Sept. 13, 1949. H. C. STEPHENS 2,482,074

WATER SKI

Filed March 11, 1946

Fig. 1

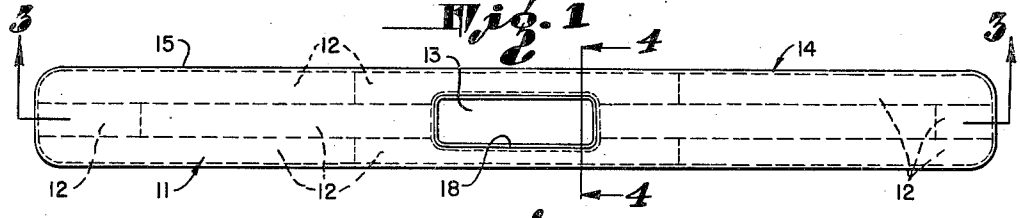


Fig. 2

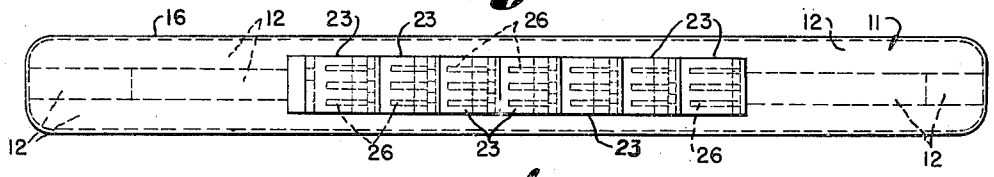


Fig. 3

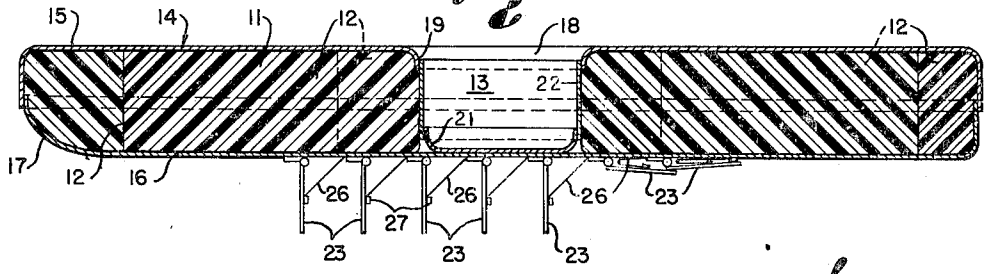


Fig. 4

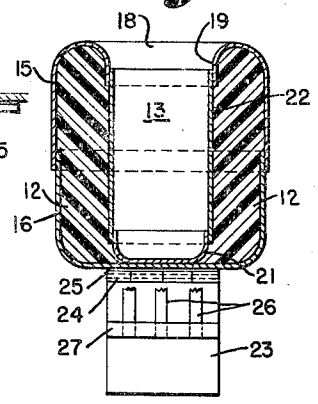
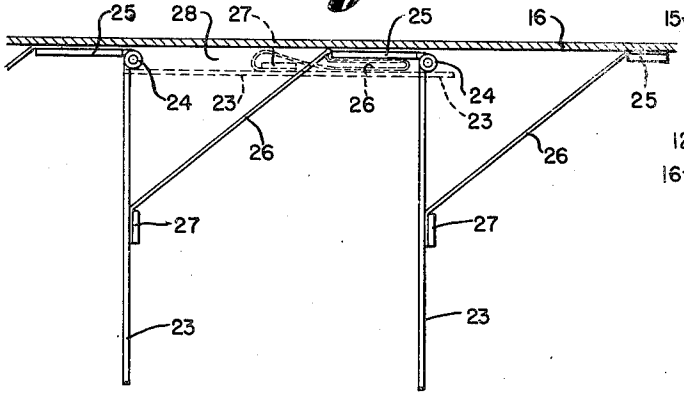


Fig. 5



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2,482,074

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2,482,074

WATER SKI

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8 Claims. (Cl. 9—21)

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My invention relates in general to aquatic amusement devices and more particularly to skis for use upon the surface of the water.

Hitherto water skis have been similar in general form to snow skis, although generally somewhat broader. That is to say, they have been wooden planks turned upward at their forward ends and provided with toe straps to hold them to the feet of the user. In such form they have been capable of sustaining a skier only when the skier was propelled at considerable velocity, as by being towed by a power boat, both because the skis lacked buoyancy and required the lifting force to be derived from planing on the water, and because they afforded the skier a base unstable in all directions, laterally, longitudinally, and vertically, upon which the skier could not achieve balance except dynamically. In effect, such skis have been only divided aquaplanes and not true skis in the sense that the skier could walk with them upon a surface which, without their use, would not sustain him.

It would appear, on first consideration of the problem, that satisfactory water skis could be made by merely increasing their buoyancy, by making them either larger or of more buoyant materials, but such is not the case. The problems of stability, of static balance, of sustaining the shifting forces which arise when a skier shifts his weight from foot to foot as in walking, are not solved by mere buoyance, nor is the problem—familiar to snow skiers—of keeping one ski from sliding backward while the other is advanced. In my invention I have increased the buoyancy of the skis by making them of very light plastic foam and have given them tractive efficiency by providing them with fins resistant to backward motion and non-resistant to forward motion. I have further increased the buoyancy of the skis by increasing their bulk in depth, rather than in width or length, with the result that they sink more deeply in the water and are restrained from lateral drift or side slip by submerged lateral surfaces of greater area and depth. The increased total surface subject to water friction is, of course, less than with an equal submerged volume of shallow draft, while the flat bottom of the skis still presents ample surface for planing; and drag is reduced to a minimum by encasing the pastic foam in a casing of plastic sheet material of great natural smoothness. The increased draft of the skis enables me to provide foot wells in which the skier stands, not only below the surface of the water, but below the metacenter of the skis which are thereby stabilized to provide a

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base upon which static, as well as dynamic, balance is possible.

A principal object of my invention is to provide water skis having collectively sufficient buoyancy and stability to support the skier on the water with a high degree of static balance, and individually sufficient buoyancy and stability to support the skier on the water while in the act of walking or gliding thereon.

Another object of my invention is to provide water skis resistant to backward motion in the water and thereby supporting the forward thrust necessary to walking upon the water, and yet presenting surfaces of low resistance to forward motion and an under surface upon which the skis may plane upon the water.

How I attain the foregoing and other useful objects will be specifically set forth or will be apparent from the following detailed description of a preferred embodiment of my invention and from the accompanying drawings illustrative thereof, in which

Fig. 1 is a plan view of a water ski according to my invention, it being understood that both skis constituting a pair are substantially alike;

Fig. 2 is a plan view as seen from below, with the cleats shown in the rearwardly pivoted position;

Fig. 3 is a sectional view on the line 3—3 of Fig. 1 with some of the cleats shown in their water-gripping position and some shown in rearwardly pivoted position;

Fig. 4 is a sectional view on the line 4—4 of Fig. 1; and

Fig. 5 is an enlarged detail of Fig. 3.

With reference to the details of the drawings, I have indicated by the numeral 11 a buoyant body comprising a plurality of blocks 12, preferably of plastic foam material such as is commercially known as Styrofoam, cemented together in parallel longitudinal rows, and so formed and joined as to leave amidships a well 13 of sufficient length and width to receive the foot of a skier. The buoyant body 12 is entirely enclosed in a covering 14 of plastic sheet material such as cellulose acetate, as described in my copending application, Serial No. 625,349, filed October 29, 1945, of which an upper shell 15 and lower shell 16 are overlappingly joined and cemented by a solvent such as acetone. While the buoyant body 11 might be made of a single large block of buoyant material, I have found that a cemented structure of a plurality of blocks increases the rigidity and strength of the buoyant body 11 as well as making possible the forma-

tion of the well 13 by omission and assembly, rather than by excavation. The exact size of the buoyant body 11 may vary according to whether the skis are intended for use by adults or by children, but by way of example, the body 11 might be formed of three parallel rows of blocks 12, of which the center row is staggered in relation to the outer rows and is discontinuous to form the well 13. With the outer rows formed of three blocks thirty inches long, by three inches wide and ten inches deep, and with the center row formed of blocks of similar width and depth to appropriate lengths, a buoyant body is formed with a length of ninety inches, a width of nine inches and a depth of ten inches, which I have found will support, without submergence, a weight of over two hundred pounds, thus permitting the average adult to place full weight upon one ski while moving the other forward in the act of walking. At the forward end of the body 11 the blocks 12 are curved as shown at 17 to form prows, and the blocks adjacent the well 13 may be cut away to create a well of sufficient width to accommodate the skier's foot.

The upper shell 15 has an opening 18 corresponding to the well 13, and a flange 19 around said opening and extending downwardly into the well. A cup 21 closes the lower end of the well 13 and is joined to the flange 19 by a ring 22 which forms the wall of the well, the lower shell 16, cup 21, ring 22, and flange 19 being cemented together in the same manner as the upper shell 15 and lower shell 16. Pressure, or weight, applied to the cup 21 is thus supported by reenforcement by the lower shell 16, and by the upper shell 15 by transmission of stress through the ring 22.

As shown in Figs. 4 and 5, the skis are substantially rectangular in cross-section, presenting to the water vertical sides of considerable depth to prevent side slip and a flat bottom surface upon which the skis may plane when sufficient speed is achieved. To enable the skier to propel himself forwardly with a walking or gliding motion, the skis are provided with a plurality of cleats 23, each of which is pivotally supported by a hinge 24 affixed to the bottom surface of the lower shell 16 by means of hinge plates 25. The cleats 23 are free to pivot rearwardly upon the hinges 24 and are restrained from pivoting forwardly beyond the perpendicular to the axis of the skis by tapes 26. Preferably, the cleats 23 and hinge plates 25 are of the same plastic sheet material as the lower shell 16, so that the cleats may be cemented to the movable hinge plate, and the fixed hinge plate may be cemented to the lower shell. A reenforcing strip 27 is cemented to each of the cleats 23, and the ends of the tapes 26 are held between said strips and said cleats and between the fixed hinge plates 25 and the lower shell 16.

The depth of the cleats 23 is such that each cleat overlaps the next cleat in rearward progression when the cleats are in their rearwardly directed position, thus lying in said position like scales upon a fish, with the exception that the cleats do not lie flat against the lower shell 16, but are held therefrom by the hinges 24 and hinge plates 25 so as to leave spaces 28 into which the reenforcing strips 27 fit and the tapes 26 fold. The reenforcing strips and tapes permit the use of thin sheets of plastic material as cleats, and the spaces 28 enclose the strips and tapes during forward motion of the skis in the water, and the construction as a whole avoids protruding cleat stops and presents to the water only the most forward of the hinges 25 as a forwardly resistant surface and only the thin edges of the cleats 23 as rearwardly dragging surfaces during forward motion.

With water skis constructed in accordance with the foregoing description, the skier need not sit on the edge of a dock or boat or crouch submerged in the water waiting to be yanked into planing velocity by a motor boat as a glider is yanked by an aeroplane, but may stand upon them without forward motion, nevertheless standing below the water surface so as to have static balance. The pivoted cleats 23 grip the water to permit a glading walk as with snow skis, being brought to their downward or water gripping position and to their rearward or gliding position by rearward and forward water-resistance respectively. The use of sheet plastic material in forming the cleats not only gives a gliding surface of glassy smoothness and permits easy assembly by simple cementing operation, but as the plastic may be selected to have a specific gravity only slightly above unit, there is neither the excess weight of metallic cleats nor the floating tendency of wooden ones. The overlapping placement of the cleats insures that if any one cleat is hydraulically moved toward its vertical position, all cleats forward of the cleat so moved will be successively mechanically started toward the same position, permitting the water pressure to act upon them more effectively to move them further, and minimizing the changes of functional failure of the cleats.

It will be apparent that modifications and changes may be made in the design and arrangement of my invention, of which the foregoing is an illustrative description, without departing from the spirit and scope of the invention, and I do not wish to be limited to the exact form herein described except as set forth in the appended claims.

I claim as my invention:

1. Water skis comprising individually: a plurality of blocks of plastic foam cemented together to form an elongated body having a flat normally lower side upturned at one end to form a prow, and of substantial depth relative to its width, and of sufficient buoyancy to retain its upper surface above water while sustaining the weight of a person, and having a well amidships adapted to receive the foot of a person and extending downwardly in said body to below the normal metacenter thereof; a cover for said body having upper and lower shells of plastic sheet material sealed to each other and inclusive of walls and a bottom closure for said well; a plurality of cleats of plastic sheet material hingedly fastened to the lower surface of said cover so as to be free to swing rearwardly parallel thereto; and means restricting the forward movement of said cleats to positions substantially at right angles to the axis of said elongated body.

2. Water skis comprising individually: a plurality of blocks of buoyant material cemented together to form an elongated body of substantial depth relative to its width and having a well amidships adapted to receive the foot of a person; a cover for said body of waterproof material inclusive of walls and a bottom closure for said well; and swingable means secured to said cover so as to be free to swing in response to water pressure between positions substantially at right angles to said body and below the normal water-

line thereof and positions substantially parallel to the axis of said body.

3. Water skis comprising individually: a plurality of blocks of plastic foam cemented together to form an elongated body having a well amidships adapted to receive the foot of a person; a cover for said body of waterproof material inclusive of walls and a bottom closure for said well; and swingable means secured to said cover so as to be free to swing in response to water pressure between positions substantially at right angles to said body and below the normal waterline thereof, and positions substantially parallel to the axis of said body.

4. Water skis comprising individually: a plurality of blocks of rigid buoyant material joined together to form an elongated rigid body having a well amidships adapted to receive the foot of a person; a cover for said body of substantially rigid waterproof material, inclusive of walls and a bottom closure for said well; and swingable means secured to said cover so as to be free to swing in response to water pressure between positions substantially at right angles to said body and below the normal water line thereof and positions substantially parallel to the axis of said body.

5. Water skis comprising individually: a plurality of blocks of buoyant material joined together to form an elongated and relatively narrow and deep rigid body having a well amidships adapted to receive the foot of a person; a cover for said body of plastic sheet material inclusive of walls and a bottom closure for said well; and swingable means secured to said cover so as to swing in response to water pressure between positions substantially at right angles to said body and below the normal water line thereof and positions substantially parallel to the axis of said body.

6. Water skis comprising individually: a plurality of blocks of rigid buoyant material cemented together to form an elongated body having a well amidships adapted to receive the foot of a person and extending downwardly in said body below the normal metacenter thereof; a cover for said body of substantially rigid waterproof material inclusive of walls and a bottom closure for said well; and cleats secured to said cover so as to be moved by water pressure outwardly

therefrom when said water ski tends to move rearwardly in the water, and to be moved by water pressure inwardly and parallel to the axis of said body when said water ski tends to move forwardly in the water.

7. Water skis comprising individually: a plurality of blocks of buoyant material joined together to form an elongated and relatively narrow and deep rigid body having a well amidships adapted to receive the foot of a person; a cover for said body of substantially rigid waterproof material, inclusive of walls and a bottom closure for said well; said well extending substantially through said body, and said bottom closure receiving support from the bottom portion of said cover; and swingable cleats secured to said cover so as to be free to swing to positions substantially at right angle to said body and positions substantially parallel to said body in response to water pressure exerted respectively to said positions upon the rearward and forward sides of said cleats.

8. Water skis comprising individually: a plurality of blocks of buoyant material joined together to form an elongated rigid body having a well amidships adapted to receive the foot of a person and extending substantially through said body; a cover for said body having upper and lower shells of substantially rigid waterproof material sealed to each other; said upper shell including walls and a bottom closure for said well, and said lower shell affording support to said bottom closure; and means swingably secured to said cover for resisting rearward movement of said ski through the water, said means being adapted to swing to non-resistant positions when said ski is moved forwardly through the water.

HENRY CALDWELL STEPHENS.

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