

[54] **BOAT SUPPORT FOR TRAILERS**

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[51] Int. Cl. **B60p 3/10**

[58] Field of Search **280/414 R; 214/505,**
214/506, 84

[56]

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UNITED STATES PATENTS

2,830,718	4/1958	Havins	214/84
3,176,865	4/1965	Faul et al.	214/84
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3,512,667	5/1970	Calkins	214/505

FOREIGN PATENTS OR APPLICATIONS

655,970	5/1965	Belgium	280/414 R
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[57]

ABSTRACT

A boat support designed to accommodate changes in the load distribution on a boat trailer. Self-balancing hull support roller assemblies are combined on a supporting framework together with a bow securing assembly. Limited movement is provided on the framework between the bow securing assembly and the hull supporting assembly to permit self-balancing of the hull supporting assembly independently of the bow securing assembly. Such movement can be provided by a limited pivotal connection between the trailer framework and tongue of the trailer, by walking beam supports for multiple hull supporting assemblies or by an arrangement which allows limited elevational movement of the bow securing assembly relative to the trailer framework.

11 Claims, 11 Drawing Figures

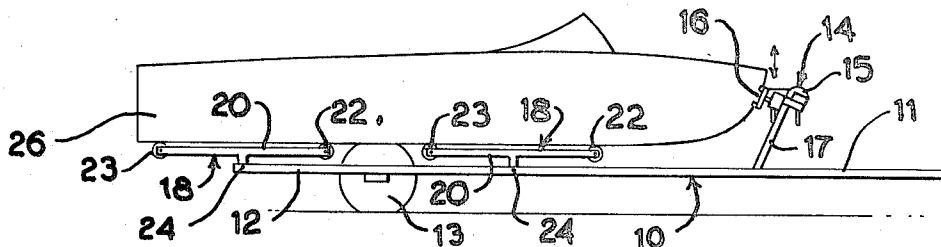


FIG 1

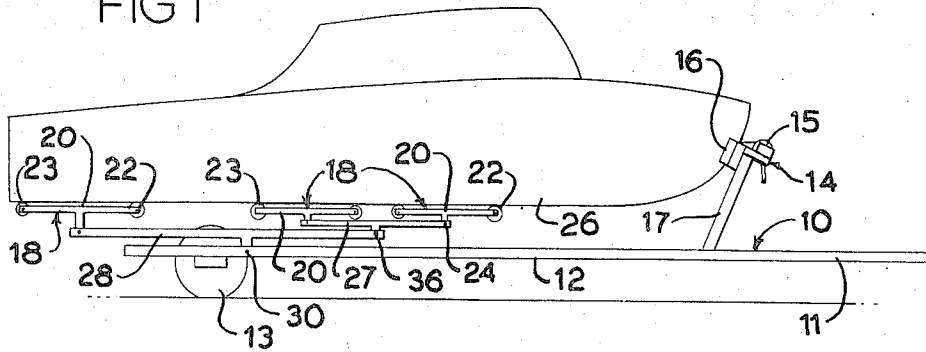


FIG 2

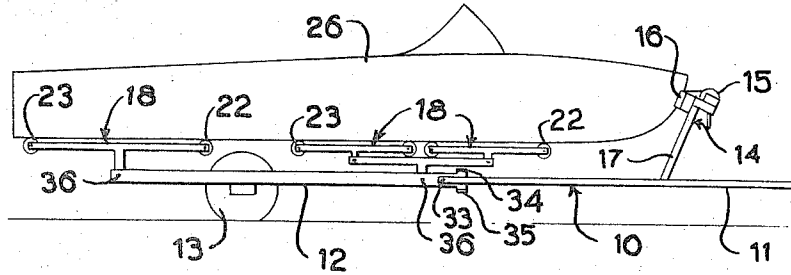
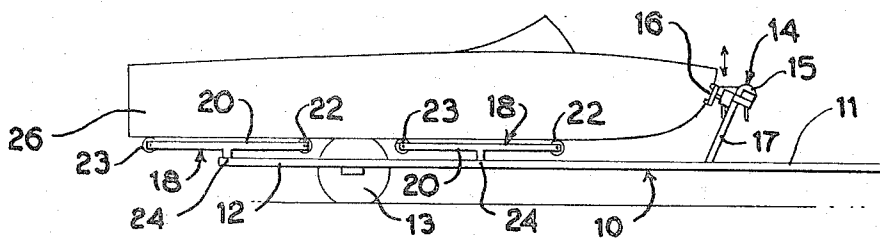
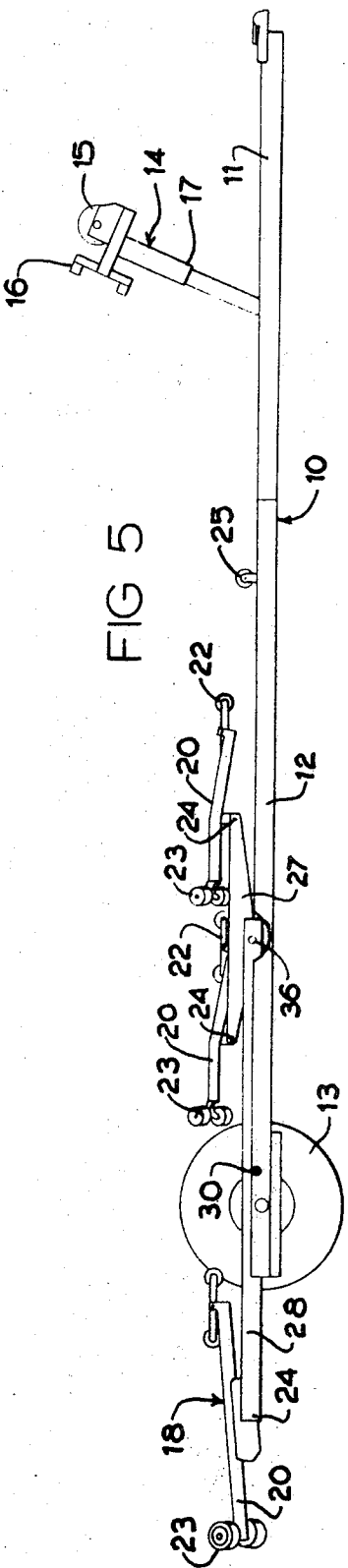
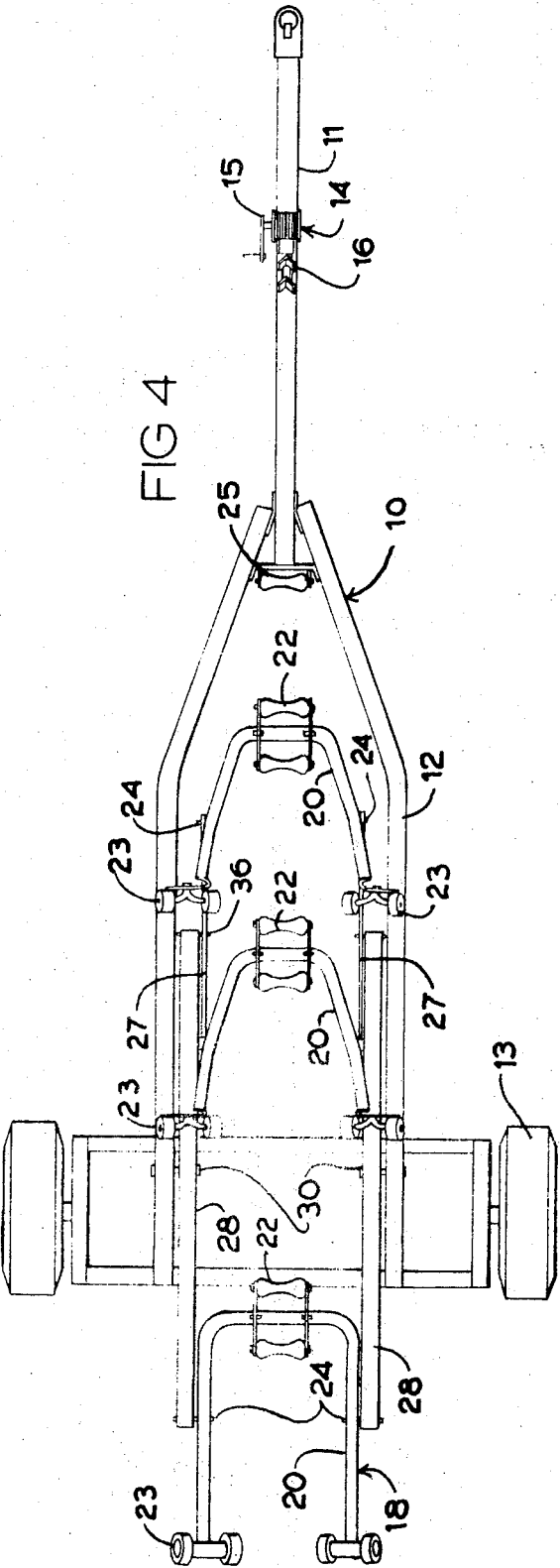


FIG 3





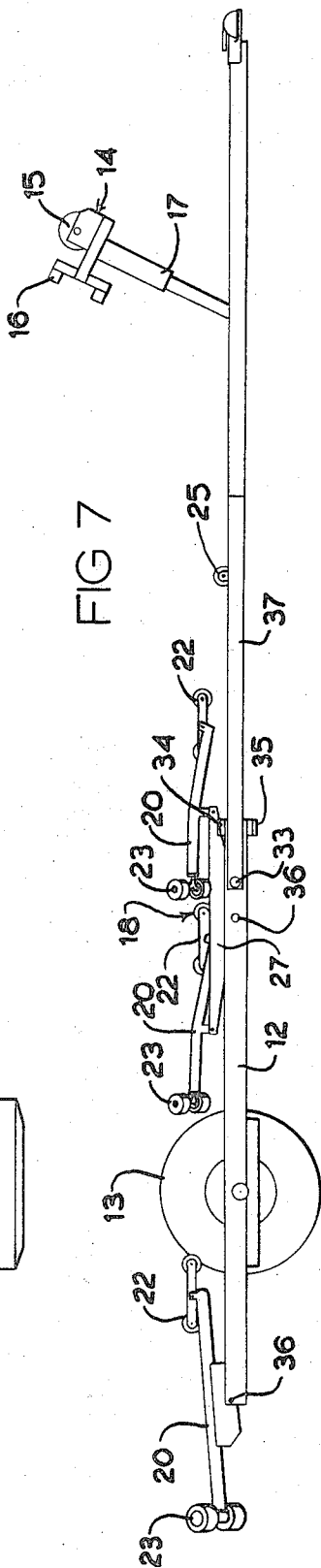
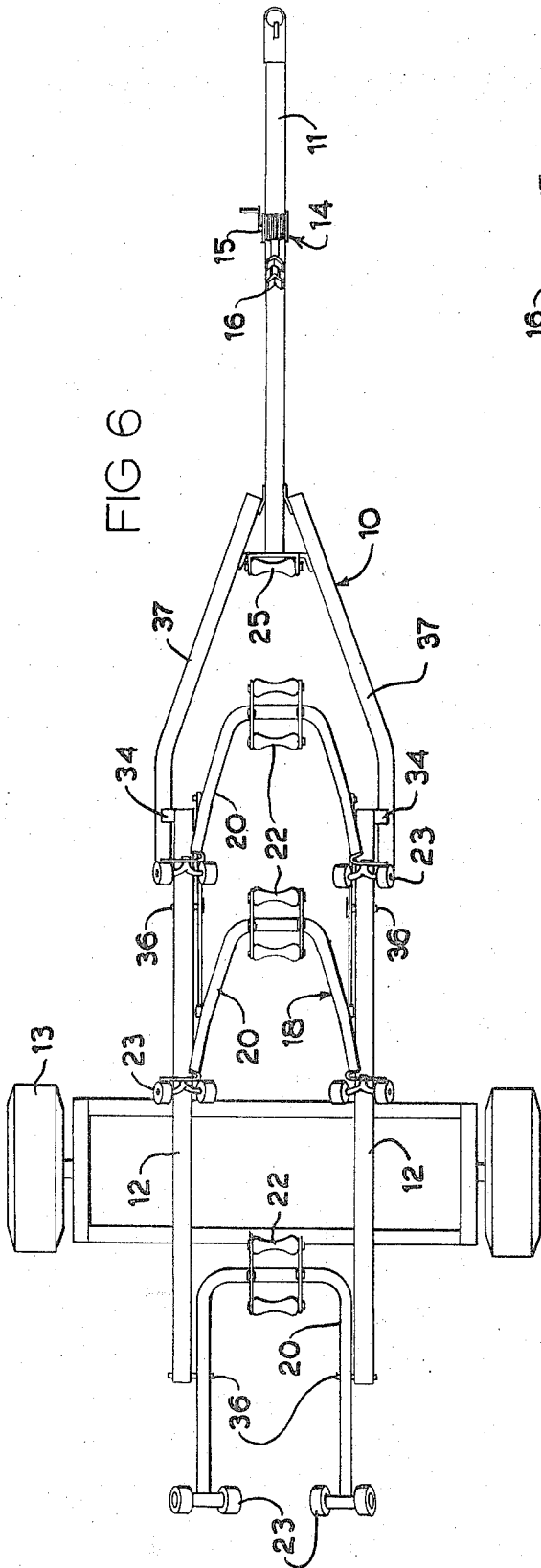


FIG 8

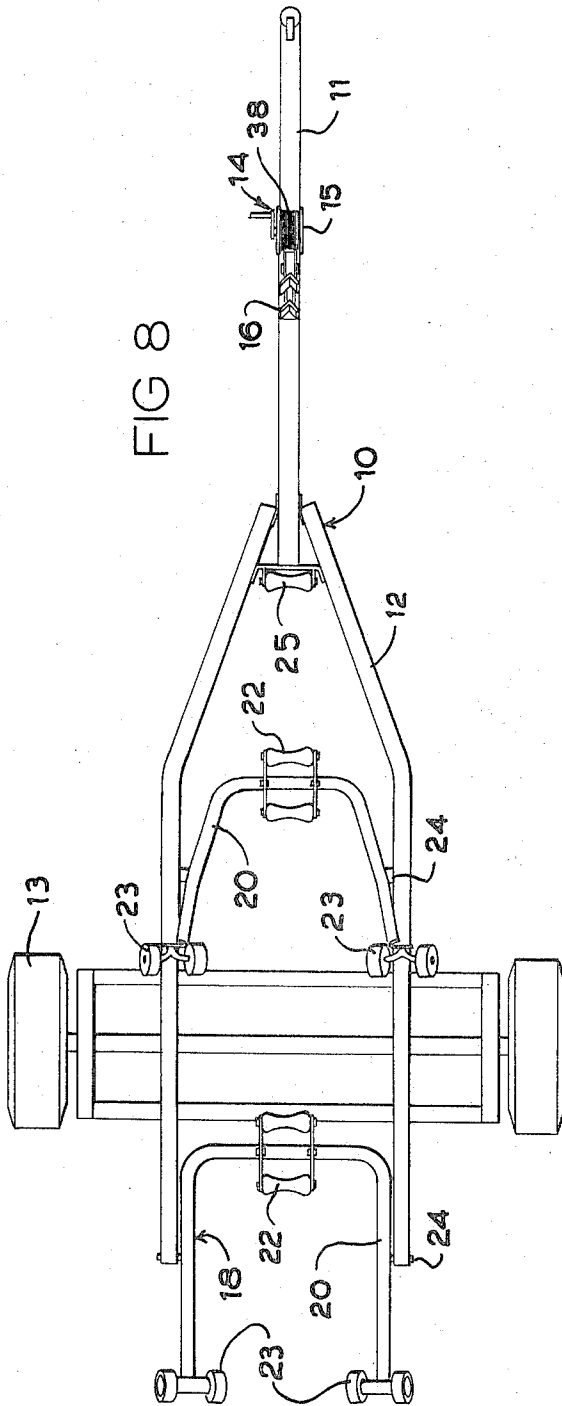
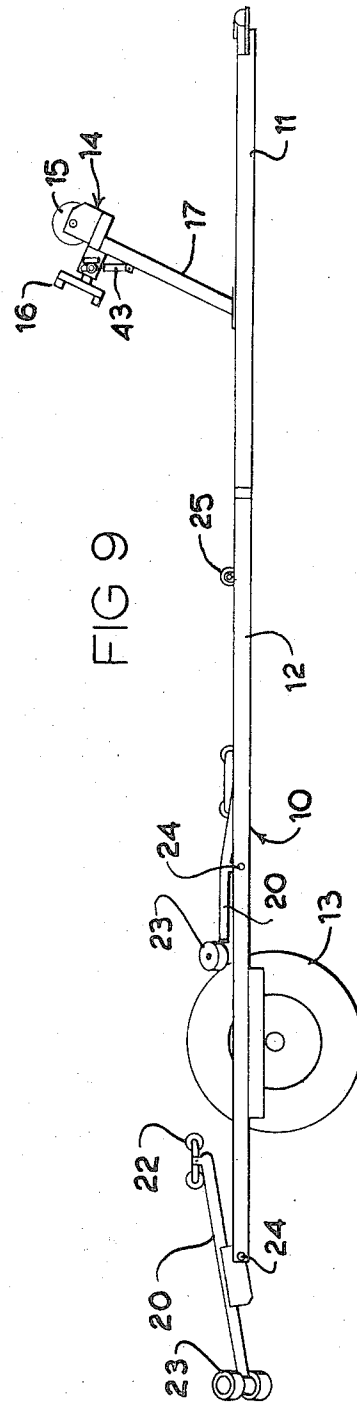


FIG 9



BOAT SUPPORT FOR TRAILERS

BACKGROUND OF THE INVENTION

This disclosure relates to an improvement in the type of boat trailer illustrated by the disclosure in U.S. Pat. No. 3,512,667, granted Apr. 21, 1969. The boat trailer includes self-centering or self-balancing cradle assemblies for hull engagement. Each cradle assembly is pivoted to the trailer framework about a transverse axis intermediate front and rear rollers that engage and carry the weight of a portion of the boat hull. In the patented disclosure, weight of the boat is balanced between the rollers on each cradle assembly, but two or more cradle assemblies are normally required to support a boat of any substantial size, and heretofore rigid frame connections have been utilized between these multiple cradle assemblies.

In the use of such a trailer, the bow of the boat is normally fixed to an upright mast at the tongue or front of the trailer, typically through a locked winch and cable or rope. The transom of the boat is normally tied down at the rear cradle assembly. The various hull supports in the form of rollers, pads, bunks, etc., are located along the framework to achieve desired weight distribution for the boat hull while stationary on the trailer in a loaded condition. They can be pre-adjusted for a particular boat. However, as the trailer is used for road travel, minor momentary adjustment of the loading arrangement is inevitable due to vertical movement of the wheels as caused by road or surface variations. Upward or downward movement of the wheels is transmitted to the framework, causing momentary deflection of the framework and resulting load variations on the various devices in contact with the boat hull. Assuming that the hull itself is rigid, deflection of the trailer framework causes some rollers to exert considerable increases in force on the boat trailer surfaces, while other rollers might momentarily be entirely free or disengaged from the boat surfaces. In practice, this has resulted in wear at the exterior boat surfaces, a condition particularly troublesome in the case of reinforced plastic boat hulls, where the outer plastic material or gel coat is often worn completely in the area of roller contact.

Another problem of load variation along a boat trailer arises from the nature and use of a boat trailer, particularly when carrying a pleasure boat. It frequently occurs that the boat user will utilize the boat itself to transport spare boat motors, ice chests, camping equipment and other various portable materials. The weight variation and distribution along the trailer can vary considerably from that for which the trailer is designed or pre-adjusted. This often creates serious imbalances in the loading of the boat trailer when at rest, and even further accentuates the problems of road shocks during travel while so loaded.

The solution to these problems, as disclosed in detail in the following description, is to provide essentially two point support of the boat in the loaded or travel condition on the boat trailer by a hull supporting assembly and a bow engaging assembly, and to permit limited elevational variation between these assemblies independently of one another. This requires a self-balancing hull support assembly capable of engaging the hull along its horizontal length. The hull support can be of the type shown in U.S. Pat. No. 3,512,667 or al-

ternate hull supports which are self-balancing about an intermediate fulcrum on the trailer framework so as to automatically distribute the load between longitudinally spaced rollers or other hull engaging members. With this improved arrangement, momentary road shocks and variations in static load are accommodated by the limited movement permitted between the two assemblies on the boat trailer.

SUMMARY OF THE INVENTION

The invention relates to a boat trailer having a wheel-supported framework, bow securing means mounted to the framework, hull support means mounted to the framework and movable connecting means on the framework between the hull support means and the bow securing means for permitting automatic self-balancing of the hull support means during road travel independently of the bow securing means.

It is a first object of this invention to provide an improved boat trailer configuration capable of absorbing and controlling the application of varying static boat loading or momentary vertical loading on the trailer framework due to road shocks or surface conditions on which the trailer is traveling.

Another object of this invention is to provide several specific devices for accommodating load variation in forms applicable to most existing types of boat trailers.

Another object of this invention is to provide such an improvement in a manner that does not necessarily add materially to the cost of the boat trailer and which can be utilized at an added cost readily justifiable by the resulting decrease in trailer damage or boat hull damage during use of the trailer.

These and further objects will be evident from the following disclosure, which sets out three specific forms of the basic invention. These specific forms are presented by way of illustration and other obvious adaptations of the concepts disclosed herein will be readily observable by those skilled in the art.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic side elevation view of a first form of the invention;

FIG. 2 is a schematic side elevation view of a second form of the invention;

FIG. 3 is a schematic side elevation view of a third form of the invention;

FIG. 4 is a plan view showing the first form of the invention;

FIG. 5 is a side elevation view of the trailer shown in FIG. 4;

FIG. 6 is a plan view of the second form of the invention;

FIG. 7 is a side elevation view of the trailer shown in FIG. 6;

FIG. 8 is a plan view of the third form of the invention;

FIG. 9 is a side elevation view of the trailer shown in FIG. 8;

FIG. 10 is a perspective view showing the bow securing assembly of FIGS. 8 and 9 at an enlarged scale; and

FIG. 11 is a top view of the bow securing assembly shown in FIG. 10, with the general outline of a boat bow illustrated in dashed lines.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

GENERAL DESCRIPTION

FIGS. 1-3 schematically illustrate three arrangements by which one can utilize the present improvement in the design of a boat trailer. The following general description applies to these three illustrative structures, which are shown in detail in the remaining drawings. The reference numerals in this general description are common to all schematic and detailed forms of the disclosure, except in those instances which are specifically denoted with respect to a specific embodiment.

The trailer comprises a main structural framework designated by the numeral 10. Framework 10 includes a forward longitudinal tongue 11 and rear side members 12 which extend longitudinally along the boat hull 26 at the respective sides thereof. Framework 10 is typically supported by a transverse wheel assembly 13 which includes one or more pairs of ground engaging wheels.

At the front of tongue 11 is a bow securing assembly 14. It includes a winch 15 having a cable releasably attached to the bow of the boat hull 26. The cable and winch 15, when secured, hold the bow of the boat in a fixed position against a bow bracket 16 located at the upper end of a mast 17.

The hull supporting assemblies 18 are in the form of multiple pairs of rollers, 22, 23, mounted at opposite longitudinal ends of individual support frames 20, each frame 20 being pivotally supported intermediate the rollers 22, 23 at pivot connections shown at 24. Because of this intermediate pivotal support, the load on the paired rollers 22, 23 is automatically balanced to attain a working static condition. The pivotal support of the rearmost frame 20 is further utilized to assist in loading and unloading of the boat hull 26 with respect to the trailer. The details of construction and use of self-centering or self-balancing roller supports of this general type are set out in U.S. Pat. No. 3,512,667, which is herein incorporated by reference.

To accommodate change in the loading applied to the trailer framework 10 during road travel and to eliminate the usual resulting excessive wear on the exterior surfaces of boat hull 26 caused by the rollers 22, 23 or other hull engaging devices, provision is made herein for automatic self-balancing of the hull engaging assembly 18 independently of the bow securing assembly 14.

As shown in FIG. 1, this is achieved by pyramiding the frames 20 on transversely pivoted longitudinal frames 27 and ultimately supporting them upon a main walking beam 28 at each side of the boat trailer. Each walking beam 28 is pivoted to the side members 12 of framework 10 at pivot connection 30. Thus, automatic load equalization or reapportionment is achieved between all of the paired rollers 22, 23 along the full length of the boat hull 26, and frame deflection or loading will be distributed through all of these rollers, and not concentrated at any particular roller, nor will any roller be momentarily freed from loading due to such deflection.

In FIG. 2, the hull supporting assembly is not mounted to the side members 12 at a single axis, but at two pivot connections 36 at opposite sides of the wheel assembly 13. The tongue 11 is not rigidly connected to the side members 12, but is pivoted to them about a

transverse pivot connection 33, which permits elevational movement between the bow securing assembly 14 and the side members 12 that carry the hull supporting assembly 18. The extent of this pivotal movement of tongue 11 is limited by upper and lower stops 34, 35 on the side members 12. This arrangement permits the hull supporting assembly to reapportion the load during road travel by pivotal movement about the fulcrum provided by the wheel assembly 13 and accommodates resulting movement between the hull supporting assembly and the bow securing assembly without concentrating the load at either the underside of the boat hull 26 or at its bow.

The solution shown in FIG. 3 can be utilized on any boat trailer, although it also is preferably used in conjunction with self-balancing hull supporting assemblies 18. In this configuration, the tongue 11 and side members 12 form a rigid framework 10, and provision is made at the upper end of mast 17 for vertical movement of the bow bracket 16 with respect to mast 17 and tongue 11. Again, this allows for load reapportionment during road travel by the hull supports independently of the bow of the boat hull.

In all three embodiments, there is a basic common support concept insuring reapportionment or balancing of force application along all of the rollers 22, 23 at any given time during road travel. This is accomplished by mounting the balanced frames 20 or other suitable hull engaging devices about a single transverse fulcrum with some of the rollers forward of the fulcrum and others rearward thereof to enable the rollers to balance one another automatically and thereby reapportion the weight of the boat between them. Secondly, the member pivoted or connected to the fulcrum is free of rigid attachment to the bow bracket 16, which is fixed with respect to the front end of the boat hull. The bow bracket 16 thus serves to fix the longitudinal position of the boat hull on the trailer, but does not interfere with the balanced support of the boat hull itself.

In FIG. 1, the common fulcrum is at pivot connections 30, and all of the rollers 22, 23 are mounted on pivotal frames so as to balance one another at both sides of the main fulcrum. The pivot connections 30 and walking beams 28 supported thereby eliminate rigid connection between the bow brackets 16 and the rollers 22, 23. Thus, rollers 22, 23 can readjust their weight distribution without being hampered by the reaction of any rigid frame connection to the front of the boat hull.

In FIG. 2, the common fulcrum is provided across the wheel assembly 13. Again, rollers 22, 23 are balanced on the framework at opposite sides of the fulcrum and are supported by pivotal frame members in such fashion as to automatically balance each pair of rollers 22, 23, as well as to balance one another at opposite longitudinal sides of the fulcrum provided by wheel assembly 13. In this instance, the bow bracket 16 is freed by the pivot connection 33 from rigid attachment to the longitudinal support for the rollers.

In FIG. 3, the rollers 22, 23 are carried on self-balancing individual frames, which in turn are pivotally balanced at opposite longitudinal sides of wheel assembly 13, which acts as the main fulcrum for the framework 10. In FIG. 3, the hull support independent suspension for the main roller support (framework 10) is provided by the free vertical movement afforded to bow bracket 16 relative to mast 17.

FIRST EMBODIMENT OF THE INVENTION

FIGS. 4 and 5 show in detail the structure of the first embodiment of the invention shown schematically in FIG. 1. The transverse wheel assembly 13 supports the longitudinal side members 12 of the main framework 10, which converge forwardly and are rigidly secured to a longitudinal center tongue 11. The bow securing assembly is rigidly located near the forward end of tongue 11, which is provided with a conventional hitch for attachment to a towing vehicle. A winch 15 has a cable adapted to be secured to an eye (not shown) at the front of a boat. The eye is drawn through the center of a V-shaped upright bow bracket 16 rigidly mounted to mast 17. The bracket 16 cradles the pointed bow of the boat and prevents the boat from moving longitudinally, while maintaining it in a centered condition at the front end of the boat.

In the drawings there is shown a center protective roller 25 located at the convergence of the side members 12 immediately rearward of the tongue 11. This roller 25 might be casually mistaken for a conventional keel roller, but it does not serve the normal function of a keel roller. A conventional "keel roller" along a boat trailer is used as a support for a loaded boat. The purpose of roller 25 is to prevent the forward end of the boat from being damaged by contact with the frame members during loading of the boat onto the trailer. It acts as a roller guide to assist in lifting the front end of the boat over the tongue 11. When the boat hull is loaded onto the trailer, the hull is elevationally above roller 25 and not further supported by roller 25 in any way. The use of keel rollers or other fixed supports along the trailer frame is in contradiction to the basic purpose of this disclosure, namely the complete balancing of all vertical load support members about a common fulcrum on the framework 10.

The illustrated trailer in FIGS. 4 and 5 is provided with three cradle frames 20, each having balanced forward rollers 22 at the center of the frame 20 and side rollers 23 at the open rear ends of each frame 20. The side rollers 23 are mounted to the frames 20 for pivotal movement about the longitudinal center axis of the open frame legs to permit the rollers to conform to the side inclined configuration of a boat hull. Each cradle frame 20 has its rollers 22, 23 movably balanced about a free transverse pivot axis by means of a cradle frame pivot connection 24. In addition, where two or more cradle frames 20 are used in conjunction with one another at one side of the main framework fulcrum, it is necessary to provide intermediate longitudinal frames 27 which interconnect the pivot connections 24 and which in turn are pivoted about common transverse axes by means of an intermediate pivot connection 36.

In this embodiment, which utilizes a substantially rigid framework 10, the rollers 22, 23 are ultimately balanced about a transverse fulcrum provided across walking beams 28 which support the entire roller assembly. The longitudinal walking beams 28 support the rear cradle frame by its pivot connection 24. They support the two front cradle frames 20 by the pivot connections 36 of the interposed frames 27. Walking beams 28 in turn are pivotally mounted to framework 10 by coaxial transverse pivot connections 30 between the walking beams 28 and the respective side members 12.

In this form of the invention, all of the rollers 22, 23 are balanced about the fulcrum of the walking beams 28, so that any load forces transmitted from the framework 10 to walking beam 28 will be automatically balanced between the freely pivoted rollers 22, 23 and such loads will not be concentrated at any particular roller area. The expected deflection of framework 10 will not cause undue stress on the boat hull due to the rigid connection provided at bow bracket 16, since the framework is isolated from rigid connection to the hull supporting assembly 18 by the common fulcrum provided at the pivot connection 30.

SECOND EMBODIMENT OF THE INVENTION

The second embodiment of this invention is shown in detail in FIGS. 6 and 7 and is schematically illustrated in FIG. 2. In this form, the framework 10 includes side members 12 that extend longitudinally over the wheel assembly 13. Tongue 11 further includes longitudinal extensions 37 which overlap the forward ends of side members 12 and which are pivotally connected thereto at 33. The forward ends of side members 12 have protruding upper and lower stops 34, 35 which define the respective limits of pivotal movement of the tongue 11 relative to side members 12.

The bow securing assembly 14 is identical to that shown in FIGS. 4 and 5. The rollers 22, 23 are also similarly mounted to those in FIGS. 4 and 5, but the rear cradle frame 20 and the intermediate frame 27 are pivotally connected at 36 to the side members 12, rather than to longitudinal walking beams. In this instance, the side members 12 serve a function similar to that of the walking beam illustrated in FIGS. 4 and 5. Vertical deflection along the side members 12 due to road shocks transmitted through wheel assembly 13 or variations in the trailer load will be automatically balanced and compensated among the freely pivoted rollers 22, 23 at each longitudinal side of the fulcrum provided in the framework by the wheel assembly 13. This ability to redistribute load along the framework is possible due to the freedom of movement afforded between tongue 11 and side members 12 through the pivot connection 33.

With respect to FIGS. 6 and 7, this pivoted tongue arrangement is not to be confused with prior pivoted tongue devices which were designed to facilitate loading or unloading of boats. As an example of such prior devices, attention is called to U.S. Pat. No. 3,057,493, granted Oct. 9, 1962. The purpose of these prior pivot tongue connections was to permit the rear end of the rigid frame to be lowered for launching or retrieval of a boat in the water. During road transport usage, the tongue and frame are rigidly interlocked with no provision for relative free movement between the bow support and the rollers or other members engaging the underside of the boat. The pivot connection that exists between the tongue and longitudinal side members in FIGS. 6 and 7 does not provide sufficient freedom for pivoting the rear of the frame to be substantially useful in launching or retrieving the boat. As noted above, the lowering of the frame is unnecessary when the illustrated type of roller assembly is used, since the rear-most rollers 23 on the trailer are free to be lowered elevationally about the pivot connection 24 of the cradle frame 20 supporting them.

THIRD EMBODIMENT OF THE INVENTION

The third embodiment of the invention is shown in

FIGS. 8-11. The main framework 10 of the trailer is substantially that previously discussed with respect to FIGS. 4 and 5. The illustration shows only a single cradle frame 20 forward and rearward of the wheel assembly 13, with their pivot connections 24 being directly 5 connected to the side members 12. It is to be understood that in all of the embodiments, greater numbers of cradle frames 20 can be pyramided at either side of the main fulcrum of the framework 10, which in FIGS. 8 and 9 is provided between the connection of the 10 wheel assembly 13 and the side members 12.

Details of the third embodiment are best seen in FIGS. 10 and 11. In these Figures, the winch cable 38 is shown provided with an outer hook 39 for attachment to the bow of a boat through the center of the 15 bow bracket 16. This operative position of the cable 38 and hook 39 is shown in dashed lines in FIG. 11. When hook 39 is attached to the bow of a boat and the bow is pulled forwardly into engagement with bracket 16 with tension on cable 38, the boat is rigidly fixed relative to the bracket 16. However, in this arrangement, the bracket 16 is vertically movable along upright slots 20 40 formed through rearwardly facing ears 41 at the upper end of mast 17. A transverse pivot shaft 42 on the bow bracket 16 is received through slots 40. Shaft 42 permits pivotal motion of the bow bracket 16 to conform to the bow configuration and guides the bracket 16 vertically along the length of slot 40. 25

While the brackets 16 can be freely supported by the pivot shaft 42 alone, it is desirable that movement of the bow bracket 16 be dampened. This is preferably accomplished by interconnection of a conventional hydraulic shock absorber assembly 43 between the bow bracket 16 and the mast 17. The apparatus is preferably adjusted so as to normally locate the pivot shaft 42 35 at the elevational center of slot 40, whereby the bow bracket 16 is then free to move slightly upwardly or downwardly in response to subsequent load variation along the trailer framework 10. As discussed above, the trailer rollers 22, 23 are balanced at the longitudinal sides of the fulcrum provided by the wheel assembly 13, and are free to compensate among themselves to accommodate reapportion the changing load of the boat hull applied to rollers 22, 23 to road forces transmitted through the side members 12 without hindrance of a rigid framework connection to the bow of the boat. The slots 40 provide a "lost motion connection" freeing the bow of the rigid boat hull from the deflection of the longitudinal trailer framework members. 40

CONCLUSION

The three illustrative embodiments of this invention can be combined with one another if this is desired to further insure adequate freedom along framework 10 to accommodate road shocks. The amount of free movement required for such compensation purposes is dictated somewhat by the allowable deflection along the trailer frame members. It is to be understood that other types of balanced roller or hull engaging devices may be substituted in place of the U-shaped cradles illustrated in these drawings and that many minor modifications might be made with respect to the basic arrangement of components described herein. Because of the many possible variations, only the following claims are intended to limit and define the scope of the invention set out in this disclosure. 45

Having thus described my invention, I claim:

1. In a boat trailer:

a wheel-supported longitudinal framework adapted to be pulled by a towing vehicle for road travel while carrying a boat in a loaded position on the trailer;

bow securing means mounted at the forward end of the framework for attachment to the bow of a boat in a loaded position on the trailer during road travel to prevent longitudinal motion of the loaded boat relative to the trailer;

self-balancing hull support means operably mounted at each side of said framework about a common fulcrum, said hull support means being free of rigid attachment to said bow securing means;

said self-balancing hull support means being composed of spaced elements respectively engaged with the underside of a boat in a loaded position on the trailer during road travel and serving as the only elevational support for the boat, said elements being paired on rigid frames pivotally mounted intermediate each pair of elements so as to permit momentary reapportionment of load during road travel between the paired elements independently of said bow securing means.

2. A boat trailer as set out in claim 1 wherein said elements are longitudinally paired and mounted on longitudinal frames pivoted about transverse pivot axes located intermediate each pair of elements for balancing of the load distribution between the paired elements about the respective axis of the frame on which they are mounted.

3. A boat trailer as set out in claim 1 wherein said elements are all mounted to longitudinal walking beams extending longitudinally along the framework and pivotally connected thereto about an axis intermediate their ends constituting said common fulcrum.

4. A boat trailer as set out in claim 1 further comprising:

a lost motion connection between the bow securing means and said framework for permitting free vertical movement of the bow support means relative to the framework and relative to said hull support means.

5. A boat trailer as set out in claim 1 wherein the movable support means comprises a vertically slotted bracket on an upright mast fixed to the framework;

an upright bracket adapted to be secured to the bow of a boat when loaded on the trailer;

and a transverse pivotal shaft mounting the bow bracket to the slotted bracket on the mast for limited vertical movement of the bow bracket along said slot.

6. The apparatus as set out in claim 5 further comprising:

shock absorbing means operatively connected between the bow bracket and mast for dampening vertical movement of the bow bracket relative to the mast.

7. A boat trailer as set out in claim 1 wherein the wheel-supported framework comprises a substantially rigid main frame carrying said hull support means and elevationally supported by a transverse wheel assembly;

and a longitudinal tongue extending forward from the main frame, said tongue being pivotally connected to the main frame about a transverse axis located forwardly of the wheel assembly.

8. A boat trailer as set out in claim 1 wherein the wheel-supported framework comprises a substantially rigid main frame carrying said hull support means and elevationally supported by a transverse wheel assembly;

a longitudinal tongue extending forward from the main frame, said tongue being pivotally connected to the frame about a transverse axis located forwardly of the wheel assembly;

and stop means on said frame and tongue for limiting the angular extent of pivotal movement between the tongue and main frame about said axis.

9. In a boat trailer:

a wheel-supported longitudinal framework adapted to be pulled by a towing vehicle for road travel while carrying a boat in a loaded position on the trailer;

hull support means mounted at each side of said framework for engagement with the underside of a boat in a loaded position on the trailer during road travel;

an upright mast on the framework forward of said

hull support means;

and bow securing means freely vertically movably mounted to said mast for attachment to the bow of a boat in a loaded position on the trailer during road travel to prevent longitudinal motion of the loaded boat relative to the trailer while permitting free vertical movement of said bow securing means relative to the mast.

10. A boat trailer as set out in claim 9 further comprising:

a lost motion connection operatively interposed between said bow securing means and said mast permitting said free vertical movement of said bow securing means relative to the mast.

11. A boat trailer as set out in claim 9 further comprising:

shock absorbing means operatively connected between the bow securing means and said mast for dampening vertical movement of the bow securing means relative to said mast.

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