

Nov. 5, 1940.

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2,220,608

COLLAPSIBLE BOAT

Filed April 9, 1938

2 Sheets-Sheet 1

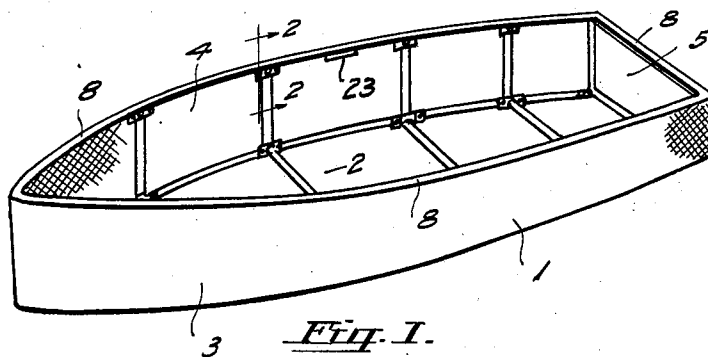


Fig. 1.

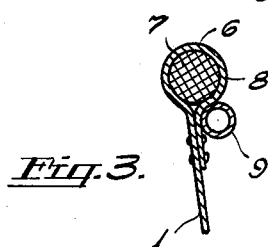


Fig. 3.

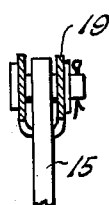


Fig. 2.

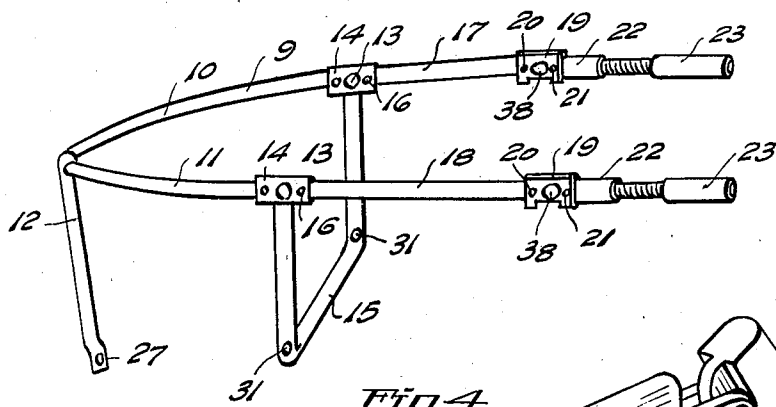


Fig. 4.

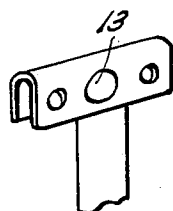


Fig. 8.

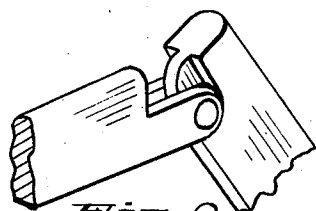


Fig. 9.

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2 Sheets-Sheet 2

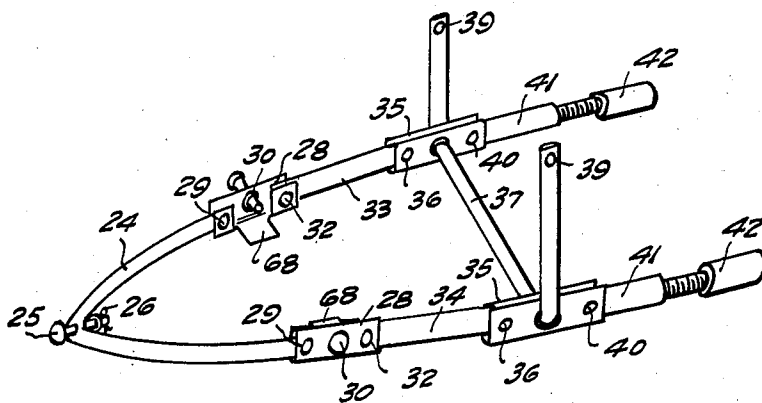


Fig. 5.

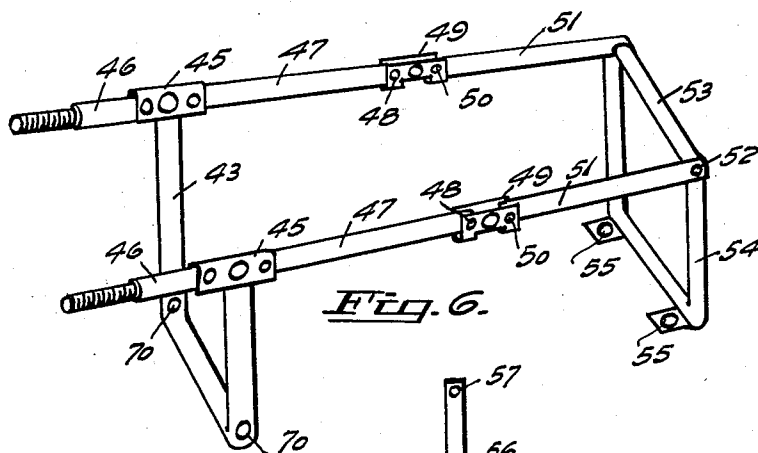


Fig. 6.

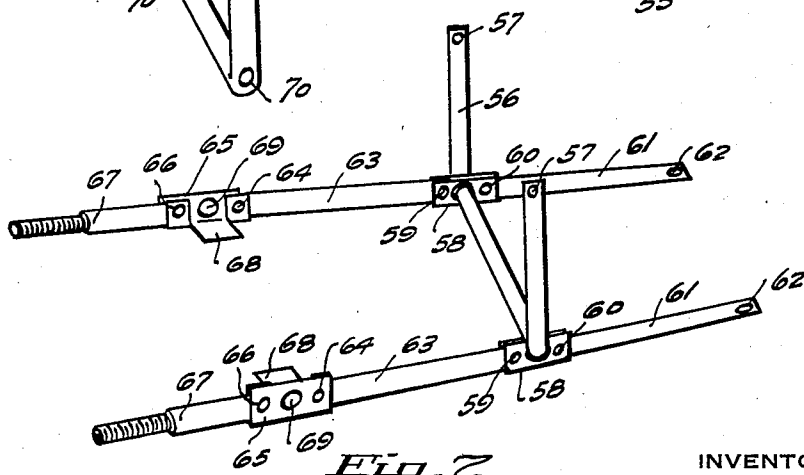


Fig. 7.

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2,220,608

COLLAPSIBLE BOAT

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Application April 9, 1938, Serial No. 201,127

4 Claims. (Cl. 9—2)

This invention relates to a collapsible boat, wherein a structural frame has been designed which will truly collapse into a minimum space for carrying, and over which a flexible shell is mounted and then stretched by the frame itself, to form a tight and rigid boat. The principal object of the invention is to provide a collapsible boat which may be packed into a very small space, and which is entirely portable and can be handled by one person.

The envelope forming the hull of the boat is completely formed into one piece which is flexible, and may be removed from the frame and folded into a convenient package. The framework likewise collapses into small sections which may be folded to small dimensions and packed with the flexible envelope.

A small boat of this type is very desirable since the wide use of the automobile, in that it may be packed into the car, and taken on trips to lakes or to the sea shore. Its weight is so reduced as to permit the handling by one person, both as regards carrying and assembling. The boat is particularly useful for summertime pleasure trips, or for fishing or hunting, replacing the canoe or rowboat, which is usually of such size and length as to make it cumbersome in transporting.

Another feature of the invention is its all-metal frame construction, which permits the use of light material, such as Duralumin.

Many attempts have been made to design such a boat, but few have conceived the advantages of a light metal framework, with the joining possibilities afforded by the metal, and its consequent rigidity. A number of mechanical shapes of suitable design may be used for the framework, such as tubing, angles, T-bars, or channels, and any one of these may be adapted with equal advantage. Most of the collapsible boats are of wooden construction, and are therefore subject to depreciation in the weather, as well as requiring considerable attention as regards painting. These wooden boats are all subject to the further depreciation, in that each time they are taken down, the wooden parts become worn, and joints soon depreciate to a rickety condition. The applicant's boat is free from all of these disadvantages, and is so designed as to at all times furnish a perfectly rigid boat, as the frame is never subject to change, either by weather conditions or wear due to the continual collapsing and erecting. Furthermore, in the old type of wooden boat with a flexible hull made from canvas or other textile, there is seldom any provision made to tighten up against the canvas, which is constantly stretch-

ing or shrinking. Unless this adjustable feature is provided, the canvas stretches considerably upon becoming wet, and sags on the frame while the boat is in use. The applicant's boat provides a full adjustment for tightening the canvas at all times, no matter how much stretching occurs due to the wetting of the textile hull.

To accomplish this expansion, the applicant has divided his framework preferably into four units which may be quickly erected through its hinged action and the supplemental locking points which retain the framework in a fixed position. The framework is made with as many of its joints permanent folding joints as possible, with a minimum number of joints to be made upon erection. After the units are set up, the applicant preferably provides screw-threaded members operating on the principle of the turn-buckle, with one right hand thread, and one left hand thread, thereby providing the easy insertion of the frame into the envelope and the expansion of the frame therein to provide a perfectly tight hull.

Applicant has provided a beading around the top of his hull so as to form an edge, which, when the frame is expanded in the hull, provides a means to prevent any tendency of the hull to slip from the frame. This arrangement, which would consist normally of a rope bound in the top edge of the hull, forms a very strong top on the hull, and reduces the periphery of the hull to less than the periphery of the frame. Obviously, when the framework is expanded into the hull, the hull envelope cannot be removed from the frame until the frame is contracted. This not only provides a very strong and safe structure, but also prevents any possibility of the hull being stretched by the expansion of the frame to the point of rupture.

The preferred embodiment of the invention as disclosed in the drawings forming part of this specification is confined to a flat bottomed boat of the rowboat type. However, it is to be understood that any of the other forms of hull may be simulated, such as a canoe or motor boat, and the bottom may be either flat or V-shaped. The same principle may be applied to the shapes generally used for sailing boats. It is to be understood that the form illustrated and described is merely illustrative of the invention, and that any of the hull shapes to which the expanding frame may be adapted, are to be included as a part of this invention.

To more clearly describe the invention, ref-

erence is made to the accompanying drawings, in which:

Figure 1 is a perspective view of the boat completely assembled.

5 Figure 2 is a section taken on the line 2—2 in Figure 1.

Figure 3 is an enlarged detail, showing the arrangement of the beaded edge of the flexible hull in its position against the framework.

10 Figure 4 is a perspective view showing the members of the upper framework.

Figure 5 is a perspective view showing the members of the lower framework.

15 Figure 6 is a perspective view showing the framework of the upper part of the stern of the boat.

Figure 7 is a perspective view showing the framework of the lower part of the stern of the boat.

20 Figure 8 is a detailed view showing the method of attaching the lateral members into the gunwales of the boat.

Figure 9 is a perspective view showing a modification of the hinged joints used in place of the preferred joints shown in the structure.

25 In the drawings, 1 is a flexible envelope hull which may be made from canvas, rubber impregnated fabric, or any other material which will serve the purpose. This flexible envelope is preferably sewed together to the exact shape of the boat when finished. The envelope will consist essentially of a bottom 2, sides 3 and 4, and a stern piece 5. Any convenient or standard method of lapping the seams or joining the fabric together will be suitable, so long as the envelope is one piece when finished, and is suitable to fold. At the upper edge of the envelope 1, is an edge 6 which is turned over a rope 7, and sewed.

30 This rope 7 forms a substantial bead 8 which trims the entire top edge of the envelope. In order to expand the envelope and properly support it so as to make it a rigid boat, a framework is constructed from tubing or any structural shape, and may be from any material, preferably Duralumin, which has the tensile strength of iron, but is much lighter in weight. This framework consists essentially of a top bow piece 9, formed V-shaped with arms 10 and 11. At the center of the bow piece 9 is attached member 12, which forms the prow of the boat. This piece may be attached by any hinged means. In describing the joints, the same numbers are used for both sides of the boat wherein the parts are duplicates. The ends of the arms 10 and 11 are joined by a pivot pin 13 into a U-shaped socket 14 which is preferably turned downward, as shown in Figure 8. The part 14 has an additional hole at its center for receiving a lateral U-shaped member 15, to which it is rigidly attached. The part 14 also has an additional hinged pin 16 which receives extensions 17 and 18. These extensions terminate in a U-shaped piece 19 which is more clearly shown in Figure 2. This U-shaped piece 19 has two pivots, 20 and 21. The pivot 20 provides a hinge point for the extensions 17 and 18. The part 19 has pivots 21 for receiving the end of a threaded stud, 22, which has turnbuckle joints 23 threaded thereto. To form the lower part of the prow structure, reference is made to Figure 5, in which a V-shape member 24 is similar to part 9. At the vertex of this member, a bolt 25 is provided with a cotter pin 26, for attaching member 12 by means of hole 27. The lateral member 15, shown in Figure 4, is adapted to set into hinge type brackets 28, which are connected by pivots 29 to the U-shaped member 24. The connection of the part 28 to the lateral member 15 is made by a loose pivot adapted to set through the hole 30 in the part 28, and hole 31 in lateral member 15. Extending from the bracket 28 by means of hinge pins 32, are extension arms 33 and 34, which are equivalent in length to arms 17 and 18, shown in Figure 4. These arms terminate in U-shaped hinged brackets 35, which are opened downward and have hinge pins 36. The lateral member 37 is U-shaped and extends through the holes in the brackets 35, and upward to form terminals which rest in openings in the hinge brackets 19, and are secured thereto by pins mounted in holes 38. Likewise, there are holes 39 in the lateral uprights for receiving the same pin. Attached by pivots 40 to the brackets 35, are bolts 41 which are threaded on one end to receive turnbuckle connections 42.

Referring to Figure 6, the upper section of the stern frame consists of a U-shaped lateral member 43. The member 43 is rigidly attached to a U-shaped bracket 45 at a center position. Extending from U-shaped bracket 45 toward the front of the boat, is a bolt 46 which has a threaded end for receiving the turn buckle nuts 23. Extending from the other side of bracket 45, and hinged thereto, is extension arm 47, which terminates at a hinge pin 48, mounted in U-shaped bracket 49. The bracket 49 has another hinge pin 50 to which is attached extensions 51. Extensions 51 terminate in hinge pins 52 mounted in a rear cross-member 53, forming the top member of the stern of the boat. Hinged at the same pivots 52, is a lateral U-shaped member 54, which forms the lower part of the stern of the boat. Extending from the lateral bracket 54 are flat tabs 55 with holes therein.

Referring to Figure 7, this drawing shows the lower structure for forming the stern of the boat, and consists of a rigid lateral bracket 56, its up-turned ends having holes 57 therein. Hingedly mounted to this bracket 56 are two U-shaped clips 58, which have hinge pins 59 and 60 at their extremities. Attached to the hinge pin 60 are members 61, which have holes 62 for bolting to clips 55, shown in Figure 6. Extending from hinge pin 59 are arms 63 which terminate at hinge pivots 64 mounted in clips 65. The clips are U-shaped and open at the top, and are the same as clip 28 previously described and shown in Figure 5. Mounted on pivots 66 are bolts 67 with screw threads formed thereon for connecting into the turnbuckle nuts 42. At the center of the bracket 65, the metal has been turned down to form tabs 68 which form a support and rest for the lateral bracket 43, shown in Figure 6. The lateral bracket 43 is attached at this point by bolts which pass through openings 69 in the clip 65, and through openings 70 in the lateral bracket 43.

It is obvious that the top of the hinged joint is subject to a considerable modification, and if the frame work should be cast or made from bar metal, a structure such as shown in Figure 9 would be practical and affords the advantage of being self-locking in one direction.

Referring to Figure 4, it is obvious that this structure may be folded up to form a flat unit, by merely hinging the parts 9 and 12 together, then hinging 9 against 15, then hinging 17 and 18 against 15. The hinging is so constructed as

to permit the proper movement for collapsing, but is self-locking in the other direction.

Referring to Figure 5, it will be noted that the same is true as in Figure 4. The units 24 and 33 may be folded together, and then against the lateral bracket 37, then arms 41 may be folded against bracket 37. This again forms a flat unit, with the hinging so arranged as to completely collapse in one direction, and to be entirely locked in the other direction. Referring to Figure 6, it will be noted that the hinging is so arranged that lateral bracket 54 may be folded against extension 51, where in turn arms 51 will fold against extensions 47, then in turn against extensions 43. The bolts 45 fold against lateral bracket 43. This structure therefore collapses into a perfectly flat element for transporting, but if extended, the hinges are self-locking against collapsing in the other direction.

Referring to Figure 7, it will be noted that the extensions 61 may be folded downward; likewise extensions 63 may be folded downward, whereas bolts 67 may be folded upward to form a flat unit. Likewise the bracket 56 may be turned completely around pivoting in the bracket 58, conforming and lying parallel to the extensions 61 and 63. The same analysis may be made to each of the figures showing the structure, and it will be noted that the self-locking type of hinge 14, as shown in Figure 4, has been applied throughout the four structural elements of the framework into a flat element for handling, but that in no instance does the hinging occur in the direction between the top and the bottom elements of the frame. In other words, when the frame of the boat is put together, all of the hinges are positioned so as their self-locking function is acting against the equivalent hinges in the lower frame. This causes the frame to have a rigid assembly which cannot be collapsed except by removing the assembly pins. Likewise, the intermediate transverse brackets 37 and 56 are connected to the upper frame. The hinges are so arranged as to be held in their locked position by assembly pins operating through the lateral bracket and the hinge itself.

In assembling the boat, the bow shown in Figure 4 and the bottom of the bow shown in Figure 5, are first joined together, then the stern of the boat, using the structure shown in Figures 6 and 7, is fastened together. The bow is then joined to the stern by turning the turnbuckle nuts 23 and 42, which have right hand threads in one end, and left hand threads in the other end, so that they will join the structures together. This threading in the nuts 23 and 42 obviously contracts or expands the frame structure in its length. While the frame structure is somewhat contracted, the envelope hull is placed over it, and then the nuts 23 and 42 are rotated in a direction to cause a linear expansion of the frame. This expansion causes the frame to engage the envelope and to stretch it to any pre-determined extent; furthermore, as the boat is used in the water and the envelope swells, additional tightening may be accomplished by the same nuts.

It will be particularly noted that the framework is slipped under the bead 8, and that inasmuch as the inner periphery of the bead 8 is less than the normal periphery of the boat at its upper edge, that when the frame is expanded into the boat, it will be impossible to remove the envelope.

The structure as described and illustrated shows the simplest form of boat, but obviously

this could be extended to a considerable extent by adding other units built along the same principles; and although hinged joints are all shown as very simple and of a practical nature, it is obviously within the scope of this invention to use any type of joint which would properly connect the members and produce the rigidity required.

It is to be pointed out that in every instance the applicant has so arranged his joints as to have the opening and locking action check, one against the other, when the boat is assembled. This produces a very rigid frame which cannot collapse while in use. Furthermore, the expanding feature wherein a substantially fixed envelope is used as a hull and the frame expands longitudinally therein to form a rigid structure, is particularly desirable in a boat where a maximum amount of inner space is desired, and therefore prohibits cross-members.

Obviously, in collapsing the frame of the boat, it is only necessary to remove the loose pins joining the members, whereupon the frame separates into two parts; the upper part consisting of the gunwales and the uprights attached thereto, and the lower frame with the cross-members attached thereto. This avoids the necessity of removing the turnbuckles. However, for the sake of making the specification entirely clear, the applicant has chosen to illustrate and describe each of the four independent elements separately, wherein the turnbuckles are disconnected.

Having described the invention, what is claimed as new and is desired to be secured by Letters Patent, is:

1. A collapsible boat comprising a framework and a flexible preformed envelope constituting the hull therefor, said framework including a continuous upper edge member comprising rod elements and means interposed in the edge member between the rod elements for varying the length of the edge member, said hull member including a flexible body portion and a continuous uninterrupted flexible substantially non-extensible upper edge element of slightly less peripheral length than the upper edge member secured to said flexible body portion whereby upon increasing the length of the edge member the frictional engagement between the edge member and the non-extensible edge element constitutes the sole attachment between the frame and hull.

2. A collapsible boat as claimed in claim 1, wherein a rope element constitutes said flexible non-extensible upper edge element, and wherein said element is shorter than the upper edge member by such a small amount that the element may not lie entirely within the boat.

3. A boat as claimed in claim 1, wherein a rope member constitutes said upper edge element, and wherein said rope member is shorter than the upper edge of the frame by such an amount that frictional engagement between the rope, body portion, and frame constitutes the sole engagement between said cover and frame, and at the same time the rope may not lie entirely within the frame.

4. A collapsible boat comprising a hinged collapsible framework and a flexible preformed envelope constituting the hull therefor, said framework including a continuous upper edge member comprising rod elements, means interposed in said edge member between certain of the rod elements for varying the length of the edge member, and hinge means interposed between certain

other rod elements to permit folding of the edge member, said hull member including a flexible body portion and a flexible substantially non-extensible upper edge element of slightly less
5 peripheral length than the upper edge frame member when in assembled relation, secured to said flexible body portion, whereby upon insert-

ing the frame within the cover and increasing the length of the upper edge member of the latter, the frictional engagement between the edge member and non-extensible element constitutes the sole attachment between the frame and cover. 5

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