

[54] **LINKAGE ASSEMBLY FOR FOLDING TABLES AND THE LIKE**

[72] Inventor: **Paul H. Mitchell**, Fort Smith, Ark.
 [73] Assignee: **Fort Smith Table & Furniture Co.**, Fort Smith, Ark.
 [22] Filed: **Sept. 11, 1969**
 [21] Appl. No.: **857,054**

2,921,825 1/1960 Spiegel.....108/132 X
 3,190,596 6/1963 Kaminky.....108/130 X
 3,120,976 2/1964 Van Sejoc.....108/138 X

Primary Examiner—Paul R. Gilliam
Attorney—Cohn and Powell

[52] U.S. Cl.108/131
 [51] Int. Cl.A47b 3/00
 [58] Field of Search108/131-133, 129-130, 108/115

[57] **ABSTRACT**

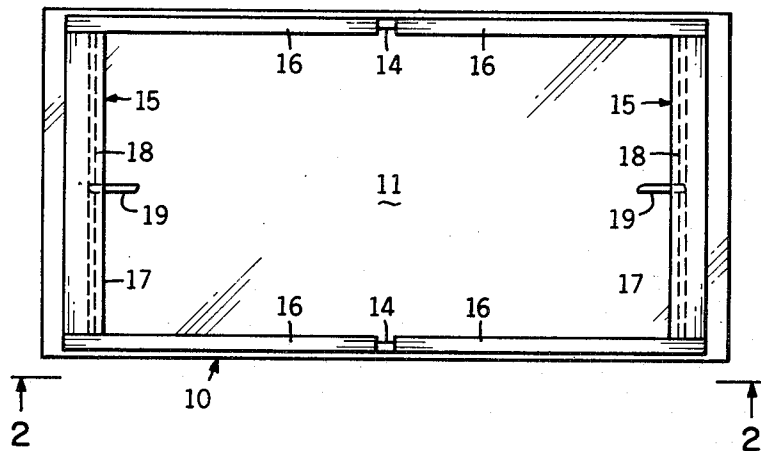
The folding table includes a pair of U-shaped leg units, each comprising two legs connected by an apron member. The leg units are pivotally attached to opposite ends of a table top, having side apron members, by a compact linkage assembly located at each corner of the table and concealed by the apron members. Each linkage assembly includes an inclined link member having one end pivotally attached to a leg unit and the other end pivotally attached to a side apron. Each linkage assembly also includes latch members locking the leg unit to the table top in both the erected and the folded positions and an adjustment device is provided to ensure that the leg members tightly abut the table top side aprons in the locked condition.

[56] **References Cited**

UNITED STATES PATENTS

2,075,778	3/1937	Johannsen	108/131
2,213,681	9/1940	Symmonds.....	108/130
2,478,507	8/1949	Peterson.....	108/132
2,860,940	11/1958	De Saussure	108/133

10 Claims, 6 Drawing Figures



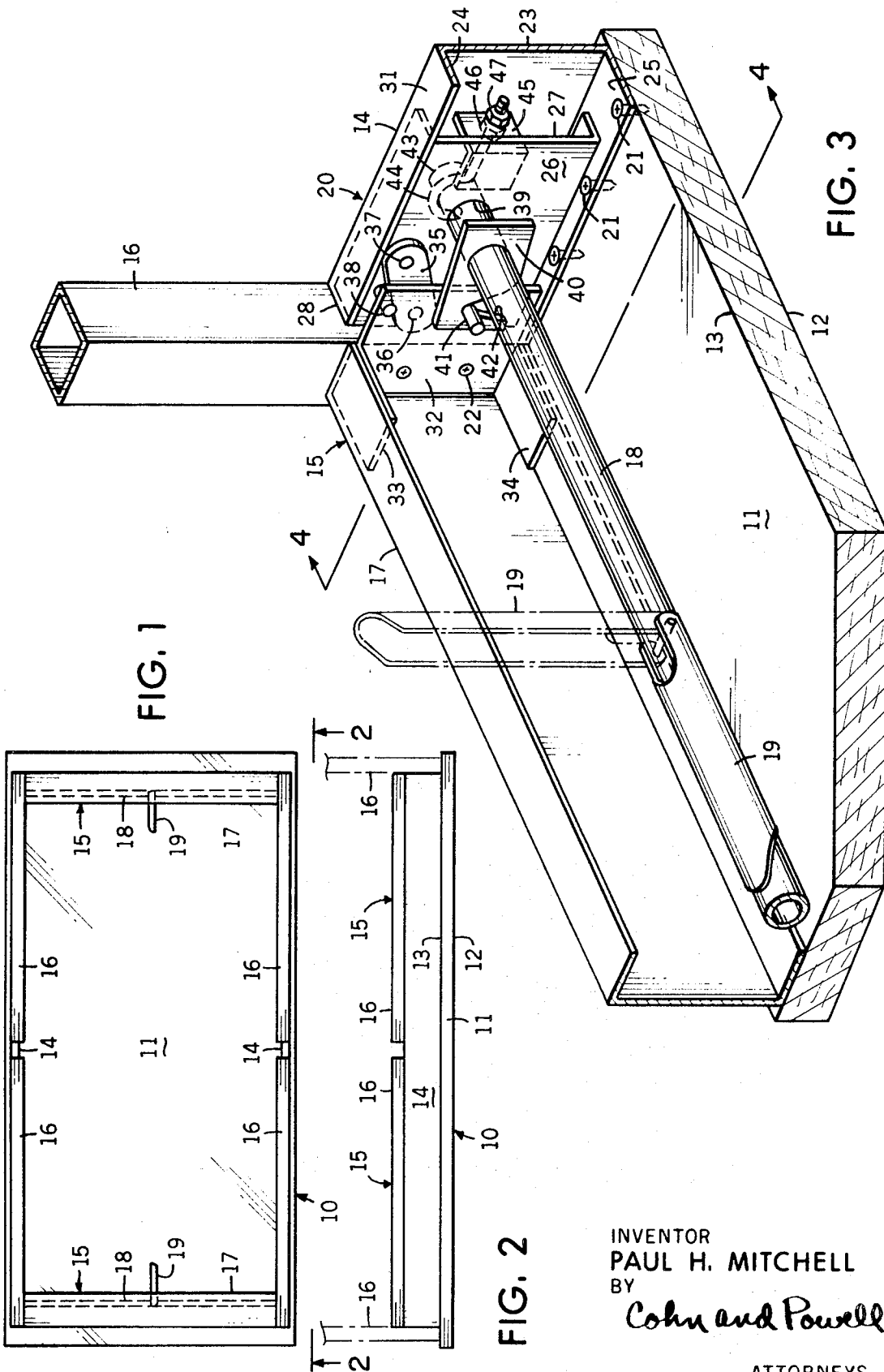


FIG. 1

FIG. 2

FIG. 3

INVENTOR
PAUL H. MITCHELL
BY
Cohn and Powell
ATTORNEYS

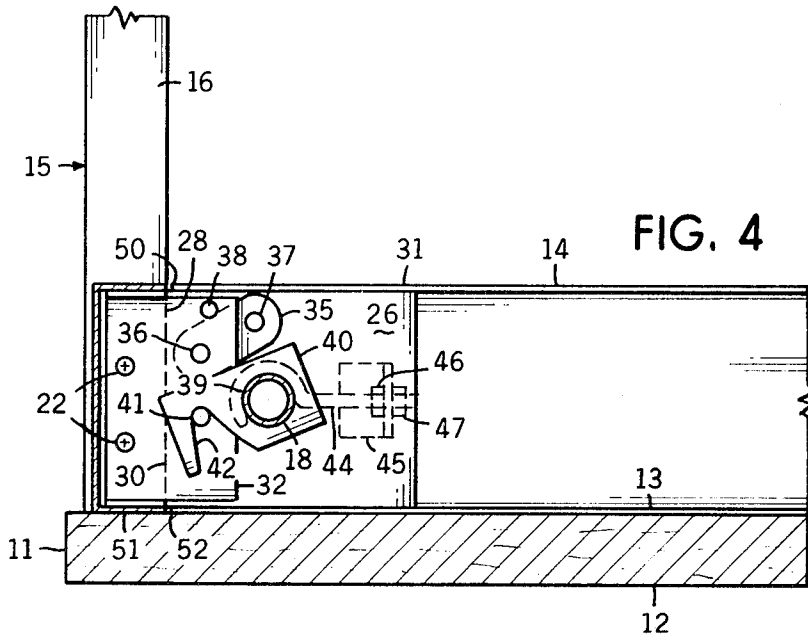


FIG. 4

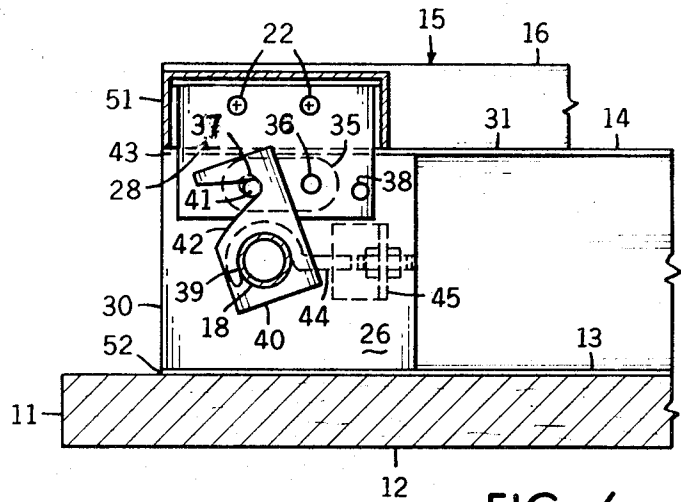


FIG. 6

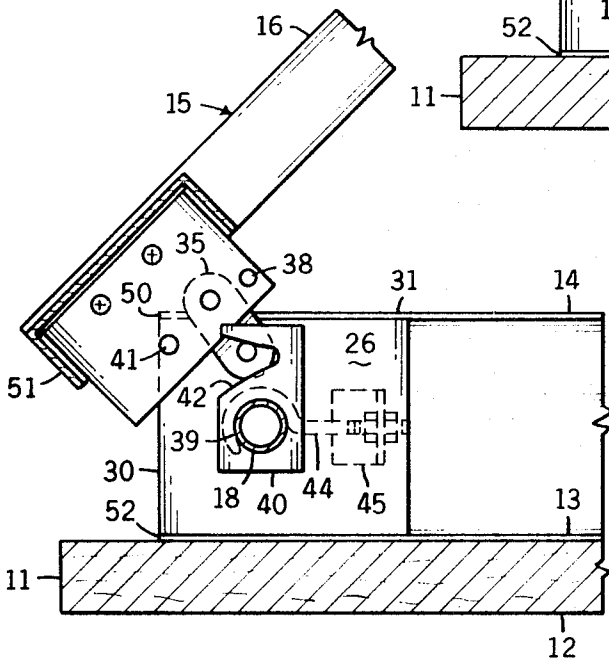


FIG. 5

INVENTOR
PAUL H. MITCHELL
BY

Cohn and Powell

ATTORNEYS

LINKAGE ASSEMBLY FOR FOLDING TABLES AND THE LIKE

BACKGROUND OF THE INVENTION

This invention relates to folding tables, and more particularly to such tables utilizing a compact concealed linkage assembly to effectuate the folding operation.

The prior art is replete with examples of folding tables in which the folding mechanism utilizes collapsible struts and braces which are part of the leg support framework and are attached to the legs some distance below the table top. These tables, because of the tendency of the support framework to obstruct leg room, are not very satisfactory for use as conference tables and the like. Further, they lack the clean, contemporary lines which are so desirable in modern offices and homes.

Obviously, it is of great importance for tables to be very rigid in use, and the stiffness of the leg connection to the table top is of paramount importance. In the case of non-folding tables, the solution of the stiffness problem merely involves making the leg to table top connection secure. With folding tables, in which the folding mechanism is to be compact and concealed, the problem becomes acute because this mechanism must be disposed at the very location where stiffness is most important.

SUMMARY OF THE INVENTION

This folding table has no visible braces and the folding mechanism is sufficiently compact so as to be completely concealed behind the apron members when the table is erected.

A linkage assembly, connecting each leg to the table top, permits the folding operation to be made simply and without interference between parts and in particular, the swing-away nature of the linkage assembly is such that not only the end apron members, but also the side apron members have square corners, and the side apron members are cleared by the legs when the legs are moved to a folded position.

A latching device provides complete rigidity at the connection between the legs and the table top, both in the erected and folded positions. An adjustment feature obviates the need for close tolerance in the moving parts.

In general, the linkage assembly includes a table top member having support means providing first and second abutment means. A leg member including bearing means engages the first abutment means when the table is in an erected position and the second abutment means when it is in a folded position.

Link means connects each leg member to the support means, the link means including a first pivot means connecting the link means to the leg member and the second pivot means connecting the link means to the support means. Locking means, which includes a latch member pivotally attached to the support means and a cooperating pin member fixedly attached to the leg member, locks the table leg to the support means in the erected and the folded positions of the table. The pivot axis of the latch member is adjustable to compensate for wear between parts and ensure satisfactory initial installation.

Each link means includes a link member having the first and second pivot means disposed in fixed, spaced relation. The link member is inclined so that the leg member may be pulled away or swung away from the first abutment means during the folding operation to prevent interference between the leg members and the support means.

The table top member includes a pair of oppositely disposed side apron members, each providing a support means. Each leg is part of a substantially U-shaped leg unit comprising two legs and a bight-forming apron member, and each leg includes an inner face portion providing at least part of the bearing means. Each side apron includes a pair of adjacent face portions at each end, one of the face portions providing the first abutment means and the other face portion providing the second abutment means. An elongate extension member couples associated latch members to ensure concerted leg movement in the locking of the individual legs of one of the leg units.

Each leg unit includes a pair of opposed bracket members disposed in side-by-side relation with an associated side apron member. The first pivot means of each link member connects the bracket member to the link member and the second pivot means connects the link member to the apron member. The first pivot member is disposed substantially equidistant from one abutment face in the erected position as it is from the other abutment face in the folded position. Each latch member is pivotally attached at one end to a side apron and includes a cam face at the other end engageable with the pin member to lock the leg member in the erected and folded positions. The center of rotation of the latch member is substantially perpendicularly equidistant from the leg member in the erected and folded positions. The extension member projects beyond each latch member and is journaled into the side apron members to provide pivotal rotation of the latch members which are fixedly attached to the extension member. Each apron member includes an oversize journal receiving one end of the extension member. The extension member includes a transverse rotating handle facilitating the locking and unlatching of the latching means.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a plan view of the underside of the folding table with the legs in the folded position;

FIG. 2 is a side elevational view taken on line 2—2 of FIG. 1, the open position of the legs being shown in phantom outline;

FIG. 3 is an enlarged, fragmentary, perspective view illustrating the linkage assembly at one corner of the table;

FIG. 4 is a fragmentary elevational view taken on line 4—4 of FIG. 3, illustrating the erected position;

FIG. 5 is a similar view to FIG. 4 with the leg in the partially folded position, and

FIG. 6 is a similar view to FIG. 4 illustrating the folded leg position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now by characters of reference to the drawings, and first to FIGS. 1 and 2, it will be understood that the folding table includes a table top unit 10 having foldable table leg units 15 disposed at each end. The table top unit 10 includes a table top member 11 having an upper side 12, an underside 13 and a pair of oppositely disposed apron members 14, the apron members 14 constituting support means. The leg units 15 are adapted to be rotated from an erected position, indicated in phantom outline in FIG. 2, to a folded position substantially parallel with the table top member 11 and adjacent the side apron members 14.

Each of the leg units 15 includes opposed leg members 16 interconnected by a bight-forming, end apron member 17. The leg units 15 are adapted to be locked in the erected and folded positions by means of a latching mechanism operated by an extension member 18 extending between the side apron members 14, each extension member 18 including a transverse handle 19 for latching and unlatching the leg units 15. The leg units 15 are pivotally interconnected to the table top unit 10 by means of linkage assemblies, one of which is generally shown by numeral 20 in FIG. 3. It will be understood that four such linkage assemblies 20 are provided in the preferred embodiments.

As indicated in FIG. 3, the side apron member 14, which constitutes a support means, is fixedly attached as by screws 21 to the underside 13 of the table top element 11. The end apron members 17, on the other hand, are fixedly attached to the legs members 16 as by screws 22, and in consequence move with the leg members 16 from an erected to a folded position as a single unit.

Each side apron member 14 includes an elongate channel member 23 having opposed flanges 24 and 25. At its ends, each apron member 14 includes a reversely disposed short channel element 26 welded or otherwise attached to the channel member 23 in nested relation. The web member 27 of the

channel element 26 is preferably flush with the narrower flange 24 of the channel member 23. This nested channel arrangement provides the side apron member 14 with a box end against which a side face of the leg member 16 abuts in the erected position. The side apron member 14 also provides an upper flange 24 against which the leg member 16 abuts in the leg-folded position, as is clearly illustrated in FIGS. 4 through 6. The end face 30 and the upper face 31 of each side apron member 14 constitute first and second abutment means respectively. Generally, in tables of the type under discussion, the legs are preferably right angularly disposed to the table top. Consequently, the end face 30 is perpendicular to the table top member 11, and the upper face 31 is parallel to the table top member 11.

Each leg unit 15 includes an outstanding bracket member 32 which is attached to the end apron member 17 by means of projecting lugs 33 and 34 welded or otherwise attached to the flanges of end apron member 17. The bracket member 32 provides a convenient means by which the leg member 16 is attached to the end apron member 17 by screws 22 to form the leg unit 15.

The bracket member 32 is disposed in side-by-side relation to the web 27 of the channel element 26 and, therefore, to the side apron member 14. A link member 35, constituting a link means, connects the leg unit 15 to the table top unit 10. This connection is effectuated by pivot pins 36 and 37. Pin 36, which constitutes a first pivot means, connects the link member 35 to the bracket member 32. Pin 37 which constitutes a second pivot means, connects the link member 35 to the web 27.

It will be observed that the bracket member 32 is spaced from the web 27 and that the link member 35 is disposed within this space between the bracket member 32 and the web 27. A guide stud 38, constituting a stop means, is welded to the bracket member 32 and projects from the bracket member 32 in adjacent relation to the link member 33 in the erected position. This stud 38 assists in guiding leg units 15 during the folding operation in a manner which will be later described.

The linkage assembly 20 includes a locking means locking the leg member in the erected and folded positions. The locking means includes a latch member 40, pivotally attached to the side apron member 14, and a pin member 41 welded or otherwise attached to the bracket member 32. In the preferred embodiment, the latch member 40 is fixedly attached as by welding to the extension member 18. This extension member 18 is journaled into the web 27 through an aperture 39 provided in the web and extending as it does from side to side of the table provides for concerted latch release action between a pair of individual latch members 40 to lock one of the leg unit 15. The latch member 40 is disposed in spaced relation from the face of the web 27 and is located on the other side of the bracket member 32 to avoid interference with the link member 35.

Because of its attachment to the extension member 18, the latch member 40 is pivotally attached at one of its ends to the apron member 14. The latch member 40 includes a cam face 42 at its other end which is engageable with the pin member 41 to lock the leg unit 15 in the erected leg position. The cam face 42 is preferably arcuate in order to exert a wedge action on the pin member 41, and hence draw the leg unit 15 into its ultimate position.

In the preferred embodiment of the linkage assembly 20, the disposition of parts is such that the latch member 40 locks the leg unit 15 in the folded position in addition to the erected position. See FIGS. 4 and 6. This convenient arrangement, which requires only one latch member for each linkage assembly, is effectuated by disposing the center of rotation of the latch member 40 substantially equidistant perpendicularly from the end abutment face 30 and the associated right angularly disposed abutment face 31.

The locking means includes an adjustment device which is capable of relocating the latch pivot center slightly. This adjustment device obviates the necessity for manufacturing the

linking assembly parts to extremely close tolerances. In the preferred embodiment, the adjustment means is effectuated by providing an oversized hole 39 as the journal means rotatively receiving the extension member 18. It will be observed that the extension member 18 includes at each end, a projecting portion 43. This projecting portion 43 is engaged by a hook bolt 44 which is carried by an angle member 45 welded or otherwise attached to the inside face of the channel web 27. The hook bolt 44 is relocated by means of nuts 46 and 47, and by suitable adjustment of these nuts. The location of the center of rotation of the extension member 18, and therefore of the latch member 40, may be varied as required to draw the leg unit 15 against the side apron member 14 and ensure a rigid connection in its journal aperture 39.

It is thought that the functional and structural advantages of this folding table linkage assembly have become fully apparent from the foregoing description of parts, but for completeness of disclosure, the operation of the assembly will be briefly summarized.

In the drawings, for purposes of explanation, the table is illustrated in the upside down position lying on a support surface, such as the ground. It will be assumed that initially, the legs 16 are in their open position as shown in FIGS. 3 and 4. Each leg unit 15 is unlatched by moving the handle 19 into an operative, transverse position and rotating the handle 19 toward the table top member 11. The extension member 18 and the latch members 40 which are fixedly attached to each end thereof, are likewise rotated, causing the cam face 42 of each latch member 40 to rotate out of engagement with the pin member 41.

Referring now to FIGS. 4, 5 and 6, it will be observed that when the latch member 40 is unlatched, the couple provided by leg member bearing face 28 abutting the side apron end face 30, and the latch member 40 which together hold the leg unit 15 rigidly in place against the table unit 10, is terminated. Because the axis of the link member 35 between pins 36 and 37 is inclined relative to the table top element 11, the leg unit 15 may be moved outwardly as well as upwardly so that the bearing face 28 of the leg member 16 clears the abutment face 30. Because of this clearance capability, the leg unit 15 may be swung in a clockwise direction about the center of rotation of the pivot pin 37 without suffering interference from the apron corner 50 which would otherwise result. This arrangement obviates any necessity to round the corner 50, and provides a more effective abutment in the erected and folded positions. The rotation of the leg unit 15 between the erected and folded positions is clearly shown in FIG. 5.

In the preferred embodiment, the pivot pin 36 is disposed the same perpendicular distance from the abutment face 30 in the erected position, as it is from the abutment face 31 in the folded position. Because of this relationship and because the pivot pin 36 maintains a constant perpendicular distance from the bearing face 28 while the pin 37 is spaced a variable perpendicular distance from the face 28, the leg unit 15 can rotate relative to both pins 36 and 37. In the embodiment illustrated, the leg member 16 moves through 90° between the erected and folded positions. The link member 35, however, moves through an angle substantially greater than this and in fact, in the amount of 180°.

With the disposition of parts as described in the linkage assembly 20, it is possible to provide that leg unit flange 51, which is adjacent the table face 13 in line with the abutment face 30 in the folded position. This arrangement has considerable advantage in that the folded table may be more easily stacked so that the leg unit 15 is not susceptible to damage, and is achieved by spacing the pin 36 the same perpendicular distance from face 13 in the erected position as it is from face 30 in the folded position.

Because the center of rotation of the latch member is substantially perpendicular equidistant from the abutment faces 30 and 31, the latch member 40 may be used to lock the leg unit 15 in the folded position as well as in the erected position.

The stud guide 38, which projects from the bracket member 32 and is adjacent the link member 35 in the erected position, serves the purpose of guiding the rotation of the leg unit 15 from the open to the folded position. Without this guide 38, it would be possible (see FIG. 4) for the leg member 16 to rotate about the pivot pin 36 in a clockwise direction, thus causing the leg member 16 to engage the corner 50. Because of the stud guide 38, the leg member 16 is obliged to pivot about the pin 37 in a clockwise direction, although it may be moved anticlockwise relative to the pin 36, thereby clearing the right angular corner 50. Further, when the leg unit 15 is returned from the folded position, the stud guide 38 prevents inadvertent clockwise rotation of the leg unit 15 about the pin 36 which would cause the bearing face 28 to come into contact with the corner 50.

By providing a journal bearing for the extension member 18, which is essentially an oversize aperture, slight variations in the center of rotation of the member 18 and hence of the latch member 40 may be effectuated, which will compensate for wear between the latching parts and particularly between the cam surface 42 and the pin 41. In essence, the hook member 44 combines with parts of the journal aperture to provide a complete journal. This journal is adjustable simply by adjusting the nuts 46 and 47 at the threaded end of the hook bolt 44.

The latching action provides a lock position of the legs in both the erected position and the folded position by virtue of the latch engagement with the pin 41 which draws the bearing face 28 against the bearing faces 30 and 31 respectively. Because the pin 41 is spaced from the corner 50, the abutment portion between the pin 41 and the corner 50, and the pin 41 itself in essence, provide a couple resisting clockwise moment applied to the leg member 16. Any tendency for the leg unit 15 to rotate in a counterclockwise direction in the erected position is resisted by the pin 41, and the abutment portion of the table face 13 adjacent the end 51 of the leg unit 15.

In the folded position, any tendency for the leg unit 15 to rotate in a counterclockwise direction is resisted by the latch pin 41 and the abutment portion between the pin 41 and the corner 50. Obviously there is no tendency for the leg unit 15 to rotate in a clockwise direction as it is fully supported in the preferred embodiment in this position.

A particular advantage results from the provision of an inclined link member 35. When the table is in its erected, operational position, the load from the table top unit 10 tends to bear on the four leg members 16. If all of the table load is not carried directly by the ends 51 of the leg units 15, either by design or otherwise, then a portion will be carried by the pins 37 and will be transferred to the bracket member 32 by the link members 35 through the pins 36. Because the link member 35 is inclined, the vertical load will have a horizontal component tending to urge the bearing portion 38 of each leg member 16 against associated abutments 30. This force augments the couple resistance to the rotation of the leg units described above, and provides a secondary resistance couple.

I claim as my invention:

1. A linkage assembly for folding table legs and the like, comprising:
 - a. a table top member including a support means providing a first abutment means and a second abutment means,
 - b. a leg member including an inner end, and bearing means engaging the first abutment means in an erected position and the second abutment means in the folded position,
 - c. link means connecting the leg member to the support means, the link means including a first pivot means connecting the link means to the leg member and a second pivot means connecting the link means to the support means to permit the inner end of the leg member to move translationally, transversely of the table top member, and
 - d. locking means including separable latch means selectively engageable for locking the leg member in the erected position.
2. A linkage assembly as defined in claim 1, in which:

- e. the support means includes an apron member having at least one side substantially parallel to the table top to provide an abutment face, and an end substantially perpendicular to the table top to provide another abutment face, and
 - f. the leg member includes a side face providing the bearing means, said side face engaging the apron end in the erected position and the apron side in the folded position.
3. A linkage assembly as defined in claim 1, in which:
 - e. the table top member includes an upper face,
 - f. the leg member is substantially upright in the erected position, and
 - g. in the erected position, the first pivot means is perpendicularly closer to the upper face and to the leg member than is the second pivot means.
 4. A linkage assembly as defined in claim 1, in which:
 - e. the locking means includes a pivotal latch member and a cooperating pin member and cam means urging the latch member into engagement with the pin member, and
 - f. one of the last said members is attached to the support means and the other of said members is attached to the leg member.
 5. A linkage assembly as defined in claim 4, in which:
 - g. the locking means includes adjustment means selectively relocating the center of rotation of the latch member.
 6. A linkage assembly as defined in claim 1, in which:
 - e. the link means includes a link member,
 - f. the link member is disposed in side-by-side relation to the leg member, and
 - g. one of the last said members includes a stop engaging the other of said members to preclude relative rotation of one of said members in one direction as the leg moves into the folded position.
 7. A folding table comprising:
 - a. a table unit including a pair of oppositely disposed side apron members attached to the table top unit, each apron member including first and second abutment means,
 - b. a pair of oppositely disposed, substantially U-shaped leg units each attached to the table top unit in inwardly folding relation to the other leg unit, each leg unit including a pair of leg members interconnected by a bight-forming, end apron member,
 - c. each leg unit including bearing means engaging the first abutment means in an open leg position and engaging the second abutment means in a folded leg position,
 - d. like means interconnecting opposite ends of the leg unit to associated side apron members, each link means including a first pivot means connecting said link means to a leg unit and a second pivot means connecting said link means to a side apron member to permit the end apron member to move translationally, transversely of the table top unit, and
 - e. locking means including separable latch means selectively engageable for locking opposite ends of the leg units to the table top unit in the erected position.
 8. A linkage assembly as defined in claim 7, in which:
 - f. each locking means includes a pivotal latch member and a cooperating pin member,
 - g. one of the last said members is attached to the apron member, and the other of said members is attached to the leg unit, and
 - h. an elongate extension member interconnects associated latch members to lock one of the leg units by rotation of said latch members.
 9. A folding table as defined in claim 8, in which:
 - i. the associated latch members are fixedly attached to the extension member to provide concerted latching action,
 - j. each extension member includes a projecting portion at each end extending beyond each associated latch member to provide the pivotal attachment of the latch members to the apron members,
 - k. each apron member includes an oversized journal receiving one end of the projecting portion in adjustable relation, and

7

l. adjustment means is attached to each projecting portion to selectively locate the latching member within the journal.

10. A folding table as defined by claim 9, in which:

- f. each locking means includes a pivotal latch member attached to the apron member at one end and including a cam face at the other end, and a cooperating pin member attached to the leg and engageable by the cam face,
- g. an elongate extension member interconnects associated

5
10

8

- latch members whereby rotation of the extension member rotates each of the latch members, and
- h. the pivot center of each latch member is disposed substantially equidistant from its associated pin member in the erected and the folded positions whereby the cam face engages said associated pin member in both the erected and the folded positions.

* * * * *

15

20

25

30

35

40

45

50

55

60

65

70

75