May 31, 1949. J. J. TOTH 2,471,462

FOLDABLE WHEELBARROW

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Fig. 1

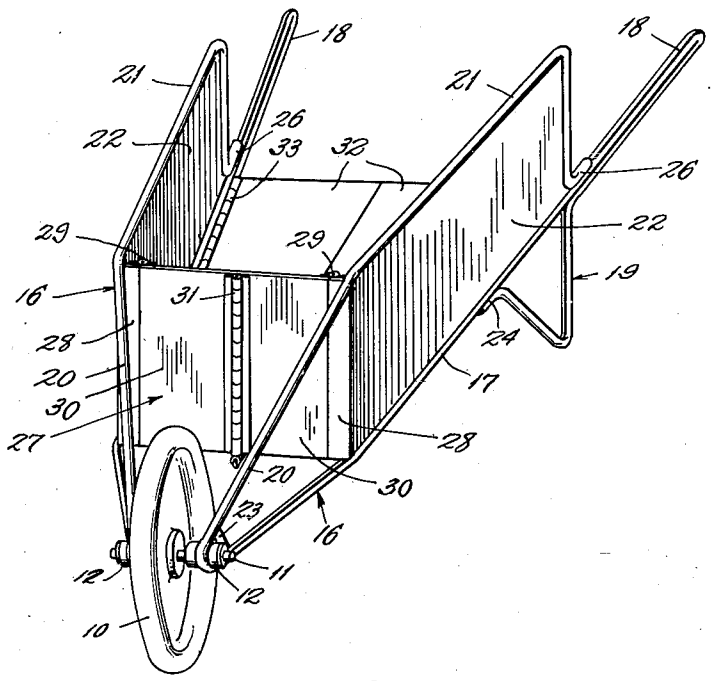


Fig. 2

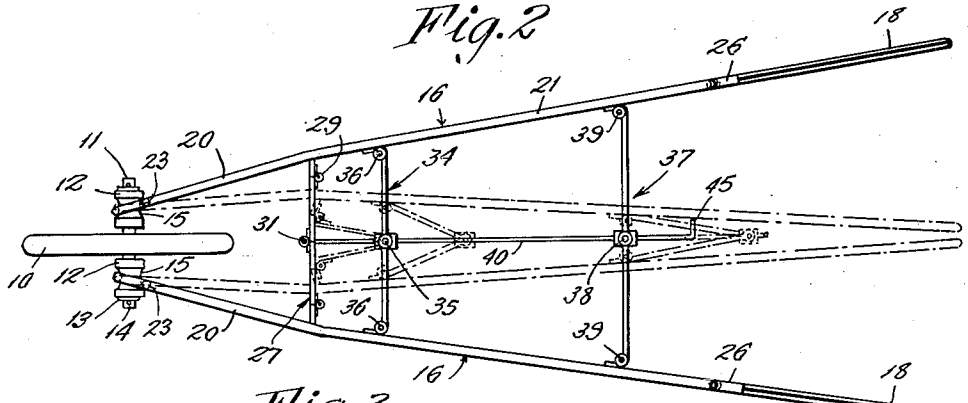
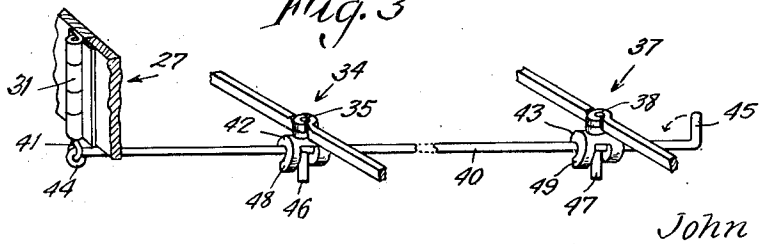


Fig. 3



INVENTOR

John J. Toth

BY Johnson, Kline and Kenneth

ATTORNEYS

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FOLDABLE WHEELBARROW

John J. Toth, Bridgeport, Conn.

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12 Claims. (Cl. 280—36)

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This invention relates to wheelbarrows, particularly to an improved form of wheelbarrow adapted to be folded together.

Wheelbarrows, because of their irregular shape, present a relatively difficult problem in the development of a construction therefor which can be conveniently folded together to a flat form adapted for shipping, packaging or storage. Numerous proposals have been made heretofore for construction of folding wheelbarrows. However, in most of these proposals, various parts had to be demounted, requiring considerable effort and manipulation in order to fold the structure together or set it up for use. In those constructions which did not require demounting of parts thereof, the operations required for collapsing the structure or unfolding it for use were relatively numerous, complicated, and inconvenient, and the mechanism was relatively expensive and difficult to manufacture.

It is therefore an object of this invention to provide a foldable wheelbarrow of sturdy, simple and economical construction having a minimum number of parts.

Another object is to provide a collapsible wheelbarrow which can be folded together or unfolded for use, with minimum effort or manipulation, and with utmost convenience.

In conjunction with the foregoing objects, it is also an object to provide a wheelbarrow having novel mechanism for effecting the folding and unfolding thereof, and for locking the structure in unfolded condition by manipulation of a single operator.

A further object of the invention is to provide a novel means for attaching the frame of the wheelbarrow to a wheel and axle.

Still another object is to provide a side frame for a wheelbarrow made essentially of a single strip of metal.

Briefly stated, the wheelbarrow in accordance with my invention comprises a pair of side frames secured to a wheel and axle on opposite sides of the wheel by an articulated attachment so that the side frames are adapted to fold together against each other by a pivotal movement about the attachment of the frames to the axle. The bottom panel of the wheelbarrow folds up against the side panel or panels mounted in the side frames, and the front panel which connects the frames collapses together in the nature of a toggle linkage. In addition to the collapsible front panel, the side frames are interconnected by

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framework in conjunction with the front panel maintains the frames equidistant from the plane of the wheel during the folding or unfolding operation. The collapsible framework likewise includes a single operator for moving, together with the front panel, to collapsed position, and for locking it in an expanded condition for use. The side frames are preferably constructed of a single metal strip, as for example, metal tubing or rod as hereinafter described.

In setting up the wheelbarrow for use it is merely necessary to move the side frames in a divergent direction, expanding the collapsible framework and front panel, whereupon the bottom panel is lowered upon the framework, and the latter, together with the front panel, is locked in expanded position by simple manipulation of a handle. In order to fold the structure together, the bottom panel is first folded against the side frames, the locking device is released, and by a simple manipulation of the same handle, the framework, together with the front panel is collapsed and the side frames can be moved together against each other so that the wheelbarrow is folded together in flat condition suitable for packaging, shipping or storage.

A preferred embodiment of my invention is illustrated in the accompanying drawings wherein:

Figure 1 is a perspective view of the wheelbarrow set up for use.

Fig. 2 is a plan view of the wheelbarrow with the bottom panel removed to show the underlying framework, and the folding position in dotted lines.

Fig. 3 is a fragmentary perspective of the toggle linkages.

As illustrated in the drawings, a preferred embodiment of the wheelbarrow in accordance with my invention comprises a wheel 10 mounted on axle 11 having a pair of bearing members 12 in which the axle rotates secured on the axle adjacent opposite sides of the wheel by conventional means, as for example by cotter pins 14 and washers 13. Each of the bearing members 12 includes an annular groove 15 in its exterior surface.

A pair of side frames 16 each include a longitudinal frame member 17 terminating at its rear end in a handle 18 and having a supporting leg 19 adjacent the base of the handle. At its forward end, the frame includes a diagonal brace 20 forming an acute angle with the frame member 17, said brace being extended rearwardly to form a rim 21 conforming to the shape of the upper

member 17 of the side frame. The side frames 16 are attached to bearing members 12 respectively by engagement of brace 20 and frame member 17 with the groove 15, the bearing member 12 lying within the acute angle formed by the longitudinal frame member 17 and the brace 20, and being loosely held therein by means of a strut 23 spanning the angle formed by the brace and frame member and likewise engaging the groove 15. Engagement of the grooves 15 by aforesaid portions of the side frames 16 is sufficiently loose to permit articulation of the side frames relative to the axle so that they can be pivotally moved in an axial plane of tthe axle to divergent position for use, or folded together against each other by moving them toward the plane of the wheel.

The side frames are advantageously constructed of a single strip of metal e. g. rod, tubing, or flat or angular strip. Preferably they are made of split metal tubing, the split side of the longitudinal member 17 and of rim 21 facing each other to form a groove for receiving the edges of side panel 22 mounted therein, as shown in Fig. 1. The longitudinal frame member 17 is formed by a part of the strip intermediate its ends, a portion thereof adjacent one end of the strip being reversed upon itself to form the handle 18 and the end of the strip being bent downward and then upward, with its end attached at 24 by welding or other conventional fastening to the underside of the longitudinal member 17, so as to form the leg 19. The opposite end of the metal strip is bent to form an acute angle with the longitudinal portion 17, thus forming diagonal brace 20 and then bent into the shape of the upper edge of the side panel 22 to form the rim 21, the end of the tubing being welded or otherwise fastened at 26 to the upper side of the longitudinal frame member 17 at the base of the handle 18. Preferably, the brace 20 and the forward end of frame member 17 are bent inward to provide additional space between the side frames at the front end of the side panels 22.

The forward edges of the side panels 22, mounted in side frame 16, are interconnected by a front panel 27 comprising a pair of narrow end sections 28 rigidly secured to side panels 22, and connected by hinges 29 to a pair of middle sections 30 which are joined together at a central hinge 31. The middle sections 30 form a toggle linkage joining the front ends of the side panels, movable to aligned position in which the panel is flat for use, and collapsible toward the rear of the wheelbarrow when the side frames 16 are moved together to folded position. The front panel 27 provides a rigid connection between the side frames, preventing angular movement of one frame relative to the other about the axis of the wheel.

In accordance with my invention, the bottom panel of the wheelbarrow is hinged to the side frames at the lower edge of a side panel 22 so as to fold upward against the side frame. Preferably the bottom panel is formed in two sections 32 adapted to lie next to each other when unfolded and respectively connected to side frames 16 at the lower edges of side panels 22 by hinges 33. When the bottom panel is unfolded, its forward edges preferably abut front panel 27, thus preventing collapse of the latter as in the folding operation.

A collapsible framework is provided in accordance with my invention for interconnecting the side frames 16 so as to maintain them equidistant from the plane of the wheel 10 during folding

or unfolding operation, and likewise providing a support for the lower panel sections 32.

As illustrated in the drawings, the collapsible frame work comprises a plurality of toggle linkages which expand to aligned condition when the front panel 27 is similarly expanded. For example, the frame work comprises a toggle linkage 34 having a central pivot 35, and having its ends attached respectively at pivots 36 to frame members 17, adjacent the front panel 27; and a second toggle linkage 37, having a central pivot 38, is attached by pivots 39 to the frame members 17 adjacent the rear end of the wheelbarrow. In order to maintain the central pivots 35 and 38 of the aforesaid toggle linkages, and the central hinge 31 of the front panel 27 in alignment, a rigid rod 40 extends through collars 41, 42 and 43 respectively secured to the lower end of hinge 31 of the front panel 27 and to the central pivots 35 and 38 of toggle linkages 34 and 37. Preferably the forward end of the rod is fastened to collar 41 on front panel 27 so as to be movable longitudinally of the wheelbarrow with said hinge when the front panel 27 is collapsed or expanded, and for this purpose, the end of the rod may be provided with a loop 44 engaging collar 41. Collars 42 and 43 are slidable on the rod 40 to permit toggle linkages 34 and 37 to collapse and expand together with the front panel 27.

A pair of lateral projections 46 and 47 are provided on the rod 40, so spaced as to engage the front side of collars 42 and 43 respectively when the toggle linkages 34 and 37 and the front panel 27 are fully expanded in aligned condition. Thus, when the bottom panel sections 32 are folded against side panels 22, rod 40 can be pulled backward by means of a handle 45 at its rear end to collapse the front panel 27, projections 46 and 47 initiating similar collapse of toggle linkages 34 and 37, whereupon the side frames 16 can be moved together to folded position.

Means provided in accordance with the invention for releasably locking the front panel and collapsible framework, interconnecting the side frames, in expanded position for use, is preferably operated by manipulation, e. g. rotation, of the rod 40. The framework can be locked in expanded condition for example by locking the central pivots 35 and 38 of toggle linkages 34 and 37 and the central hinge 31 of front panel 27 in the spaced position on the rod 40 which they occupy when said toggles and front panel are fully expanded. Thus, as illustrated in the drawings, the locking means comprises a prong 48 on collar 42 and a similar prong 49 on collar 43, each of said prongs extending downward around one side of rod 40 on the front side of the corresponding collar, and spaced from the collar so as to form recesses adapted to receive projections 46 and 47 respectively. Thus, by rotation of the rod 40 in one direction, projections 46 and 47 can be moved upward between the prongs and collars to hold the latter (and hence, central pivots 35 and 38 of toggle linkages 34 and 37) in fixed position on rod 40, the end of the rod being held in fixed relation to the hinge 31 at the center of front panel 27 by engagement of the loop 44 on the forward end of the rod with collar 41, the loop 44 sliding around the collar 41 upon rotation of the rod. When the projections 46 and 47 are thus engaged between collars 42 and 43 and prongs 48 and 49 the toggle linkages 34 and 37 are prevented from collapsing.

When it is desired to release the framework for

folding, the rod **40** is rotated in the opposite direction through a predetermined angle (for example, a quarter-turn) by means of handle **45**, so as to move projections **46** and **47** beyond the ends of prongs **48** and **49**. When the rod is thus rotated, central pivots **35** and **38** of the toggles **34** and **37** are released to slide rearwardly on rod **40**, and the front panel **27** and toggles **34** and **37** can be collapsed by pulling the rod **40** backward on the wheelbarrow.

It will be seen that the wheelbarrow in accordance with my invention provides an exceedingly sturdy, economical and simple structure, convenient and cheap to manufacture, and adapted to be folded together to a flat form suitable for shipping or storage, merely by raising the bottom panels against the sides, rotating a rod to unlock the framework, and collapsing the side frames together by pulling the rod. To set up the wheelbarrow for use, it is merely necessary to move the side frames apart until the front panel is expanded to aligned position, lower the bottom panels against the supporting framework, and lock the framework in expanded position by rotation of the aforesaid rod through a predetermined angle less than a full turn.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

I claim:

1. In a folding wheelbarrow, a wheel and axle; a pair of bearings mounted on the axle on opposite sides of the wheel, each of said bearings having a circumferential groove on its outer surface; a pair of side frames, each including at its front end a bearing-encircling portion loosely engaging the groove on the bearing to maintain engagement of the latter with the side frame but enabling pivotal movement of said frames about the bearings in convergent and divergent directions, in an axial plane of the wheel; and means interconnecting said frames for maintaining them equidistant from the plane of the wheel and for preventing angular displacement of one frame relative to the other about the axis of the wheel.

2. In a folding wheelbarrow, a wheel and axle; a pair of side frames attached to the axle on opposite sides of the wheel, said frames being pivotally movable about their point of attachment to the axle, in mutually convergent and divergent directions in an axial plane of the wheel; a front panel connecting said side frame, having a central hinge and including a pair of parallel hinges adjacent said frames, said panel collapsing as a toggle linkage upon convergent movement of the frames; and a collapsible framework interconnecting said frames for maintaining them equidistant from the plane of the wheel.

3. In a folding wheelbarrow, a wheel and axle; a pair of side frames attached to the axle on opposite sides of the wheel, said frames being pivotally movable about their point of attachment to the axle, in mutually convergent and divergent directions in an axial plane of the wheel; a front panel connecting said frames, having a central hinge and including a pair of parallel hinges adjacent said frames, said panel collapsing as a toggle linkage upon convergent movement of the frames; a plurality of toggle linkages interconnecting said frames at spaced intervals rearwardly of said front panel, said toggle linkages and said panel expanding to aligned condition when said frames are moved to divergent position for

ing; and means for maintaining the central hinge of said front panel and the midpoints of said toggle linkages in mutual alignment.

4. In a folding wheelbarrow, a wheel and axle; a pair of side frames attached to the axle on opposite sides of the wheel, said frames being pivotally movable about their point of attachment to the axle, in mutually convergent and divergent directions in an axial plane of the wheel; a front panel connecting said side frames, having a central hinge and including a pair of parallel hinges adjacent said frames, said panel collapsing as a toggle linkage upon convergent movement of the frames; a collapsible framework interconnecting said frames for maintaining them equidistant from the plane of the wheel; and means for releasably locking said front panel in expanded aligned condition so as to hold the frames in divergent position for use.

5. In a folding wheelbarrow, a wheel and axle; a pair of side frames attached to the axle on opposite sides of the wheel, said frames being pivotally movable about their point of attachment to the axle, in mutually convergent and divergent directions in an axial plane of the wheel; a front panel connecting said frames, having a central hinge and including a pair of parallel hinges adjacent said frames, said panel collapsing as a toggle linkage upon convergent movement of the frames; a plurality of toggle linkages interconnecting said frames at spaced intervals rearwardly of said front panel, said toggle linkages and said panel expanding to aligned condition when said frames are moved to divergent position for use, and collapsing simultaneously when said frames are moved to convergent position for folding; means for maintaining the central hinge of said front panel and the midpoints of said toggle linkages in mutual alignment; means for releasably locking said front panel and toggle linkages in expanded condition to hold said frames in divergent position for use; and means for moving said panel and said toggle linkages toward collapsed position upon release of said locking means.

6. In a folding wheelbarrow, a wheel and axle; a pair of side frames attached to the axle on opposite sides of the wheel, said frames being pivotally movable about their point of attachment to the axle, in mutually convergent and divergent directions in an axial plane of the wheel; a front panel connecting said frames, having a central hinge and including a pair of parallel hinges adjacent said frames, said panel collapsing as a toggle linkage upon convergent movement of the frames; a plurality of toggle linkages interconnecting said frames at spaced intervals rearwardly of said front panel, said toggle linkages and said panel expanding to aligned condition when said frames are moved to divergent position for use, and collapsing simultaneously when said frames are moved to convergent position for folding; a rod secured at one end to the midpoint of the base of said front panel, slidably attached to said toggles at the midpoints thereof; means on said rod engaging said panel and said toggles to move same toward collapsed position when the rod is pulled rearwardly on the wheelbarrow; and means on said rod for locking said panel and toggles in expanded condition upon rotation of the rod in one direction, and releasing the panel and toggles for folding upon rotation of the rod in the opposite direction.

posite sides of the wheel, said frames being pivotally movable about their point of attachment to the axle, in mutually convergent and divergent directions in an axial plane of the wheel; a front panel connecting said frames, having a central hinge and including a pair of parallel hinges adjacent said frames, said panel collapsing as a toggle linkage upon convergent movement of the frames; a plurality of toggle linkages interconnecting said frames at spaced intervals rearwardly of said front panel, said toggle linkages and said panel expanding to aligned condition when said frames are moved to divergent position for use, and collapsing simultaneously when said frames are moved to convergent position for folding; a rod secured at one end to the midpoint of the base of said front panel, and slidably attached to said toggles at the midpoints thereof, having a handle at its rear end; lateral projections on said rod engaging said toggles for moving together with said front panel toward folded position when the rod is pulled rearwardly on the wheelbarrow; and means on said toggles alternately interlocking with and releasing said projections when the front panel and toggles are in expanded condition upon rotation of the rod in opposite directions through a predetermined angle.

8. In a folding wheelbarrow, a wheel and axle; a pair of side frames attached to the axle on opposite sides of the wheel, said frames being pivotally movable about their point of attachment to the axle, in mutually convergent and divergent directions in an axial plane of the wheel; a front panel connecting said side frames, having a central hinge and including a pair of parallel hinges adjacent said frames, said panel collapsing as a toggle linkage upon convergent movement of the frames; a collapsible framework interconnecting said frames for maintaining them equi-distant from the plane of the wheel; and a bottom panel hinged to fold upwardly against a side frame prior to folding movement of said front panel and framework.

9. In a folding wheelbarrow, a wheel and axle; a pair of side frames attached to the axle on opposite sides of the wheel, said frames being pivotally movable about their point of attachment to the axle, in mutually convergent and divergent directions in an axial plane of the wheel; a front panel connecting said frames, having a central hinge and including a pair of parallel hinges adjacent said frames, said panel collapsing as a toggle linkage upon convergent movement of the frames; a plurality of toggle linkages interconnecting said frames at spaced intervals rearwardly of said front panel, said toggle linkages and said panel expanding to aligned condition when said frames are moved to divergent position for use, and collapsing simultaneously when said frames are moved to convergent position for folding; means for maintaining the central hinge of said front panel and the midpoints of said toggle linkages in mutual alignment; and a bottom panel comprising a pair of sections hinged to said side frames respectively so as to fold upward against the frames prior to collapsing movement of said front panel and toggles, said bottom panels being supported in unfolded position by said toggles, when the side frames are moved to divergent position for use.

10. A folding wheelbarrow comprising a wheel and axle; a pair of bearings secured on the axle on opposite sides of and adjacent the wheel; a pair of side frames each including a side panel,

a handle, a supporting leg and means securing the front of the frame to a bearing on said axle; said frames being pivotally movable about said bearings in convergent and divergent directions in an axial plane of the wheel; a front panel having a central hinge and hinged to each of said side panels so as to collapse as a toggle linkage upon convergent movement of the frames; a plurality of toggle linkages interconnecting said frames at spaced intervals rearwardly of said front panel, said linkages and said front panel simultaneously expanding to aligned position when said frames are moved to divergent position for use; a bottom panel comprising two sections, each hinged to the lower edge of a side panel so as to fold upward against said frames, prior to collapsing movement of said front panel and toggles, said bottom panel when unfolded being supported by said toggles when the frames are moved to divergent position for use; and means for moving said front panel and said toggles between expanded aligned position and collapsed position, said means including means for releasably locking said front panel and toggle linkages in expanded position for use.

11. A folding wheelbarrow comprising a wheel and axle; a pair of bearings secured on the axle on opposite sides of and adjacent the wheel; a pair of side frames each including a side panel, a handle, a supporting leg and means securing the front of the frame to a bearing on said axle, said frames being pivotally movable about said bearings in convergent and divergent directions in an axial plane of the wheel; a front panel having a central hinge and hinged to each of said side panels so as to collapse as a toggle linkage upon convergent movement of the frames; a plurality of toggle linkages interconnecting said frames at spaced intervals rerawardly of said front panel, said linkages and said front panel simultaneously expanding to aligned position when said frames are moved to divergent position for use; a bottom panel comprising two sections, each hinged to the lower edge of a side panel so as to fold upward against said frames, prior to collapsing movement of said front panel and toggles, said bottom panel when unfolded being supported by said toggles when the frames are moved to divergent position for use; a rod secured at one end to the midpoint of the base of said front panel, and slidably attached to said toggles at the midpoints thereof; means on said rod engaging said panel and said toggles to move the same toward collapsed position when the rod is pulled rearwardly on the wheelbarrow; and means on said rod for locking said panel and toggles in expanded condition upon rotation of the rod in one direction, and releasing the panel and toggles for folding upon rotation of the rod in the opposite direction.

12. A folding wheelbarrow comprising a wheel and axle; a pair of bearings mounted on the axle on opposite sides of the wheel, each of said bearings having a circumferential groove on its outer surface; a pair of side frames, each including a side panel and, at its front end, a bearing-encircling portion loosely engaging the groove on a bearing to maintain engagement of the latter with the side frame, but enabling pivotal movement of said frames about the bearings in convergent and divergent directions in an axial plane of the wheel; a front panel having a central hinge, and hinged to each of said side panels so as to collapse as a toggle linkage upon convergent movement of the frames; a plurality of toggle

linkages interconnecting said frames at spaced intervals rearwardly of said front panel, said linkages and said front panel simultaneously expanding to aligned position when said frames are moved to divergent position for use; a bottom panel comprising two sections, each hinged to the lower edge of a side panel so as to fold upward against said frames, prior to collapsing movement of said front panel and toggles, said bottom panel when unfolded being supported by said toggles when the side frames are moved to divergent position for use; a rod secured at one end to the midpoint of the base of said front panel and slidably attached to said toggles at the midpoints thereof, having a handle at its rear end; lateral projections on said rod engaging said toggles for moving them together with said front panel toward folded position when the rod is pulled rearwardly on the wheelbarrow; and means on said toggles alternately interlocking

with and releasing said projections upon rotation of the rod in opposite directions through a predetermined angle, when the front panel and toggles are in expanded condition.

JOHN J. TOTH.

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