A water craft is disclosed where the hull divides in the aft section from or near the central fore and aft line of the craft and sweeping out toward the beam of the craft on both sides so that a roofed swallow tail is formed with its widest separation toward the stern of the craft allowing smooth motion through the water while providing maximum stability.
SWALLOW TAILED BOAT HULL

TECHNICAL FIELD

[0001] The present invention relates to an improved hull for water craft.

DESCRIPTION OF RELATED ART

[0002] Water craft hulls typically have a pointed end known as the bow and widen in breadth toward the middle of the craft and then tend to narrow in breadth toward the stern. This traditional configuration of hulls is well known. The width of the hull at the waterline typically goes from a point at the bow to the widest about mid-ships and narrower at the stern. Displacement and semi displacement hull forms tend to narrow significantly at the stern while planing craft tend to narrow less at the stern and have a sharp angle where the bottom of the boat meets the transom.

[0003] As the average width at the waterline is significant for the stability of craft any narrowing of the waterline affects adversely the stability of the craft. Contact with the water and more easily or even being able at all to Displacement and semi displacement hull tend not to have the sharp edge between the bottom of the boat and a transom which would help them to break come up on the plane.

DISCLOSURE OF INVENTION

[0004] According to the present invention there is provided a hull for water craft comprising traditional hull shapes with the hull splitting into two toward the stern with the width at the waterline being substantially maintained. The average waterline width is thus increased while flow of water past and under the craft is not significantly restricted. The inner part of splits may have a sharp angle where the two sides converge to facilitate the break with the water flow, which facilitates planing. The same configuration can be used on tunnel hulls and multi-hulled craft where wetted areas, sponsons, and pontoons can have port or starboard parts of the swallow tail to improve stability and speed. With a slight heel on the craft the swallow tails increase the waterline length and reduce drag. The sharp angle of convergence between the two sides of the swallow tail combined with its direction slightly across the beam of the boat means that the craft more easily breaks contact with the flowing past it thus making it possible for hulls which were predominantly semi-planing and displacement craft to have a possibility to plane.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] A specific embodiment of invention will now be described by way of example in which:-

[0006] FIG. 1 shows the underside of a monohull with a swallow tail:

[0007] FIG. 2 show the underside of a tunnel hull or catamaran with a swallow tail forms on the sponsons or pontoons:

[0008] FIG. 3 shows a cross section of a monohull and relates to station aa in FIG. 1.

[0009] FIG. 4 shows a cross section of a monohull and relates to station bb in FIG. 1.

[0010] FIG. 5 shows a cross section of a monohull and relates to station cc in FIG. 1.

[0011] FIG. 6 shows a cross section of a monohull and relates to station dd in FIG. 1.

[0012] FIG. 7 shows a cross section of a tunnel hull or catamaran and relates to station ee in FIG. 2.

[0013] FIG. 8 shows a cross section of a tunnel hull or catamaran and relates to station ff in FIG. 2.

[0014] FIG. 9 shows a cross section of a tunnel hull or catamaran and relates to station gg in FIG. 2.

[0015] FIG. 10 shows a cross section of a tunnel hull or catamaran and relates to station hh in FIG. 2.

[0016] FIG. 11 shows a cross section of a monohull with hook keels on the outer edges and refers to station bb on FIG. 1.

[0017] FIG. 12 shows a cross section of a tunnel hull or catamaran with hook keels on both inner and outer edges of sponsons at station ff in FIG. 2:

[0018] FIG. 13 show a side view of a hull with stations marked which relate to FIGS. 14 to 19.

[0019] FIG. 14 shows a side view of a stern with station marking:

[0020] FIG. 15 shows a cross section of a port side Swallow Tail at station ii on FIGS. 13, 14, and 19:

[0021] FIG. 16 shows a cross section of a port side Swallow Tail at station jj on FIGS. 13, 14, and 19:

[0022] FIG. 17 shows a cross section of a port side Swallow Tail at station kk on FIGS. 13, 14, and 19:

[0023] FIG. 18 shows a cross section of a port side Swallow Tail at station ll on FIGS. 13, 14, and 19:

[0024] FIG. 19 shows a view from above of a port side Swallow Tail suitable for a monohull, tunnel hull, or catamaran portside sponson or port float of a trimaran:

[0025] FIG. 20 shows a side view of a hull with station markings that relate to station markings on FIGS. 21-26:

[0026] FIG. 21 shows a side view of the stern of a craft with station markings:

[0027] FIGS. 22-25 show cross-sections mm, nn, oo, pp, of a starboard swallow tail stern relating to station markings on FIGS. 20, 21 and 26:

[0028] FIG. 26 shows a starboard swallow tail from above for the starboard side of a monohull, the starboard sponson of a tunnel hull or catamaran or the starboard float of a trimaran:

[0029] FIG. 27 shows a cross section of a craft with both port station (ii) and starboard station (mm) Swallow Tails relating to FIGS. 13-26:

[0030] FIG. 28 shows a cross section of a craft with both port station (jj) and starboard station (nn) Swallow Tails relating to FIGS. 13-26:

[0031] FIG. 29 shows a cross section of a craft with both port station (kk) and starboard station (oo) Swallow Tails relating to FIGS. 13-26:
FIG. 30 shows a cross section of a craft with both port station (l) and starboard station (pp) Swallow Tails relating to FIGS. 13-26:

FIG. 31 shows port side swallow tail at station kk where the craft is lying on an even keel.

FIG. 32 shows the same section as 31 where the craft is heeled bringing the swallow tail up and making a sharper angle for water shear:

FIG. 33 shows a stern view and Swallow Tails of an upturned hull:

FIG. 34 shows a view of an upturned monohull with swallow tails:

FIG. 35 shows a view of an upturned tunnel hull with swallow tails:

FIG. 36 shows a cross section of a port hull section with rounded hook keels:

FIG. 37 shows a cross section of a port hull section with angular hook keels.

FIG. 38 shows a side view of an angular hook keel below a hull:

FIG. 39 shows a side view of a rounded hook keel below a hull:

FIG. 40 shows a view of the underside of the stern of a craft with swallow tails with concave fluted sections running along the hull to the swallow tail:

FIG. 41 shows a cross section of a port side swallow tail with concave sections:

FIG. 42 shows a cross section of a starboard side swallow tail with concave sections:

FIG. 43 shows a cross section of a port side swallow tail with concave sections on the inside and a concave section on the outside of the sharp edge:

FIG. 44 shows a cross section of a starboard side swallow tail with concave sections on the inside and a concave section on the outside of the sharp edge:

MODE(S) FOR CARRYING OUT INVENTION

4007 Referring to the drawings:

4008 1 = a boat hull; 2 = the Bow; 3 = the Stern; 4 = a swallow tail hull section; 5 = a transom; 6 = a tunnel; 7 = a hook keel; 8 = a sharp edge; 9 = an inside side of a swallow tail hull section; 10 = an outside side of a swallow tail section; 11 = a waterline; 12 = an outside side concave section; 13 = concave sections; 14 = hatched areas denoting areas below the waterline— or wetted areas; 15 = keels; 16 = hull section connection

4009 Referring firstly to FIG. 1, a water craft hull (1) viewed from below has a bow (2) with the body of the hull (1) extending to the stern (3) where it splits into two sections forming swallow tails (4) connected by a transom (5). The transom (5) may be located anywhere along the swallow tails (4) or forward of them. The swallow tails (4) may start to split from the keel (15) or keels (15) and splay out anywhere aft of mid-ships. The split may begin below the waterline and extend aft below the waterline extending from the keel line (15) aft and outward toward the beam of the boat. The area of the hull (16) between the two inner sides (9) of the swallow tails (4) and the transom (5) will tend to be above the waterline, but need not necessarily be so. Where the two sides of the swallow tails (4), outer (10), and inner (9) meet, they form a sharp angle (8) that lies at the juncture of the two sides running from the keel or keels aft and outward toward the beam. The outer side (10) of the swallow tail (4) will tend to be rounded as it approaches the sharp junction (8) whereas the inner side (9) will tend to be more perpendicular and flat. Stations along the hull are marked a, b, c, d, and e, and relate to FIGS. 3 to 6.

FIG. 2 illustrates a water craft tunnel hull (1) from underneath similar to FIG. 1 with the addition of a tunnel (6). The features of the swallow tails (4) are similar to those in FIG. 1. The stations cc, ff, gg, hh, relate to FIGS. 7 to 10.

FIG. 3 illustrates a cross section of a watercraft hull and relates to station aa in FIG. 1. In FIG. 3 the waterline (11) is the line between the wetted area (14) and the rest of the hull at an area near the bow of the boat.

FIG. 4 illustrates a cross section (bb) on FIG. 1 of a hull near midships showing the central keel (15).

FIG. 5 illustrates a cross section of a water craft hull FIG. 1 at the station cc where the swallow tails just start to divide.

FIG. 6 illustrates a cross section of a watercraft hull as in FIG. 1 at station dd where the swallow tails are more developed where (10) is outer side of the swallow tails (4) meet the inner side (9) at a sharp junction (8).

FIG. 7 illustrates a cross section of a tunnel hull water craft at station ee on FIG. 2 where 6 is the tunnel near the bow end.

FIG. 8 illustrates a tunnel hull water craft cross section about mid ships as in FIG. 2 at station ff. The tunnel (6) separates the two sections of the hull above the waterline (11) and the wetted areas (14). The two keels (15) run along the bottoms of each side of the tunnel (6).

FIG. 9 illustrates a tunnel hull water craft cross section at station gg on FIG. 2. The swallow tails (4) are already forming at this station gg with a widening of the tunnel (6) below and near the waterline (11).

FIG. 10 illustrates a tunnel hull water craft cross section as at station hh on FIG. 2 where the swallow tails (4) are more developed. The tunnel (6) has widened considerably to form the swallow tails this close to the stern. The outer side (10) of the swallow tails (4) meet the inner side (9) at a sharp angle (8).

In FIG. 11 is a shows a cross section of a water craft hull as at station bb in FIG. 1 with “hook keels” (7) on each side of the craft angled down and outwards around and aft of mid ships.

FIG. 12 shows a cross section of a tunnel hull water craft as in FIG. 2 at station ff about midships or a little aft of midships with hook keels angled down and out both on the tunnel (6) side of the wetted areas (14) and the outer edges.

FIG. 13 is a side view of a hull, sponson or pontoon (1) showing from the bow (2) to the stern (4) and a transom
with stations marked along the swallow tail area. The waterline being marked (11) and the hatched wetted area (14).

FIG. 14 shows just the swallow tail area side view of FIG. 13 with similar numbers as FIG. 13 while FIG. 19 shows a port side swallow tail (4) from above with related station markings to FIGS. 13-19.

FIGS. 15 to 18 show cross sections of a port side swallow tail at stations on FIGS. 13, 14, and 19. The swallow tail (4) diminishes in area toward the stern (4). The gradual diminishing in size both in draft, that is size of wetted area (14) and the narrowing of the swallow tail (4) means that at displacement speeds there is a smooth flow of water. At faster speeds the water flowing under the hull can break contact with the hull at the sharp edge (8) so craft, which were considered to only be displacement or semi displacement in shape and use, can gain some planing ability.

FIG. 20 is a side view of a water craft hull, sponson or pontoon (1) from the bow (1) to the transom (5) with wetted areas hatched (14) below the water line (11). In addition stations mm, nn, oo, and pp are marked in the swallow tail (4) area. FIG. 21 is a side view of the swallow tail (4) area of FIG. 20 where FIG. 26 is a starboard side view from above of a swallow tail where (10) is the outside side, which continues substantially in line with the beam of the boat and does not turn substantially in toward the keel line. (9) is the inside side of the swallow tail which curves outward in the stern area toward the outer side of the water craft to meet the transom and/or the outside side (10).

FIGS. 22 to 25 show cross sections of a starboard side of a swallow tail hull, or the starboard sponson or pontoon of a tunnel hull or multihull water craft that relate to stations mm, nn, oo, and pp on FIGS. 20, 21, and 26. They illustrate the narrowing and diminishing in size of the swallow tail toward the stern of the watercraft.

In FIG. 22 showing a cross section of FIGS. 20, 21 and 26 at station mm, the inside side (9) of the swallow tail has already moved outward from the keel line while the outside side (10) remains substantially in line with the outside line of the hull forward of it. The draft or depth of the wetted area (14) of the swallow tail (4) remains substantially the same as the hull forward of it. The juncture of outer side (10) and inside side (9) at this station may be, but does not necessarily need to be, as sharp as the juncture further afield.

FIG. 23 shows a cross section of a narrowed swallow tail (4) at station nn on FIGS. 20, 21 and 26. At this station the draft or depth of the wetted area (14) below the waterline (11) and beam, or line of the outside side (10) may, though not necessarily, diminish. The inside side (9) will have moved outward toward the beam of the boat in comparison to station mm.

FIG. 24 illustrates a cross section of FIGS. 20, 21 and 26 at station oo. A continuation of any variations in dimensions in draft and width begun as illustrated in FIGS. 22 and 23 will continue at this station, generally, although not necessarily, in progressive degree.

FIG. 25 is an illustration of a cross section of a starboard swallow tail section referring to station pp on FIGS. 20, 21 and 26. Here any progressive diminishing of width and depth will have continued so that the inner side (9) will have moved substantially outward toward the outside side (10) and at the juncture of the two sides the sharp edge (8) will have become sharper at, although not necessarily, less than 90 degrees angle.

FIG. 27 illustrates a cross section showing port (ii) and starboard (mm) portions of a swallow tail on a hull, tunnel hull or multihull water craft, and refers to stations ii in FIGS. 13, 14, 15 and 19 plus station mm in FIGS. 20, 21, 22, and 26. The inside sides (9) of the swallow tails have already started to move away from each other leaving a growing gap in between the joining part of the hull, widened tunnel or bridge deck (16) will tend to be, but will not necessarily be above the water line (11). The outer side (10) is at this station following substantially the same draft and beam line as the hull forward of it.

The two related stations in FIG. 28, jj (port) plus nn (starboard), are aft of stations ii plus mm. Station jj relates back to FIGS. 13, 14, 19, and 16 while nn relates to FIGS. 20, 21, 26, and 23. Again any hull part joining them will tend to be above the waterline (11) but could be below it.

FIG. 29 illustrates a cross section of port (kk) and starboard (oo) Swallow tails and relate to FIGS. 13, 14, 17, and 19 plus FIGS. 20, 21, 26 and 24 respectively. They illustrate a cross section relationship to stations jj plus nn. The diminishing width and depth of the swallow tails becomes evident, as does the sharpening angle (8).

FIG. 30 is an illustration of a cross section of port and starboard swallow tail configurations at stations ll, (port) and pp (starboard). The port side 11 relates back to FIGS. 13, 14, 18 and 19, while the starboard side pp relates back to FIGS. 20, 21, 25, and 26. The progression of the diminishing volume of each swallow tail (4) can be seen along with the sharpening angle (8) at the juncture of the outer sides (10) and the inner sides (9).

FIG. 31 shows station kk from the previous Figures where the water craft is horizontal on the water giving an area below the waterline (11) and a wetted area (14). The angle (8) of the juncture of sides (10) and (9) to the water flowing from it is less acute than in FIG. 32.

In FIG. 32 we have the same cross section station as in FIG. 31 but here the boat is heeled as when sailing. Because the outer side (10) does curve inward even slightly, when the craft is heeled the most portion of the swallow tail will tend to be higher in relation to the water line (11). In addition the angle of (8) in relation to the water line will be more acute than when the boat is horizontal as in FIG. 31. These features make for less water resistance and less drag so that the boat can sail faster.

FIG. 33 illustrates the aft section of an upturned hull will swallow tails (4) with transom (5) and connecting hull section (16).

FIG. 34 shows an upturned hull (1) with keel line (15) dividing into the swallow tails (4) with transom (5) and connecting hull portion (16) between the inside sides (9) of the swallow tails. The sharp edge (8) of the juncture between the inside side (9) and the bottom of the boat or the inward curving outer side (10) forms a break point for water flowing...
out from under the hull which facilitates planing. The gradual narrowing of the hull's wetted area coupled with any diminishing in draft facilitates easy movement through the water at displacement speeds. The splayed swallow tail (4) tends to capture water in waves moving from behind and so aids forward movement and surfing. The transom (5) and hull connection (16) also help capture water from waves from astern and so aid forward movement and surfing, particularly in conjunction with the swallow tails.

**FIG. 35** shows and upturned tunnel hull or a catamaran with a full length bridge deck with the tunnel (6) splaying out at the swallow tails (4). The advantages with this type of craft are similar to those mentioned in reference to **FIG. 34**, but in addition the swallow tails can have the effect of sucking water through the tunnel (6) and helping forward motion.

**FIG. 36** is an illustration of a cross section of a sponson or pontoon where the hook keels (7) both on the beam and keel line area in a rounded profile.

**FIG. 37** is an illustration of a cross section of a sponson or a pontoon where the hook keels (7) are of and angular profile.

**FIG. 38** shows a side view of an angle hook keel (7) below a hull (1) with (2) pointing to the bow end and (3) pointing toward the stern.

**FIG. 39** shows a side view of a curved hook keel (7) with the same orientation as **FIG. 38**.

**FIG. 40** illustrates the underside of a swallow tail (4) with a tunnel (6). Concave profiles (13) run along the underside of the swallow tails (4) to meet the outer side (10) at the sharp edge (8) in a series of curves. The concave sections give more edges for a greater variety of water release as water moves past the craft.

**FIG. 41** shows a cross section of a port side swallow tail (4) where the outer side (10) remains substantially the same as in a swallow tail without concave sections. The inner side (9) is built up in a series of concave sections which run from the hull section forward of the swallow tails and progressively end in a series of curves at (8).

**FIG. 42** shows a cross section of a starboard side of a swallow tail (4) with the same characteristics as the port side in **FIG. 41**.

**FIG. 43** is similar to **FIG. 41** but with a concave section (12) on the outside side (10).

**FIG. 44** is similar to **FIG. 42** with the addition of a concave section (12) on the outside side (10).

Further modifications and improvements may be incorporated without departing from the scope of the invention herein intended.

1-17. (canceled)

18. A water craft comprising a hull which divides into two parts in the aft section, from or near the central fore and aft axis of the craft, each part sweeping out toward the beam of the craft on either side thereof to form a roofed swallow tail with the widest separation of hull parts at the stern of the craft.

19. A water craft comprising a monohull which divides into two parts in the aft section, from or near the central fore and aft axis of the craft, each part sweeping out toward the beam of the craft on either side thereof to form a roofed swallow tail with the widest separation of hull parts at the stern of the craft, wherein the internal walls of the swallow tail and the bottom of the monohull form a sharp edge with an angle therebetween being within 25 degrees of a right angle.

20. A water craft as in claim 19 in which the space between the two parts of the swallow tail is substantially below the water line of the craft.

21. A water craft as in claim 19 in which the space between the two parts of the swallow tail is both below and above the waterline of the craft.

22. A water craft as in claim 19 in which the gap between the two parts of the swallow tail is roofed all the way to the transom.

23. A water craft as in claim 19 in which the craft has a recessed transom in the area of the roofed swallow tail.

24. A water craft as in claim 19 in which the swallow tail begins before the aft third of the craft's length but in the aft half of the craft.

25. A water craft as in claim 19 in which the swallow tail begins in the aft third of the craft's length.

26. A water craft as in claim 19 in which the first two thirds of the length of the swallow tail each part diverges from its starting point by 25 percent of the distance from the starting point to the maximum waterline width.

27. A water craft as in claim 19 in which the swallow tail diverges 70 percent of the distance from their starting point to the maximum waterline width in the aft 25 percent of the length of the swallow tail.

28. A water craft as in claim 19 in which the draft of the swallow tails decrease along their lengths to be at or near the waterline at the transom.

29. A water craft as in claim 19 in which the draft of the swallow tails remains substantially the same along their length.

30. A water craft as in claim 19 in which there is a sharp or within 25 degrees of a right angle edge both where the walls of the swallow tails meet the bottom of the boat and where the outside sides of the hull meets the bottom of the boat in the aft section of the craft.

31. A water craft as in claim 19 in which the bottom of the hull in the aft section is substantially flat.

32. A water craft as in claim 19 in which the side of the craft and the wall of the swallow tails converge to meet in a point near the transom.

33. A water craft as in claim 19 in which concave sections along the length of the bottom of the craft meet the sharp edges where the wall of the swallow tails meet the bottom of the water craft.