated, leg 5 comprises a tube 13 depending from the underside of table top 2 and having its lower end portion in sliding telescopic engagement with the upper end portion of a tube 14 extending upwardly from base member 8. Leg 6 similarly comprises a tube 15 depending from the underside of table top 2 and having its lower end portion in sliding telescopic engagement with the upper end portion of a tube 16 extending upwardly from base member 8. The lower ends of tubes 14 and 16 are rigidly connected together by means of a pivot block 17 positioned in base member 8.

Top wall 11 of base member 8 is apertured to receive bushings 18 and 19, of rubber or other suitable or compressible material, through which the lower end portions of tubes 14 and 16 respectively extend. A crossbar 20, positioned in base member 8 just below pivot block 17, is provided with apertures 21 and 22, which are substantially axial to tubes 14 and 16, respectively. A screw rod 23 extends upwardly through aperture 21 and tube 14. A tapered plug 24 is secured to the upper end of rod 23 with its smaller end in the upper end portion of tube 14. The upper end portion of tube 14 is slit, as indicated at 25. A similar plug 26 is secured to the upper end of a screw rod 27 which extends upwardly through aperture 22 and tube 16. The upper end portion of tube 16 is slit, as indicated at 28.

A lock screw 29 is threaded through the center of crossbar 20 into engagement with the underside of pivot block 17 which is angled, as indicated at 30, to provide a seat for the end of the lock screw. The lock screw is tightened when the tubes are adjusted in the proper position to provide the desired height for the table, and is not thereafter disturbed, unless the height of the table is to be changed.

A pivot pin 31 extends transversely through the center of pivot block 17 and side walls 9 and 10 of base member

8 to pivotally support the base member relative to the pivot block. The apertures in top wall 11 in which compressible bushings 18 and 19 are mounted are larger in diameter than tubes 14 and 16 so as to provide clearance for base member 8 to move pivotally about pin 31 as an axis. When the table is placed on a floor that is not precisely level, base member 8 moves pivotally about pin 31 until both feet 12 of base member 8 rest on the floor. Base member 8 cooperates with base member 7 to provide a firm support for the table with the table top 2 in a horizontal plane. Bushings 18 and 19 exert a snubbing action when base member 8 moves pivotally relative to the pivot block. Since the legs are stationary, any pivotal movement of the base member will cause the edges of top wall 11 to compress one portion of each bushing 18 and 19. Such compression of the resilient bushings will naturally create a counterforce which tends to restore base member 8 to its normal level position. Thus, while the table is standing, the bushings remain compressed. Upon movement the base member is pivoted back to its normal position. A self-leveling device is thereby produced.

FIG. 6 illustrates another embodiment of the self-leveling mechanism of this invention. Similar to the embodiment shown in FIG. 2, tubes 14 and 16 are rigidly secured to a pivot block 32. However, rather than being pivotally mounted by means of a pivot pin to the base member, its outer ends 33, are curved. These ends extend into a pair of snubbers 34 rigidly secured to base member 35. These snubbers have inner arcuate surfaces 36 whose radii correspond substantially with the radii of the curved ends 33 of pivot block 32. Complementary curved surfaces are thereby formed and these permit base member 35 to pivot relative to pivot block 32.

Apertures 37 and 38 within top wall 39 of base member 35 have a diameter larger than the diameter of tubes 14 and 16. Within the clearance effected thereby are rubber bushings 18 and 19. Since these bushings are mostly for appearance, they may be omitted, if desired.

Pressure applied downwardly by the weight of the table on a non-level floor causes the base member 35 to pivot relative to pivot block 32. Eventually, a binding action between the ends of pivot block 32 and snubbers 34 occurs by reason of the uncentering co-action of the parallel legs 14 and 16 on crossbar 20 and the base member 35. This binding action is sufficient to prevent further tilting movement of the table upon proper positioning of the base member.

The embodiments shown in FIGS. 7 to 9 indicate additions to or variation in effecting snubbing and automatic return movement of base member 8.

A pivot block 40, rigidly secured to the lower end portion of tubes 14 and 16 and pivotally supporting base member 8 on pin 31 is provided with an extension 41 at one end. Within extension 41 is a vertically threaded bore 42 in which stud 43 is threaded. The lower end of stud 43, is secured to a transversely extending knuckle pin 44 encased in a horizontally disposed sleeve 45, of rubber or other suitable compressible material. The sleeve 45 and the lower end of stud 44 are encased in a cylindrical bracket 46 longitudinally slotted at 47 adjacent stud 43. Bracket 46 is rigidly secured to side wall 10 of base member 8, by bolts 48. Obviously, other affixation means, such as rivets, studs and the like would be equally operable.

In operation, when base member 8 pivots counterclockwise to counteract an uneven floor, pivot block extension 41 moves downwardly. This movement causes stud 44, to compress the lower portion of sleeve 45 of rubber, thereby effectively snubbing the pivotal movement of base member 8. If base member 8 pivots clockwise, stud 44 compresses the upper portion of layer 45 against bracket 46. The snubbing action of stud 44 and rubber layer 45 is in addition to the snubbing action provided by bushings 18 and 19.

The structure of FIG. 10 is identical with the structure

of FIGS. 7 to 8, except that a different snubbing device is used. In this embodiment, stud 43 is connected at its lower end to a top plate 49 of a bellows 50 secured to side wall 10 by bolts 51. Bellows 50 may be of the pneumatic or hydraulic type, in which a heavy spring is embedded in the side walls. In use, bellows 50 either creates a partial vacuum or a pressure within its chamber which urges base member 8 back to its normal position. If desired, a dashpot may be substituted for the bellows.

Although I have shown four preferred illustrative embodiments of the invention in considerable detail, it should be understood that the description thereof is illustrative, rather than restrictive. Many details of the structure may be modified or changed without departing from the spirit or scope of the invention.

I claim:

1. An article of furniture comprising a top member, a pair of legs depending from the underside of said top member adjacent each end thereof, a pivot block rigidly connecting the lower end portions of one pair of legs together, a base member provided with an aperture for receiving each leg of said one pair of legs, and a supporting foot depending from each end of said base member, said base member being pivotally connected to said pivot block, whereby said base member may be pivotally adjusted to allow both of said supporting feet to engage non-level floor surfaces to cooperate with said other pair of legs to support said article of furniture with said top member in a horizontal plane.

2. An article of furniture comprising a top member, a pair of legs depending from the underside of said top member adjacent each end thereof, a pivot block rigidly connecting the lower end portions of one pair of legs together, a base member provided with an aperture for receiving each leg of said one pair of legs, a supporting foot depending from each end of said base member, said base member being pivotally connected to said pivot block, whereby said base member may be adjusted to allow both of said supporting feet to engage non-level floor surfaces to cooperate with said other pair of legs to support said article of furniture with said top member in a horizontal plane, and means for snubbing the pivotal movement of said base member.

3. An article of furniture comprising a top member, a pair of legs depending from the underside of said top member adjacent each end thereof, a pivot block rigidly connecting the lower end portions of one pair of legs together, a base member provided with an aperture for receiving each leg of said one pair of legs, said apertures being larger in diameter than said legs to provide clearance for said base member to move pivotally relative to said legs, and a supporting foot depending from each end of said base member, said base member being pivotally connected to said pivot block, whereby said base member may be pivotally adjusted to allow both of said supporting feet to engage non-level floor surfaces to cooperate with said other pair of legs to support said article of furniture with said top member in a horizontal plane and means within said clearance to snub the pivotal movement of said base member.

4. An article of furniture comprising a top member, a pair of legs depending from the underside of said top member adjacent each end thereof, a pivot block rigidly connecting the lower end portions of one pair of legs together, a base member provided with an aperture for receiving each leg of said one pair of legs, said apertures being larger in diameter than said legs to provide clearance for said base member to move pivotally relative to said legs, a supporting foot depending from each end of said base member, said base member being pivotally connected to said pivot block, whereby said base member may be adjusted to allow both of said supporting feet to engage non-level floor surfaces to cooperate with said other pair of legs to support said article of furniture with said top member in a horizontal plane, and a compressible bush-

ing mounted in each aperture to snub the pivotal movement of said base member.

5. An article of furniture comprising a top member, a pair of legs depending from the underside of said top member adjacent each end thereof, a pivot block rigidly connecting the lower end portions of one pair of legs together, a base member provided with an aperture for receiving each leg of said one pair of legs, a supporting foot depending from each end of said base member, said base member being pivotally connected to said pivot block, whereby said base member may be adjusted to allow both of said supporting feet to engage non-level floor surfaces to cooperate with said other pair of legs to support said article of furniture with said top member in a horizontal plane, said pivot block having an extension projecting beyond the outer edge of one of said legs, operatively connected to a knuckle-pin encased in a peripheral covering of resilient material, said material being within a bracket rigidly secured to the inner surface of said base member so that movement of knuckle-pin is cushioned to snub the pivotal movement of said base member.

6. An article of furniture comprising a top member, a pair of legs depending from the underside of said top member adjacent each end thereof, a pivot block rigidly connecting the lower end portions of one pair of legs together, a base member provided with an aperture for receiving each leg of said one pair of legs, a supporting foot depending from each end of said base member, said base member being pivotally connected to said pivot block whereby said base member may be adjusted to allow both of said supporting feet to engage non-level floor surfaces to cooperate with said other pair of legs to support said article of furniture with said top member in a horizontal plane, said pivot block having an extension projecting beyond the outer edge of one of said legs, a stud depending from said extension, and engaging a bellows rigidly secured to said base member, and capable of snubbing the pivotal movement of said base member.

7. An article of furniture comprising a top member, a pair of legs depending from the underside of said top member adjacent each end thereof, a pivot block rigidly connecting the lower end portions of one pair of legs together, a base member having an upper wall apertured to receive each leg of said one pair of a supporting foot depending from each end of said base member, said base member being pivotally connected to said pivot block base member may be adjusted to allow both of said supporting feet to engage non-level floor surfaces to support said article of furniture with said top member in a horizontal plane, said pivotal connection consisting of said pivot block having arcuate ends, which extend into corresponding vertically disposed facing arcuate surfaces of two snubber members rigidly secured to said base member.

8. An article of furniture comprising a top member, a pair of tubular legs depending from the underside of said top member adjacent each end thereof, each side leg containing an inner tube telescoped in sliding engagement therein, each inner tube being slit at its inside end and containing a tapered plug adjacent said slit end with the narrowed end of said plug extending into the slit end, adjustable means for insertion of said plug into said slit end to expand said end to lock the telescoped inner tube and leg member against slide movement relative to each other, a pivot block rigidly connecting together the lower end portions of a pair of said tubes, located at one end of the article of furniture, a base member provided with apertures for receiving each tube of said pair of tubes, and a supporting foot depending from each end of each said base member, said base member being pivotally connected to said pivot block, whereby said base member may be pivotally adjusted to allow both of said supporting feet to engage non-level floor surfaces to cooperate with said other pair of legs to support said article of furniture with said top member in a horizontal plane.

9. An article of furniture comprising a top member, a pair of tubular legs depending from the underside of said top member adjacent each end thereof, each said leg containing an inner tube telescoped in sliding engagement therein, each inner tube being slit at its inside end and containing a tapered plug with its arrow end extending into the slit end of said tube, a pivot block rigidly connecting together the lower end portions of a pair of said tubes located at one end of the article of furniture, a crossbar, positioned vertically by an adjustable locking screw bearing against said pivot block, a rod extending upward through each end of said crossbar through one of said inner tubes and adjustably connected to said tapered plug, a base member provided with an aperture for receiving each tube of said one pair of tubes, and a supporting foot depending from each end of said base member, said base member being pivotally connected to said pivot block, whereby said base member may be pivotally adjusted to allow both of said supporting feet to engage non-level floor surfaces to cooperate with said other pair of legs to support said article of furniture with said top member in a horizontal plane.

10. An article of furniture comprising a top member, a pair of tubular legs depending from the underside of said top member adjacent each end thereof, each said leg containing an inner tube telescoped in sliding engagement therein, each inner tube being slit at its inside end and containing a tapered plug with its narrow end extending into the slit end of said tube, a pivot block rigidly connecting together the lower end portions of a pair of said tubes located at one end of the article of furniture, a crossbar positioned vertically by an adjustable locking screw bearing against said pivot block, a rod extending upward through each end of said cross bar through one of said inner tubes and adjustably connected to said tapered plug, a base member provided with apertures for receiving each tube of said one pair of tubes, said apertures being larger in diameter than said legs to provide clearance for said base member to move pivotally relative to said tubes, a supporting foot depending from each end of said base member, said base member being pivotally connected to said pivot block, whereby said base member may be adjusted to allow both of said supporting feet to engage non-level floor surfaces to cooperate with said other pair of legs to support said article of furniture with said top member in a horizontal plane, and a compressible bushing mounted in each aperture to snub the pivotal movement of said base member.

11. An article of furniture comprising a top member, a pair of tubular legs depending from the underside of said top member adjacent each end thereof, each said leg containing an inner tube telescoped in sliding engagement therein, each inner tube being slit at its inside end and containing a tapered plug with its narrow end extending into the slit end of said tube, a pivot block rigidly connecting together the lower end portions of a pair of said tubes located at one end of the article of furniture, a crossbar positioned vertically by an adjustable locking screw bearing against said pivot block, a rod extending upward through each end of said crossbar through one of said inner tubes, and adjustably connected to said tapered plug, a base member provided with apertures for receiving each tube of said one pair of tubes, a supporting foot depending from each end of said base member, said base member being pivotally connected to said pivot block whereby said base member may be adjusted to allow both of said supporting feet to engage non-level floor surfaces to cooperate with said other pair of legs to support said article of furniture with said top member in a horizontal plane, said pivot block having an extension projecting beyond the outer edge of one of said tubes operatively connected to a knuckle-pin encased in a peripheral covering of resilient material, said material being within a

bracket rigidly secured to the inner surface of said base member so that movement of said knuckle-pin is cushioned to snub the pivotal movement of said base member

12. An article of furniture comprising a top member, a pair of tubular legs depending from the underside of said top member adjacent each end thereof, each said leg containing an inner tube telescoped in sliding engagement therein, each inner tube being slit at its inside end and containing a tapered plug with its narrow end extending into the slit end of said tube, a pivot block rigidly connecting together the lower end portions of a pair of said tubes located at one end of the article of furniture, a crossbar positioned vertically by an adjustable locking screw bearing against said pivot block, a rod extending upward through each end of said bar through one of said inner tubes, and adjustably connected to said tapered plug, a base member provided with apertures for receiving each tube of said one pair of tubes, a supporting foot depending from each end of said base member, said base member being pivotally connected to said pivot block whereby said base member may be adjusted to allow both of said supporting feet to engage non-level floor surfaces to cooperate with said other pair of legs to support said article of furniture with said top member in a horizontal plane, said pivot block having an extension projecting beyond the outer edge of one of said tubes, a stud depending from said extension, and engaging a bellows rigidly secured to said base member and capable of snubbing the pivotal movement of said base member.

13. An article of furniture comprising a top member, a pair of tubular legs depending from the underside of said top member adjacent each end thereof, each said leg containing an inner tube telescoped in sliding engagement therein, each inner tube being slit at its inside end and containing a tapered plug with its narrow end extending into the slit end of said tube, a pivot block rigidly connecting together the lower end portions of a pair of said tubes located at one end of the article of furniture, a crossbar positioned vertically by an adjustable locking screw bearing against said pivot block, a rod extending upward through each end of said crossbar through one of said inner tubes, and adjustably connected to said tapered plug, a base member provided with apertures for receiving each tube of said one pair of tubes, a supporting foot depending from end of said base member, said base member being pivotally connected to said pivot block whereby said base member may be adjusted to allow both of said supporting feet to engage non-level floor surfaces to support said article of furniture with said top member in a horizontal plane, said pivotal connection consisting of said pivot block having arcuate ends, which extend into corresponding vertically disposed facing arcuate surfaces of two snubber members rigidly secured to said base member.

14. An article of furniture comprising a top member, a tubular leg depending from the underside of said top member and secured thereto adjacent opposite sides thereof, each said leg containing an inner tube telescoped in sliding engagement therein, each inner tube being slit at its inside end, a tapered plug adjacent said slit end with the narrow end of said plug extending into the slit end, adjustable means for insertion of said plug into said slit end to expand said end to releasably lock the telescoped inner tube and leg member against sliding movement relative to each other, base members supporting said inner tubes respectively, and means cooperatively arranged with said base members and said adjustable means to operate said adjustable means to tighten and loosen the tapered plug whereby the height of the top member may be adjusted.

15. An article of furniture comprising a top member, a pair of tubular legs depending from the underside of said top member adjacent to opposite sides thereof, each side leg containing an inner tube telescoped in sliding engagement therein, each inner tube being slit at its inner end, a tapered plug adjacent said slit end with the narrow end of said plug extending into the slit end, a base member supporting each of said inner tubes, adjustable means in said base members cooperatively connected to said tapered plugs and cooperatively arranged with said base members to move said plugs with respect to said slit ends to tighten and loosen said slit ends with respect to said side legs at any position of the inner tubes relative to the side legs in which they are telescoped to releasably lock the inner tubes with respect to said side legs whereby the height of said top member may be controllably adjusted.

16. An article of furniture comprising a top member and tubular legs depending from the underside of said top member adjacent to opposite sides thereof respectively, each leg comprising an upper tubular member secured to said top member and a lower tubular member, the tubular members of each leg being disposed in telescoping cooperative relation, an end of one tubular member of each leg being disposed within the tubular member cooperating therewith, said end of said tubular member being slit, a tapered plug adjacent to said slit end with the narrow end of said plug extending into said slit end, and adjustable means for insertion of said plug into said slit end and for removal of said plug from said slit end to expand said end to releasably lock the telescoped tubes against sliding movement relative to each other.

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