

May 29, 1945.

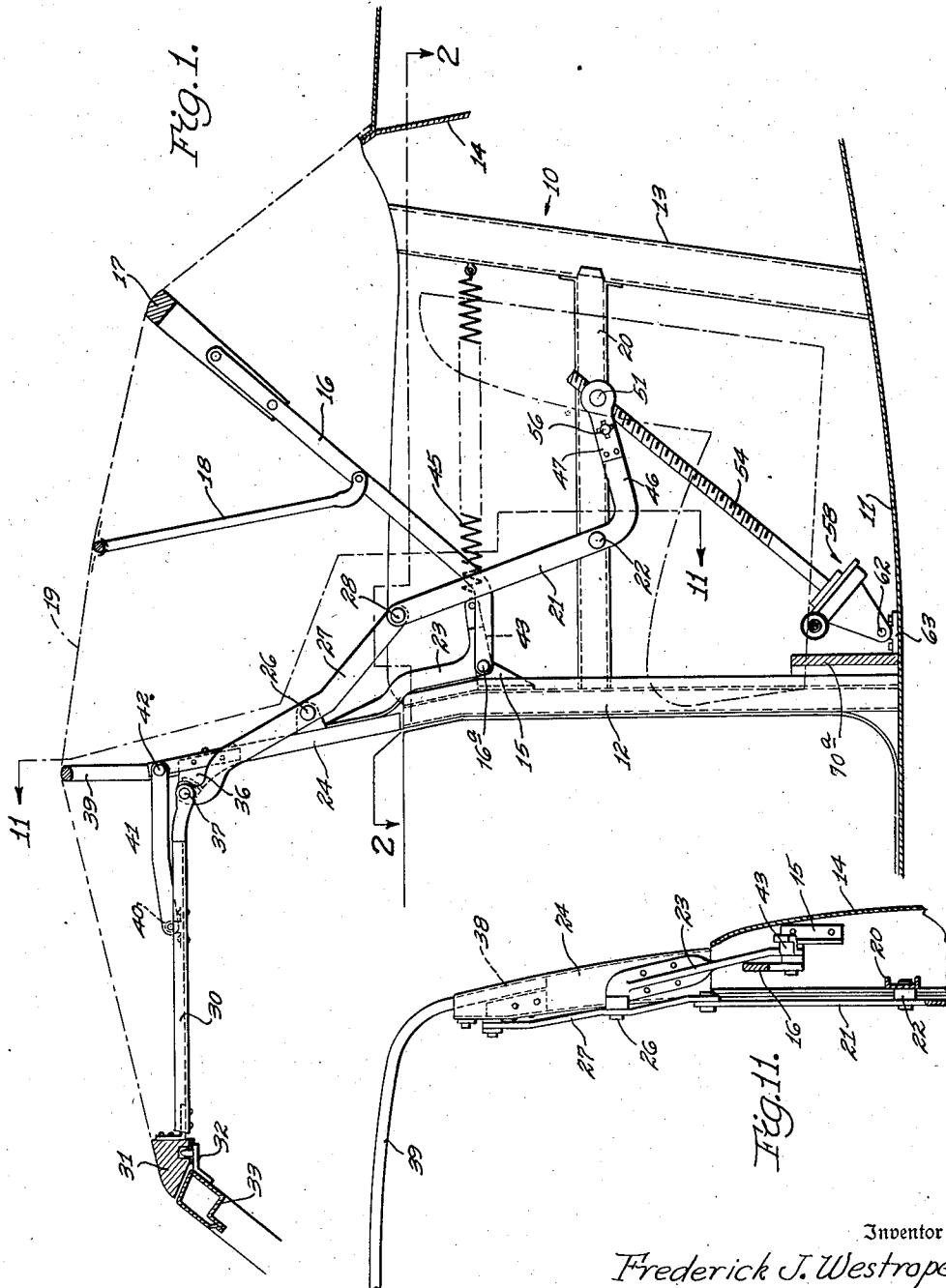
F. J. WESTROPE

2,376,949

FOLDING TOP OPERATING MECHANISM

Filed April 9, 1940

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

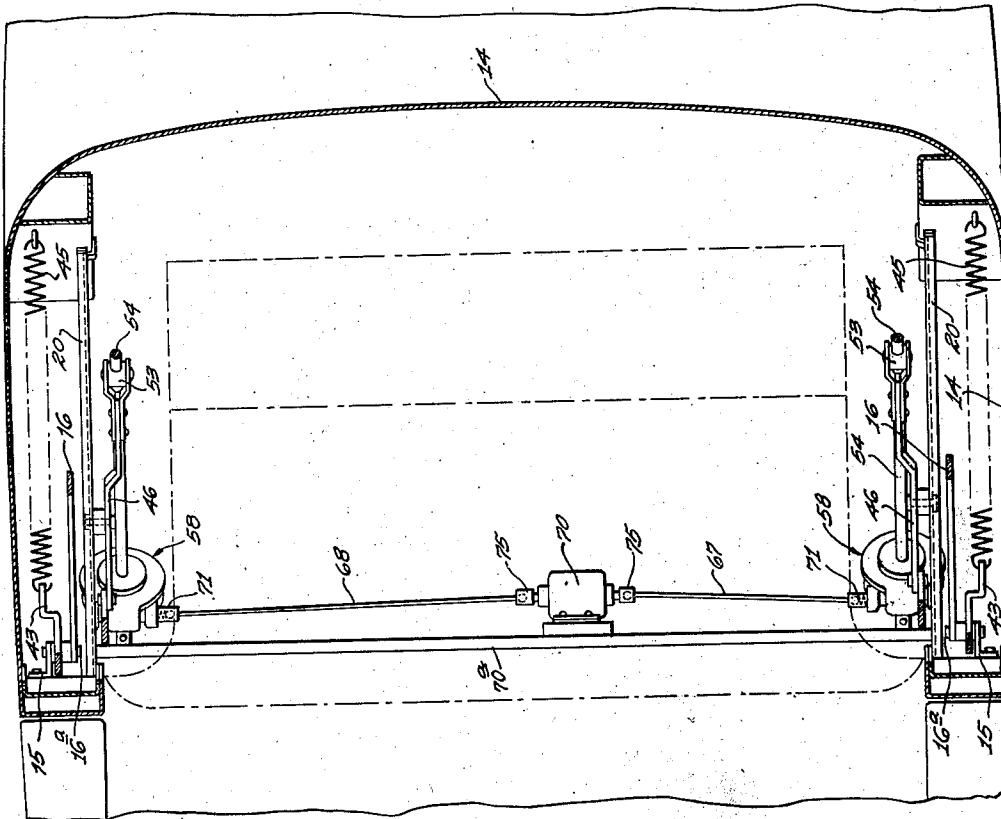
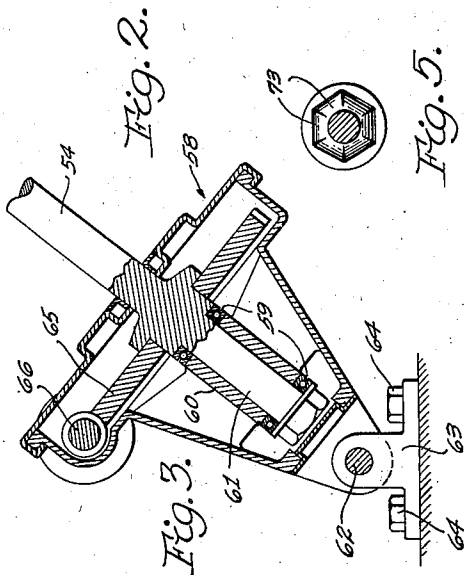


Fig. 5.

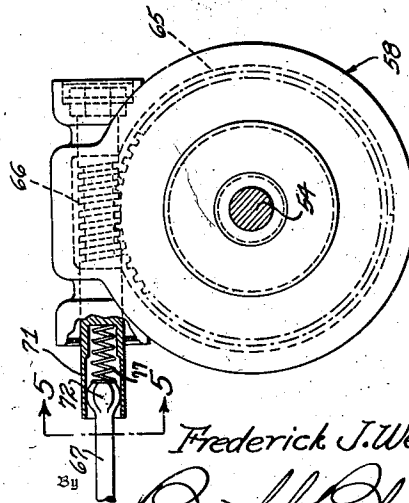


Fig. 4.

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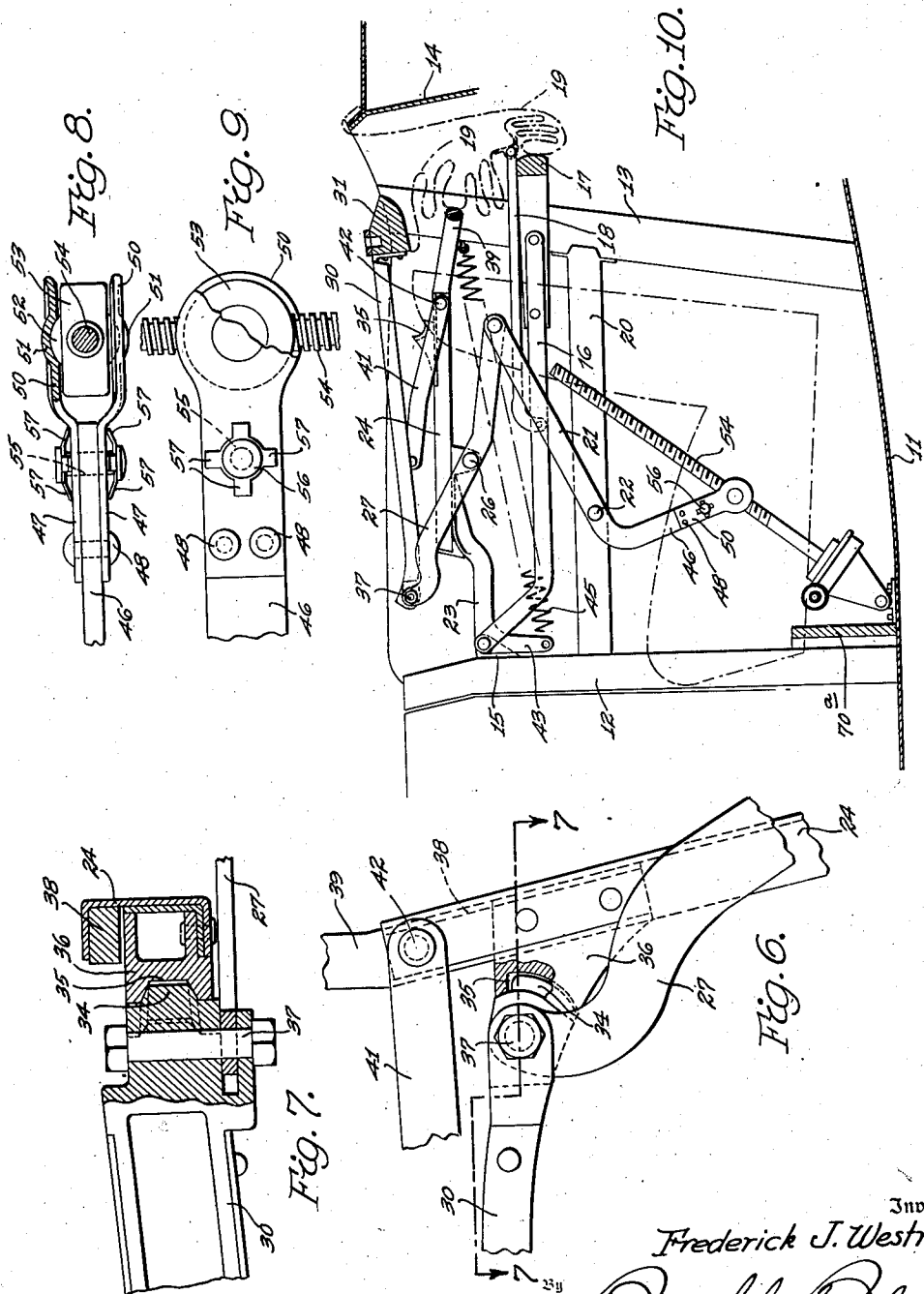
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FOLDING TOP OPERATING MECHANISM

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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FOLDING TOP OPERATING MECHANISM

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3 Claims. (Cl. 296—117)

This invention relates generally to vehicles and more particularly to foldable tops therefor.

It is an object of the present invention to provide a new and improved folding top and improved operating mechanism therefor.

Another object of the invention is to provide a vehicle top having a new and improved arrangement of the movable parts thereof.

A further object of the invention is to provide a foldable vehicle top which is raised and lowered by an electric motor which may be readily disconnected from the top so that the top may be raised and lowered manually, if desired.

Other objects of the invention will become apparent from the following detailed description taken in connection with the accompanying three sheets of drawings in which

Fig. 1 is a sectional vertical view taken longitudinally of a motor vehicle body to show part of the foldable top structure and operating mechanism therefor;

Fig. 2 is a cross sectional view of the body, taken along the line and in the direction of the arrows 2—2 of Fig. 1;

Fig. 3 is a sectional view showing certain details of construction of the operating mechanism;

Fig. 4 is a detail view partly broken away and in section of the structure of Fig. 3;

Fig. 5 is a cross sectional view taken along the line and in the direction of the arrows 5—5 of Fig. 4;

Fig. 6 is an enlarged fragmentary side view of the top structure;

Fig. 7 is a view shown partly in elevation and partly in section, taken along the line and in the direction of the arrows 7—7 of Fig. 6;

Fig. 8 is a fragmentary enlarged view shown partly in elevation and partly in section of a connecting member of the top operating mechanism;

Fig. 9 is a fragmentary side view of the connecting member shown in Fig. 8;

Fig. 10 is a fragmentary view similar to Fig. 1 but showing the top in its lowered position, and

Fig. 11 is a cross sectional view of the structure taken along the line and in the direction of the arrows 11—11 of Fig. 1.

Referring to the drawings by characters of reference, the numeral 10 designates generally a motor vehicle body having a frame structure including a floor 11, intermediate and rear upright pillars 12, 13 respectively and outer panels 14. Rigidly mounted on each of the upright pillars 12 there is a bracket 15 to which a pair

of bow links 16 are respectively pivoted, as at 16a, and rigidly secured to the links 16 is a rear cross bow 17 of a foldable top. Pivoted adjacent its lower ends to the links 16 there is a second or intermediate cross bow 18 which aids to support the top covering 19 which may be leakproof fabric or other foldable material, the fabric top covering being attached to the cross bows 17 and 18.

The intermediate and rear pillars 12 and 13 respectively of opposite sides of the body are rigidly secured together by longitudinal body frame members 20 and to each of the members 20, an operating member or lever 21 is pivoted intermediate its ends, as at 22, for raising and lowering the top frame structure. Also pivoted to each of the brackets 15, there is a lever 23 to each of which is rigidly secured an upright member 24, these upright members 24 constituting continuations of the intermediate pillars 12 when the top is in raised position. Intermediate their ends, the uprights 25 are pivoted, as at 26, to and intermediate the ends of links 27 which in turn are pivoted at their lower ends, as at 28, to the upper ends respectively of the operating levers 21. Forwardly extending frame members 30 are pivoted at their rear ends respectively to the upper ends of the links 27 and rigidly secured to the front ends of the members 30 there is a cross member or windshield header 31. When the top is in its raised position, as shown in Fig. 1, the header 31 rests upon and may be suitably releasably secured to one or more brackets 32 which are rigidly secured to the windshield frame, designated by the numeral 33.

As shown more clearly in Figs. 6 and 7, the longitudinal frame members 30 are each provided at their rear ends with a reduced, extended portion 34 adapted to engage and seat respectively in forwardly directed sockets 35, respectively provided in socket members 36 which are rigidly secured, one to each of the upright members 24, adjacent the upper ends thereof. The upper ends of the links 27 may be connected respectively to the rear ends of the longitudinal frame members 30 by bolts 37 or by any other suitable means. Preferably, the extension pillar members 24 are channel-shape members as shown in Fig. 7 and receive therein downturned end portions 38 of a cross bow 39 which may be riveted or be otherwise rigidly secured to the members 24, the top covering 19 being suitably attached to the cross bow. Intermediate their ends, the longitudinal frame members 30 are provided with upwardly directed lugs 40, see Fig. 1, to which are respec-

tively and pivotally connected, forwardly disposed ends of links 41, the rear ends of the links 41 being pivotally connected, as at 42 to and adjacent the upper ends of the members 24. Each of the levers 23 is provided with an arm 43 which, when the top is in raised position, extends rearwardly and upwardly and to each of the lever arms 43 is connected helical coil springs 45 which are anchored respectively to the rear body posts or pillars 13. When the top is lowered, the springs 45 yieldingly oppose lowering of the top and are tensioned to balance or steady the top movement.

The operating levers 21 are each provided with a lower arm 46 and the ends of these arms 46 are each provided with an extension comprising a pair of tensioned plate members 47 which may be rigidly secured to the arms by rivets 48, or by other suitable means. Below the ends of the lower arms 46, the plate members 47 are provided with oppositely directed, offset, substantially parallel end portions 50 which are provided with opposed recesses or sockets 51 to receive rounded extended portions 52 of internally threaded traveler members or nuts 53 which respectively screwthread onto rotatable shafts 54, driven by an electric motor 70. The end portions 50 are made of resilient or spring metal and are pre-formed inwardly toward each other such that they must be forced apart in order that the extensions 52 may be positioned in the sockets 51 with the result that the extensions 52 are held in their sockets 51 by the tension under which the spring portions 50 are placed. Between the rivets 48 and the sockets 51 the lever arm 46 and the extension member 47 are provided with aligning apertures to receive a rivet 55, and held under tension under the heads of the rivet 55 are spring plate members 56 having radially spaced spring fingers 57 engaging the opposite sides of the extension members 47 to aid the tensioned end portions 50 in holding the extensions 52 in their sockets 51. It will be seen that the above described ball and socket joints permit relative swinging movement between the drive screws 54 and the operating levers 21 respectively connected thereto and that by forcing the extension portions 50 apart the operating levers 21 and screws 54 may be easily and quickly disconnected. By disconnecting the levers 21 and the screws 54, the top may then be raised or lowered manually, if desired.

The lower ends of the drive screws 54 extend respectively into gear housings 58 wherein they are preferably journaled in roller bearings 59, separated by tubular spacer members 60 which surround the lower shaft portion 61 of each of the drive screws. At their lower ends, the gear housings 58 are individually pivoted, as at 62, to brackets 63 which are rigidly secured to the body structure floor 11 by bolts 64. By pivotally mounting the gear casings 58, it will be seen that screws 54 pivot as they rotate to pivot the top operating levers 46 in raising and lowering the top.

Secured onto each of the screw shaft portions 61 there is a worm wheel or gear 65 in mesh respectively with worm gears 66. The worm gears 66 are secured on separate shafts 67 and 68 which extend transversely of the body and are driven by a common, reversible type electric motor 70, see Fig. 2. As shown in Fig. 4, the worm gears 66 are each provided with a hollow end portion 71 which projects externally of their gear casings 56 and receive outer end portions 72 respectively of the motor driven shafts 67 and 68. The end

portions 72 of the shafts 67, 68 are made multi-sided internally to provide drive connections between the shafts 67, 68 and their respective worm gears 66. Similarly, inner end portions of the shafts 67, 68 are made multi-sided to engage in complementary or multi-sided sockets in members 75 which are secured to opposite ends of the drive shaft of the electric motor 70. The multi-sided opposite end portions of each of the shafts are rounded or convex, as shown in Figs. 4 and 5 to permit canting of the shafts relative to the motor 70 and to the gear casings 58 during raising or lowering of the top. The motor 70 is rigidly mounted on a cross member 70a which is rigid with the body structure. Helical coil springs 77, Fig. 4, are provided one in each of the hollow ends 71 of the worm gears 66 and act to retain the inner ends of the shafts 67, 68 in the socket members 75 of the motor 70. Any suitable control system or circuit, preferably controllable by a switch by the vehicle operator may be provided for starting and stopping the motor 70 to raise or lower the top.

Operation

In lowering the vehicle foldable top, the motor 70 is started and through the shafts 67, 68 and the gears 65, 66 rotates the angularly disposed screws 54. As the screws 54 rotate, the follower members or nuts 53 are caused to move downwardly on the screws which movement pivots the operating levers 21 clockwise, as seen facing Fig. 1, causing the screws 54 to swing counterclockwise which movement is permitted by reason of the canting drive shafts 67, 68. When the operating levers 21 are pivoted clockwise, links 27 are moved rearwardly, carrying the upper pillar extension 24 therewith which breaks the joints comprising the socket members 36 and extensions 35 therefor. The rear bow supports 16 which are held up solely by the top covering to which the bow 17 is attached, now swings downwardly by gravity, followed by the intermediate bow 18, carried thereby. As the links 27 move rearwardly and downwardly, the pillar extensions 24 swing about the pivots 16a which causes the members 30 to move rearwardly while at the same time swinging clockwise about the pivots 40. The levers, links and other parts continue moving rearwardly and simultaneously swinging about their pivots as above described until finally they assume the folded top lowered positions shown in Fig. 10. To raise the top, the motor 70 operates in the opposite direction and through rotating screws 54 pivots the operating levers 21 counterclockwise, the movements of the various top frame parts being reversed in direction from the movements they make in lowering the top. When the top is lowered, the springs 45 are tensioned which aids in steadying the movement of the top and the force stored in the springs aids the motor 70 when the top is again raised. In the event it is desired to raise or lower the top manually, the power means may be quickly and easily disconnected from the top by spreading apart the socket extension member 50 and separating the extensions from the screw travelers or nuts 53.

It will now be appreciated that I have provided new and improved individual mechanisms operated by a common or single motor for raising and for lowering a foldable vehicle top. Further, I have provided improved connections between the above mechanism and the top structure whereby they may be quickly and easily disengaged to permit manual raising and lower-

ing of the top if desired, or necessary. In addition, I have provided novel connecting means cantable between a fixed motor and the two separate top raising and lowering mechanisms and of a character which permits the motor to be quickly and easily disconnected from said mechanism.

While I have shown and described my invention in detail it is to be understood that the same is to be limited only by the appended claims for many changes may be made without departing from the spirit and scope of the invention.

What I claim is:

1. In a motor vehicle having a body, a foldable top for the body, a pair of pivoted operating levers operatively connected to said top and operable to raise and lower said top, a pair of rotatable threaded shafts, power operated means to rotate said shafts, internally threaded nuts respectively screwthreaded onto said shafts and movable longitudinally thereof by rotation of said shafts, said nuts having oppositely directed extended portions, and spaced tensioned members carried by said operating levers and having opposed sockets respectively receiving the extended portions of said nuts, whereby to provide a quickly releasable connection for facilitating manual raising and lowering of said top independently of said power-operated means.

2. In a motor vehicle having a body, a foldable top for the body, a pair of pivoted operating levers operatively connected to said foldable top and operable to raise and lower said top, a pair of rotatable threaded shafts, power operated

means to rotate said shafts, internally threaded nuts respectively screwthreaded onto said shafts and movable therealong by rotation of said shafts, and a pair of spaced extension members secured to each of said operating levers, said extension members being tensioned and having inwardly facing sockets, said nuts having oppositely disposed extended portions held in the sockets of the respective extension members by the inherent tension thereof, whereby to provide a quickly releasable connection for facilitating manual raising and lowering of said top independently of said power-operated means.

3. In a motor vehicle having a body, a foldable top for the body, a pair of pivoted operating levers operatively connected to said foldable top and operable to raise and lower said top, a pair of rotatable threaded shafts, power operated means to rotate said shafts, internally threaded nuts respectively screwthreaded onto said shafts and movable therealong by rotation of said shafts, a pair of spaced extension members secured to each of said operating levers, said extension members being tensioned and having inwardly facing sockets, said nuts having oppositely disposed extended portions held in the sockets of respective extension members by the inherent tension thereof, and yieldable tensioned members acting to urge the extension members of each pair toward each other, whereby to provide a quickly releasable connection for facilitating manual raising and lowering of said top independently of said power-operated means.

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