

July 21, 1964

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3,141,424

SUPPORT STRUCTURE FOR FOLDING APPARATUS

Filed July 22, 1963

2 Sheets-Sheet 2

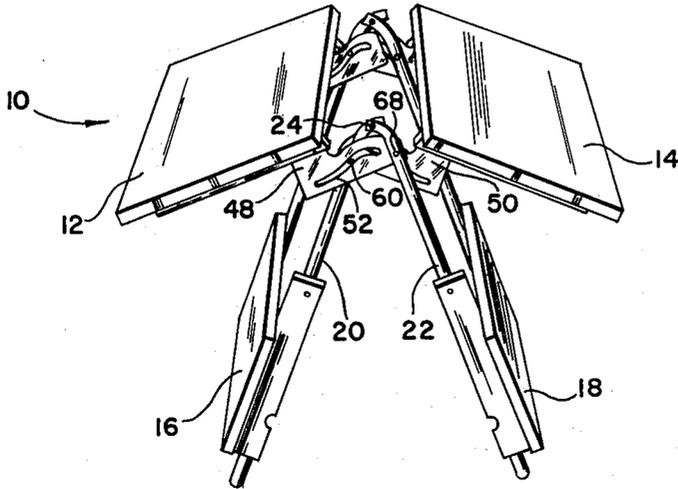


FIG. 4

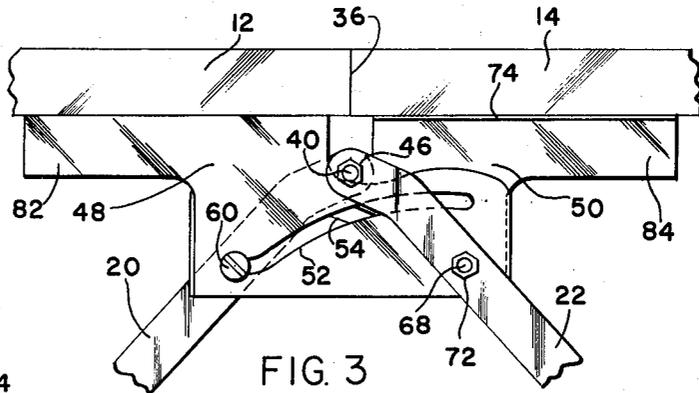


FIG. 3

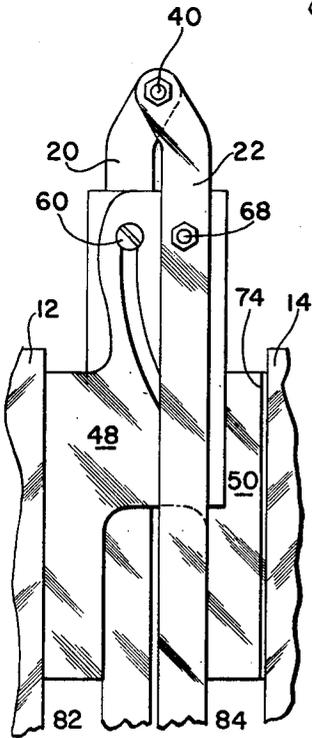


FIG. 5

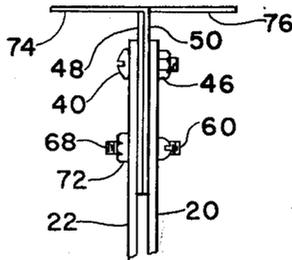


FIG. 6

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SUPPORT STRUCTURE FOR FOLDING APPARATUS

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Filed July 22, 1963, Ser. No. 296,818

4 Claims. (Cl. 108-113)

This invention relates to mechanical supporting elements and more specifically to a structure adapted to support folding apparatus in an erected position.

It has been found convenient to construct many items such as, for example, chairs, tables, tent supports, scaffolding and various stands in such a manner that the items may be moved from their normal position of use to a folded position. Obvious advantages in ease of storage and transportation of the folded item are thus achieved. Among the most common methods of construction of such items is the hinged connection of a plurality of legs or links which are movable to a predetermined position with respect to one another, corresponding to the erected position of the item with which such legs are associated, and supported or locked in such position by appropriate apparatus. It is principally with the last-named type of apparatus that the present invention is concerned.

An object of the present invention is to provide novel apparatus for supporting a plurality of hingedly connected elements in a predetermined position with respect to one another.

A further object of the invention is to provide simple and compact apparatus which allows free movement of associated elements from a folded to an erected position, maintains such elements in the erected position and allows free movement of the elements back to the folded position.

Still another object is the provision of a structure associated with a plurality of foldable elements which is adapted to maintain such elements in a predetermined erected position and also to support additional elements, such as a table top.

A still further object is to provide a supporting structure for maintaining folding apparatus in an erected position, said structure being simple and economical in manufacture, effective and durable in use, and refined in appearance.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the apparatus possessing the construction, combination of elements and arrangement of parts which are exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings wherein:

FIGURE 1 is a perspective view of a folding table in the erected position in which the present invention is incorporated;

FIG. 2 is an enlarged, exploded, perspective view of a preferred embodiment of the elements of the present invention;

FIGS. 3-5 are fragmentary, front elevational views of a portion of the table of FIGURE 1 showing the elements of the invention in folded, intermediate and erected positions, respectively; and

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FIG. 6 is a fragmentary, side elevational view of the apparatus as shown in FIG. 3.

For convenience and simplicity of description, the elements of the invention are illustrated in the accompanying drawings in association with a folding table. It will be appreciated, however, that the invention may be employed in the same manner with any form of apparatus which includes a plurality of members which are mutually movable and are to be supported in some predetermined position. Although the movable members shown in the drawings comprise the legs of the illustrated table, and are referred to throughout the description as legs, it is to be understood that such members could be characterized as arms, links, braces, etc., if the structure of the invention were employed in conjunction with different apparatus. Therefore, the term "legs" is used in its broadest sense, denoting any plurality of pivotally connected and mutually movable members.

Referring now to the drawings, wherein like numerals denote like elements throughout the several views, in FIGURE 1 is seen a table, denoted generally by reference numeral 10, of the folding type shown in the erected position. Table 10 includes top surface portions 12 and 14, seat portions 16 and 18, and U-shaped legs 20 and 22. Legs 20 and 22 are pivotally connected to one another at 24, as will appear more fully in the description of the other figures, and at the opposite end of each leg (not shown). Seat portions 16 and 18 are pivotally attached to legs 20 and 22, respectively, in a conventional manner at 25 and 26 and in a similar manner at the opposite ends. Seat supports 28 and 30 are also pivotally attached to legs 20 and 22 respectively at 32 and 34. Thus, it is evident that seat supports 28 and 30 may be removed from their supporting engagement, as shown, with seat portions 16 and 18, at which time both the seat portions and the seat supports may be moved about their respective pivotal mountings into flat or parallel relation with legs 20 and 22. Top portions 12 and 14 are preferably two distinct portions of substantially the same size, being separated at parting line 36 which is adjacent connection 24 between legs 20 and 22 when table 10 is in the erected position.

Table 10 is maintained in the position of FIGURE 1 by a support assembly, denoted collectively by the reference numeral 38. A similar support assembly (not shown) is preferably provided in like manner at the opposite ends of legs 20 and 22. The details of support assembly 38 may be seen more clearly in FIG. 2. Fragments of legs 20 and 22 may be seen and pivotal connection 24 is shown as comprising an ordinary shaft, such as bolt 40, passing through holes 42 and 44 in the legs 20 and 22 and secured by nut 46 in such manner as to allow free mutual motion of the legs.

A pair of support plates 48 and 50 are so mounted that each plate is pivotally mounted with respect to one leg and slidably mounted with respect to the other. Support plates 48 and 50 include, respectively, cam slots 52 and 54, and holes 56 and 58. Bolt 60 passes through cam slot 52 in support plate 48, hole 58 in support plate 50, and hole 62 in leg 20, being secured on the opposite side by appropriate means such as nut 64. Likewise, bolt 68 passes through cam slot 54 in support plate 50, hole 56 in support plate 48, hole 70 in leg 22, and is secured by nut 72. Bolts 60 and 68 are secured loosely enough, of course, so as to act as free pivotal mountings between

leg 20 and support plate 50, and leg 22 and support plate 48, respectively. Also, cam slot 52 must slide freely upon bolt 60, as with cam slot 54 and bolt 68.

Support plates 48 and 50 also include means for securing thereto elements of the apparatus with which they are associated. In the illustrated embodiment these comprise bent-over portions 74 and 76 having openings 78 and 80, respectively. Top portions 12 and 14 may be secured to portions 74 and 76 by appropriate securing means (not shown) such as rivets or bolts passing through openings 78 and 80. For some types of apparatus, for example tent frames, it is possible to extend end portions 82 and 84 of support plates 48 and 50, in any desired shape, to form elements of the apparatus itself.

When assembled, the erected position of support structure 38 appears as shown in FIG. 3. Bolt 60 rests against the lower end of cam slot 52 and bolt 68 against the lower end of cam slot 54. Thus, leg 22 cannot move further in a counterclockwise direction, as seen in FIG. 3, about its pivotal connection with leg 20 since bolt 60 is fixed with respect to leg 22 and support plate 48, although slidably mounted with respect to leg 22, is pivotally mounted with respect to leg 20. The reverse applies with respect to clockwise movement of leg 22. Any downward pressure on the top of the table or the seat portions tends to spread the legs further apart. Since the legs cannot move further apart by virtue of the unique construction of support assembly 38, table 10 will be maintained in the erected position and cannot collapse by reason of normal use wherein all weight or pressure is applied downwardly on the top surface or seat portions.

Table 10 may be moved easily and extremely rapidly from the erected to the folded position and vice versa. From the erected position of FIG. 3 the apparatus may be moved toward the folded position of FIG. 5 either by moving one leg toward the other or by moving downward on the outer edge of either of top sections 12 and 14. Movement of one of the legs results in cooperative movement of the other through the mutual connections of support plates 48 and 50.

As table 10 is moved away from the erected position, the angle between legs 20 and 22 decreases and top sections 12 and 14 part along line 36 and move towards a flat position with respect to the legs. Seat portions 16 and 18 may, if desired, be moved to the folded position, as previously described and shown in FIG. 4, before folding the legs and top portions. As legs 20 and 22 are folded, holes 62 and 70 move closer together; thus, holes 56 and 58 also move closer together. Since bolt 60, which passes through holes 58 and 62, also passes through cam slot 52, support plate 48 is rotated in a counterclockwise direction as bolt 60 moves up cam slot 52. As bolt 68 moves up cam slot 54 support plate 50 is rotated in a clockwise direction as seen in FIGS. 3-6. No binding occurs during such movement even if one leg is moved while the other is held stationary since cam slots 52 and 54 are symmetrical and opposite, following the path of the adjacent point on the leg holding the bolt passing through the cam slot. This may be seen in FIG. 4 wherein the apparatus is in an intermediate position, bolt 60 being a portion of the way up cam slot 52. As table 10 continues to be folded, bolt 60 approaches the upper end of cam slot 52 and bolt 68 approaches the upper end of cam slot 54. The folded position of support assembly 38 is shown in FIG. 5. As may be seen, the assembly, as well as the table or other folding apparatus with which it is associated, is extremely compact in the folded position. The apparatus may be moved from the folded to the erected position in reverse manner, moving through the positions shown from FIG. 5 to that of FIG. 3, merely by lifting outward and upward on the two outer edges of top portions 12 and 14. Once it reaches the erected position, table 10 is held there by its own weight tending to move legs 20 and 22 farther

apart, and the legs being prevented from further movement in such direction by support assembly 38.

It is obvious that the configuration of legs 20 and 22 is immaterial to the purposes of the present invention.

It has been found that tubular legs are desirable for some applications, while relatively flat legs may be used for others. In table constructions such as that shown in the present drawings, the legs may be U-shaped, as shown, or may comprise four conventional legs, each pair being pivotally connected as shown. Motion will be transmitted from one support assembly to the other through the top portions of the table, thus insuring ease of erecting and folding even when four separate legs are used.

Since certain changes may be made in the above apparatus without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having thus described the invention in such manner that it may be practiced by those skilled in the art, what is claimed as new and desired to be secured by U.S. Letters Patent is:

1. In apparatus including a pair of pivotally attached legs movable between a folded position, wherein said legs are substantially parallel, and an unfolded position, wherein said legs are arranged at an angle, support means for maintaining said apparatus in said unfolded position, said support means comprising, in combination:

- (a) a pair of support elements, substantially identical in construction, each having an opening and a cam slot therein;
- (b) a first shaft passing through one of said legs, the opening in one of said elements and the cam slot in the other of said elements; and
- (c) a second shaft passing through the other of said legs, the opening in said other of said elements and the cam slot in said one of said elements, whereby said elements are oppositely disposed and each is pivotally mounted on one of said legs;
- (d) said cam slots being so shaped that said elements are moved in opposite directions about their respective pivotal mountings through movement of said shafts along said cam slots as said legs are moved between said folded and unfolded positions.

2. Folding apparatus comprising:

- (a) at least one pair of pivotally attached legs movable between a folded position, wherein said legs are substantially parallel, and an unfolded position, wherein said legs are arranged at an angle;
- (b) two sections movable with said legs between said unfolded position, wherein said sections abut one another at a parting line to form a unitary portion of said apparatus, and said folded position, wherein said sections are moved away from each other at said parting line and toward parallel relationship with one another and with said legs;
- (c) a pair of support elements;
- (d) means for pivotally mounting one of said support elements with respect to one of said legs and the other of said support elements with respect to the other of said legs;
- (e) means for fixedly mounting one of said sections upon said one of said support elements and the other of said sections upon said other of said support elements; and
- (f) means for interconnecting said one of said support elements with said other of said legs and said other of said support elements with said one of said legs, whereby movement of said legs is transmitted through said means for interconnecting to the opposite of said support elements causing movement thereof about its pivotal mounting on the opposite of said legs.

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3. The invention according to claim 2 wherein said means for interconnecting comprise shaft means extending fixedly from each of said legs through a cam slot in the opposite of said support members.

4. The invention according to claim 3 wherein said cam slots are so shaped that movement of said legs between said folded and unfolded positions causes movement of said support elements in opposite directions about their respective pivotal mountings on said legs.

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