May 26, 1964

K. W. STIMM

3,134,114

BUOYANT SHOES

Filed Aug. 29, 1962

3 Sheets-Sheet 1

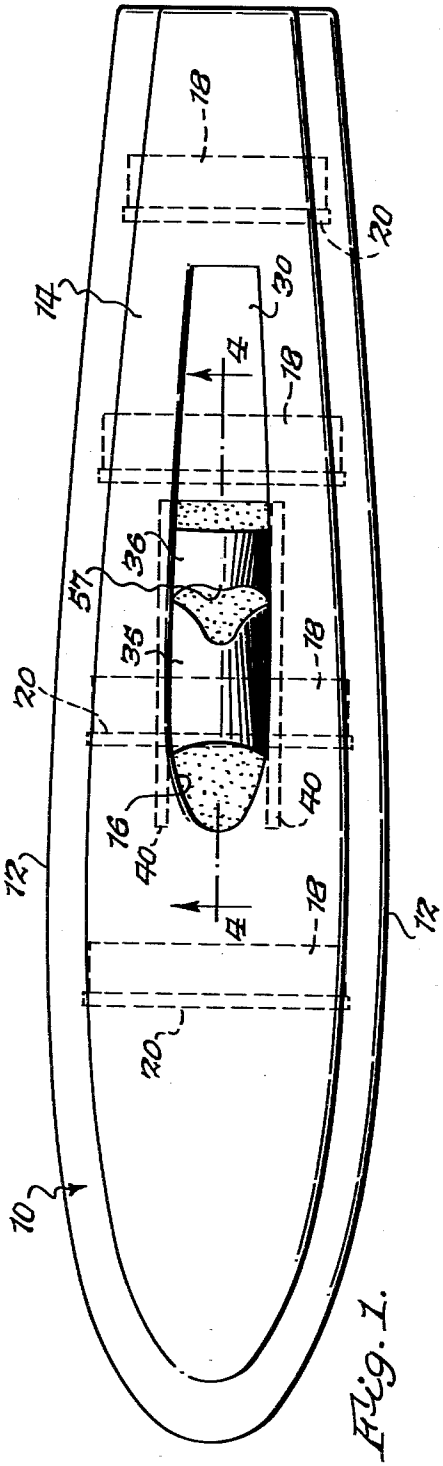


Fig. 1.

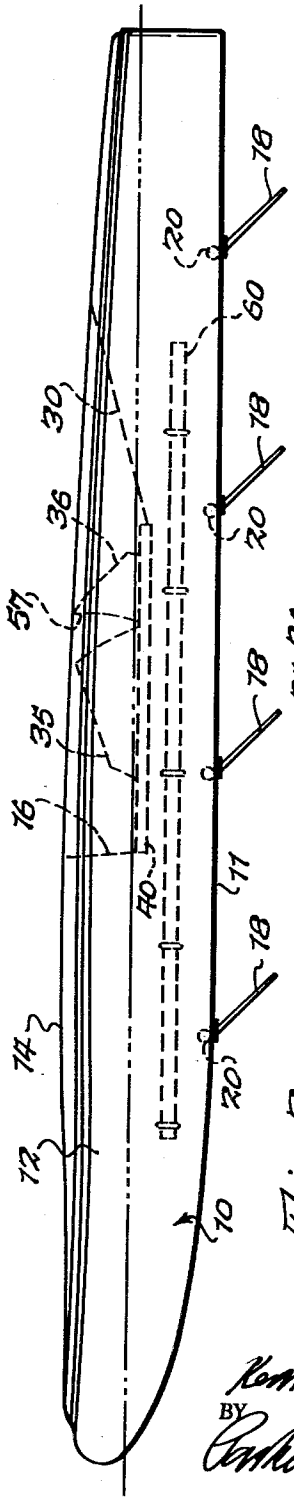


Fig. 2.

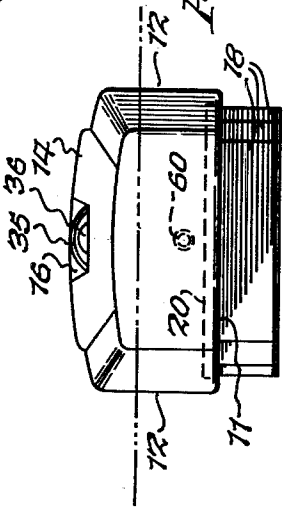


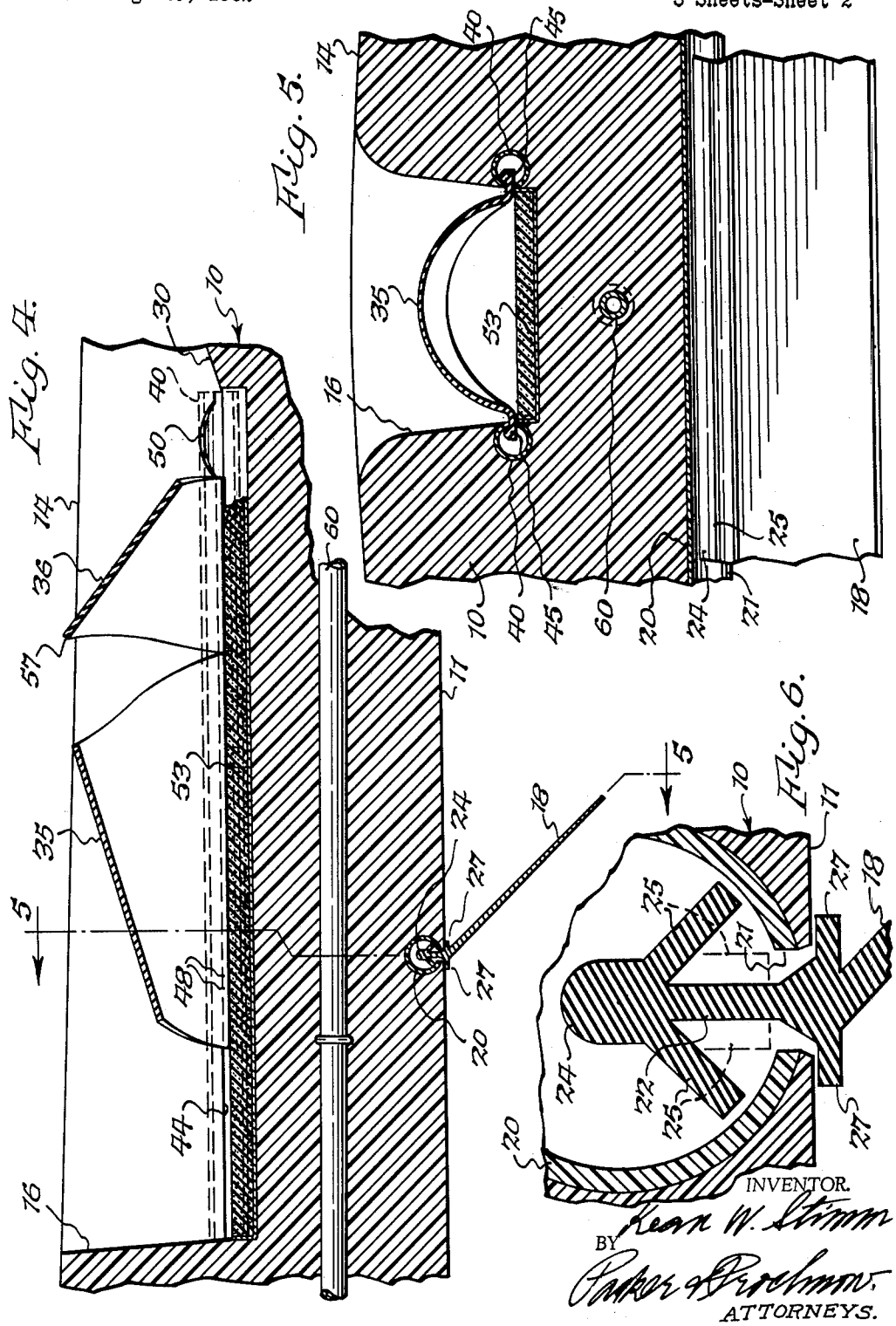
Fig. 3.

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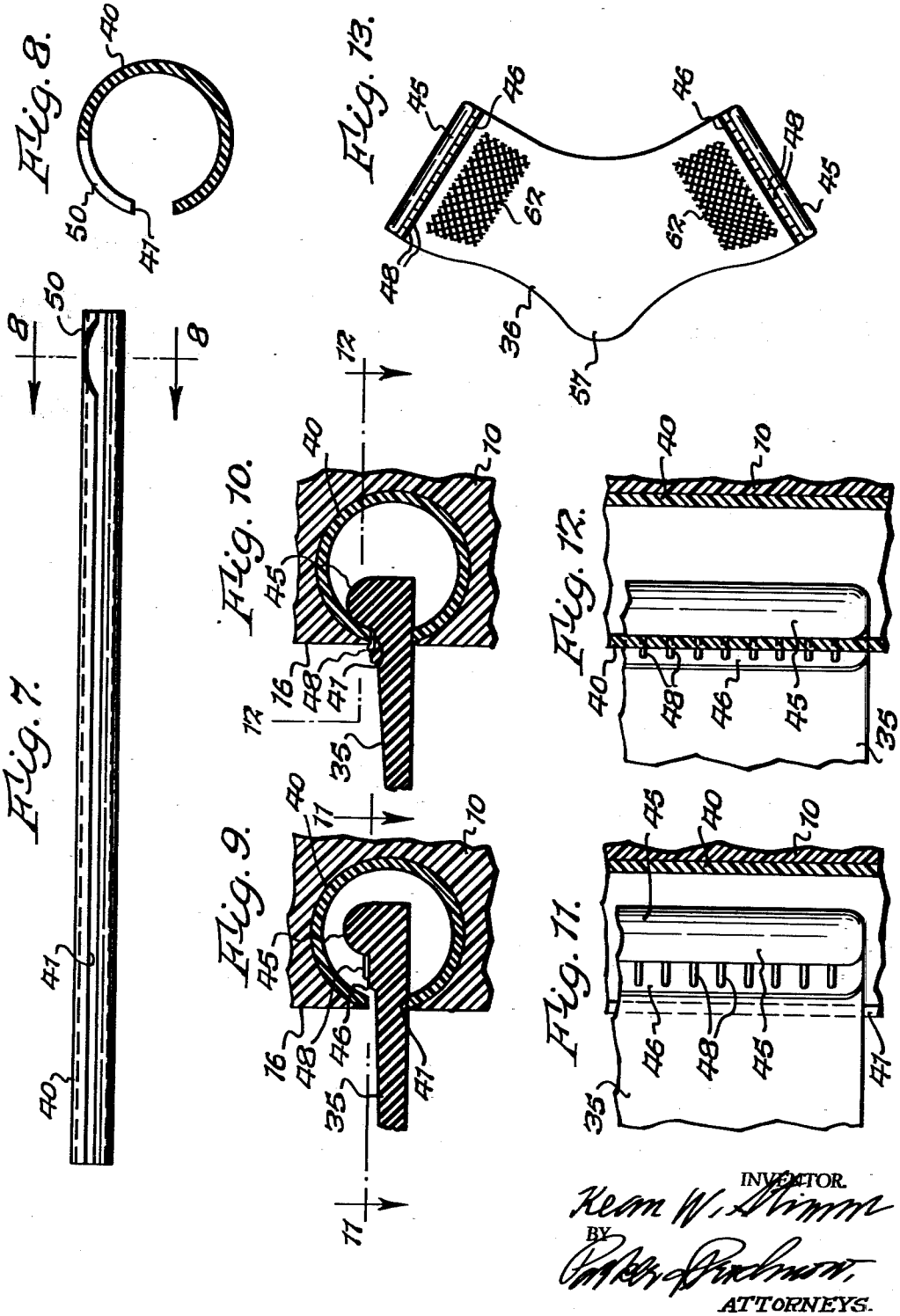
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BUOYANT SHOES

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3 Sheets-Sheet 3



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United States Patent Office 3,134,114 Patented May 26, 1964

3,134,114

BUOYANT SHOES

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Filed Aug. 29, 1962, Ser. No. 220,219
11 Claims. (Cl. 9—310)

This invention relates to improvement in shoes or buoyant devices of the type which may be worn on a person's feet to support him on water for walking on water, skiing, or other sports. This application is a continuation-in-part of my copending application Ser. No. 830,127, filed July 28, 1959 now abandoned.

It is an object of this invention to provide buoyant shoes of this type which are made of a very light waterproof material which is incapable of leaking even when cut or punctured.

Certain types of plastics may be expanded or caused to foam to form a very light and rigid body with a non-hard resilient surface, and although dented or penetrated by compressing or cutting some of the closed cells, the body cannot leak or absorb water and thus is consequently safe for use in water. Also, the non-hard surface will not injure others by contact or impact therewith.

Another object of this invention is to provide a buoyant material of this kind with a surface coating of elastic, tough material capable of stretching if the surface of the buoyant material is indented, and also thereby providing the shoe with a coating having high abrasion resistance and durability and which forms a high tensile strength skin which increases the structural strength of the shoe.

A further object is to provide shoes of this kind with flippers made of a flexible, elastic, rubber-like material arranged in the bottoms of the shoes and having the property of bending up against the bottoms of the shoes to offer lower resistance to forward motion through the water and capable of bending downwardly to offer resistance to backward motion of the shoes. Another object is to provide improved means of attaching these flippers to the body portions of the shoes.

It is also an object of this invention to provide buoyant shoes having foot harness of improved construction for fitting the feet of the wearer, and also preventing the feet of the wearer from slipping within the shoes.

A further object is to provide a shoe of this kind with a foot well on the upper surface thereof having a gradually sloping rear portion through which water which might splash into the foot well can easily be sloshed out.

In the accompanying drawings:

FIG. 1 is a top plan view of one of the buoyant shoes embodying my invention.

FIG. 2 is a side elevation thereof.

FIG. 3 is a rear elevation thereof.

FIG. 4 is a longitudinal sectional view thereof on an enlarged scale on line 4—4, FIG. 1.

FIG. 5 is a fragmentary, transverse sectional view thereof on line 5—5, FIG. 4.

FIG. 6 is a fragmentary, enlarged sectional view also taken partly on line 4—4, FIG. 1.

FIG. 7 is a side elevation of one of the slotted tubes.

FIG. 8 is a transverse section thereof on an enlarged scale on line 8—8, FIG. 7.

FIGS. 9 and 10 are fragmentary sectional views showing the parts of the foot harness in position in a slotted tube.

FIGS. 11 and 12 are respectively sections on lines 11—11 and 12—12 of FIGS. 9 and 10.

FIG. 13 is a plan view of a part of the foot harness removed form the shoe and straightened to lie in a plane.

The shoes may be of any suitable or desired form to pass easily through the water in a forward direction and are therefore made of materially greater length than width. These shoes comprise body portions **10** of unitary construction and are preferably molded of a buoyant, closed cell, expanded porous plastic material of any suitable or desired kind. For example, the body portion may be formed of a foamed plastic material, preferably of the rigid type. Polyurethane is well adapted for this purpose, but other plastics capable of foaming in a mold may be employed for this purpose. These body portions may be formed in one piece, for example, as disclosed in my copending application No. 72,358, filed November 29, 1960. The body portion is not hard but has a limited amount of flexibility so that these shoes are safe in water play in that anybody coming in contact therewith will not be injured. This body portion may be made of any desired cross sectional shape and preferably has a substantially flat bottom **11** and approximately upright sides **12** to form a certain amount of lateral resistance to movement of the shoes sidewise when in water. The top surface **14** has a slight curvature downward toward the sides of the body portion so that this top surface will readily shed water, and approximately in the middle upper portion of the shoe there is provided a depression or foot well **16** for a foot of the wearer. These shoes are waterproof and incapable of leaking even if cut or punctured.

The outer surface of the entire shoe may be coated with an elastic, tough material which can stretch if the body portion of the shoe is indented and which is capable of providing a very high abrasion resistance as well as durability in sunlight and water. This outer skin may also be provided with a pigment for decorative purposes if desired, and is of a special formulation compatible with the foam plastic body portion, but which has a high tensile strength and thereby increases the structural strength of the shoe. This coating material may be of any suitable composition such, for example, as a polyurethane of any elastic, tough, stretchable nature.

In buoyant shoes of this type, it is customary to provide flippers mounted on the body portion and which when the shoe is stationary or during rearward movement of the shoe move into positions to extend downwardly into the water to oppose rearward motion relatively to the water on which the shoes are used. I prefer to make these flippers of a resilient plastic or of rubber-like material, such for example as natural or synthetic rubber or polyethylene and which have their upper ends anchored in the body portion so as to extend crosswise of the same. These flippers **18** are of a material sufficiently flexible so that they may lie substantially flat against the undersurface of the shoe when the shoe is moving forwardly and will extend downwardly from the body portion when the shoe is stationary or moves to a slight extent in a rearward direction. Since these flippers are of flexible and durable material, they permit the shoes to be walked on on solid ground and may be secured at their upper ends

to the bottom of the shoe in any suitable manner. The flippers may if desired be made curved so as to have a convex downwardly and forwardly directed surface to increase their efficiency, and their resilience is such that they will extend approximately straight down when the shoes are urged backwardly.

Preferably I make the flippers 18 of single sheets of resilient material provided at their upper ends with means for securing them to the body portion of the shoes. In the particular construction illustrated by way of example, for this purpose I provide slotted tubes 20 which are preferably molded into the body portion of the shoes adjacent to the bottom 11 thereof. These tubes are preferably made of a hard, plastic material, such as rigid polyvinyl chloride to which the porous plastic material of which the body portions of the shoes are made will securely bond itself so that when these tubes are positioned in the mold, the body portion of the shoe will be formed about the tubes and firmly adhere thereto. These tubes extend crosswise of the shoes and have slots 21 in the lower portions thereof into which projections on the upper ends of the flippers extend.

The flippers are provided at their upper ends with interlocking parts which may be inserted through the slots 21 in the tubes 20 in such a manner as to be retained in these tubes after insertion into the same. For example, each flipper 18 is provided at its upper end or neck with a stem 22 formed integral with the flippers 18 and extending upwardly at an angle thereto. This stem terminates in a head portion 24 which is of sufficient width so that it can be passed through the slot 21 of a tube 20. The interlocking part of each flipper also includes a pair of wings 25 or holding extensions normally extending outwardly from opposite sides of the stem 22. The flippers and their holding extensions of course are made of readily flexible material so that when the interlocking parts of the flippers are inserted into the holding tubes 20, the head portions 24 are first pushed upwardly through the slots 21, and upon further upward pressure, the two wings 25 will be bent downwardly into close proximity to the stem 22, as shown by the broken lines in FIG. 6, which indicate the positions of the wings while passing through the slots 21. After these wings have passed through the slots, they immediately flex outwardly into their normal positions, as shown in full lines in FIG. 6, so that the upper ends of the flippers will be securely held in the tubes 20. Preferably the flippers are also provided with outwardly extending webs or flanges 27 below the tubes 20 which limit the extent to which the holding portions of the flippers may be inserted into the slotted tubes.

In the operation of the device during forward motion of the shoe, the flippers thereon flex backwardly because of their own resilience, to enable them to lie substantially closely against the bottom of the shoe 11 to offer the minimum resistance to the forward movement of the shoe. The interlocking parts which hold the flippers in place in the slotted tube 20 also permit of limited movement of the upper portion of the flipper relatively to the tube, as will be readily seen by inspection of FIG. 6, so that rearward folding of the flippers can result not only from the flexibility of the flippers themselves, but also due to the movable connection of the securing ends of the flippers in the tubes 20.

By making these flippers of a resilient, elastic material they will not injure persons coming in contact therewith.

The foot well 16 is of sufficient depth so that the lower surface thereof will generally be near or below the water level to avoid the tendency of the buoyant shoe from tipping over laterally. The rear end wall of the foot well is provided with a gradually upwardly sloping surface 30 approximately 25° from the bottom of the foot well. Because of this gradual slope any water which may collect in the foot well can be readily removed therefrom by forward motion of the shoe, in which case the water will tend to flow rearwardly over the inclined surface 30 and thus pass out of the foot well.

Within the foot well is arranged a foot harness of any suitable type from which the user may quickly release his foot. In the construction shown for this purpose, I provide a strap of flexible and elastic material 35 formed to fit over the front of the foot and another strap 36 of similar material into which the heel of the foot may extend, the two straps being spaced apart to permit easy insertion of the foot into the front part 35 while flexing the back part 36 rearwardly or downwardly out of the way and then permitting it to come forward of its own resilience or pulling it upwardly to grip the heel of the foot. The ends of the straps 35 and 36 may be secured to the buoyant shoe in any suitable or desired manner. Preferably as in the construction shown, the lower edges or ends of these straps are secured in slotted tubes 40 similar to the tubes 20 employed in connection with the flippers. These tubes have slots 41 therein and are also molded in the body portion of the shoe at opposite sides of the foot well with their slots 41 extending toward the interior of the foot well. The two straps of the foot harness are provided with enlargements formed to fit into and be held in the slotted tubes 40. The ends of the straps are also formed to be locked in the slots 41 in such a manner as to hold the straps against movement lengthwise of the tubes after they are locked in place therein. These ends of the straps are so formed that prior to being locked in the tubes they are adjustable lengthwise of the same so that the straps may be moved toward and from each other to fit the feet of the user of the device, and also both of these straps may be adjusted lengthwise of the tubes to position the foot harness at the center of balance of each shoe.

For this purpose of locking the opposite ends of the straps in the tubes 40, the ends of the straps are provided with enlargements or flanges 45 which are large enough so that they cannot pass through the slots 41 of the tubes 40, and at the junction of these enlargements with the straps, the ends of the straps are provided with ridges 46 which increase the thickness of the ends of the straps adjacent to the enlargements 45 to such an extent that this thickness closely approximates the widths of the slots 41. In addition the ridge 46 is provided at intervals with tines or raised fingers 48. Consequently when the straps have been positioned lengthwise of the tubes 40 in the desired locations, they are pulled in a direction to force the ridge 46 into the slot 41, whereupon the fingers 48 will be deformed or wedged in place, as clearly shown in FIG. 10, thus holding the straps securely against movement lengthwise against the tubes. The force of the feet of the user on the straps is also in a direction to urge the ends of the straps out of the tubes, thus holding these ends in securely locked positions in the tubes from which they can be unlocked by moving the ends of the straps into the tubes into the position shown in FIG. 9.

Each of the tubes 40 is provided adjacent to an end thereof with an enlarged opening 50 therein through which an end of the strap may be inserted by first pushing an end of the strap into the opening and then flexing the strap end and moving it lengthwise of the tube into the desired position.

Below the foot fittings or harness I preferably provide an elastic and foam rubber-like pad 53 in the bottom of the foot well. This pad may be made of a non-rigid, closed cell foam rubber or plastic material on which the foot of the user rests and which is mounted directly under the foot harness or fitting and extends forwardly and rearwardly from the same, as clearly shown in FIG. 4. This resilient and flexible foot pad 53 serves two purposes. In the first place, it forms a cushion-like pad on which the user stands and which adds materially to the comfort of the user, and in the second place the pad is made of such consistency that it is depressed somewhat in proportion to the weight of the user; a large person depressing a pad to a greater extent than a smaller, light weight

person. This consequently supplements the adjustment of the straps and makes it possible for the foot harness to adapt itself to persons of different sizes and consequently having different sized feet since a large, heavy person with large feet will depress the foot pad **35** to a greater extent than the smaller and light person. This consequently produces a larger space below the straps when the shoe is used by a large, heavy person, whereas a light person with small feet will depress the foot pad **35** to a lesser extent, thus forming smaller spaces between the straps and the foot pad. By arranging the slots in the tubes **40** to extend horizontally into the foot well, the ends of the straps will extend out of the slots in substantially horizontal directions and then must be bent upwardly to go over the users' foot. This fold or bend tends to compensate for variations in the widths of feet and helps to secure the foot from moving sideways. The heel harness strap **36** has at its upper end a forwardly extending lip **57** which bends up when in use and lies flatly against the upper back portion of the heel of the user for preventing a sharp edge of the strap **36** from bearing against the heel and also provides restraint in keeping the heel of the user from readily coming out of the heel harness. The highly elastic characteristic of this foot harness, however, makes it possible for the user to readily remove his feet from the harness and free himself of the shoes if desired.

It may be desirable at times to supplement the buoyant shoes against the possibility of breaking in the middle when subjected to unusual strains. This increasing of the strength of the shoes may readily be accomplished by incorporating a suitable tension member in each shoe which extends lengthwise thereof below the shoe well. For example, I have shown in the drawing a reinforcement member **60** which should, of course, be made of light material and which is molded within the body portion approximately midway between the sides of the shoe. I have found that a bamboo pole extending throughout a substantial portion of the length of the shoe serves this purpose very well for the reason that such poles are of relatively high tensile strength and are of sufficiently irregular shape so as to prevent the material of the body portion of the shoe from becoming loosened from the reinforcing member and permitting this member to slide relatively to the body portion of the shoe. For ordinary purpose however the shoes have plenty of strength without any reinforcing member incorporated in the same.

It may be desirable in some instances to roughen the outer faces of the sides of the straps to produce a finger grip on the outer surfaces of the straps to adjust the straps. Any desired kind of irregularity on the surface may be provided as shown at **62**, FIG. 13, and this roughening may be applied to both of the straps.

It will be understood that various changes in the details, materials and arrangements of parts which have been herein described and illustrated in order to explain the nature of the invention may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

I claim:

1. A buoyant shoe having a body portion formed of a solid block of rigid foam plastic material, flippers each consisting of a single piece of resilient plastic material each having one end thereof secured to said body portion and normally extending downwardly and rearwardly from the bottom of said shoe and bendable into positions lying close to the body of the shoe when the shoe is in forward motion and to extend outwardly from the body of the shoe to oppose rearward motion of the shoe, said body portion having slotted tubes secured therein, the upper parts of said flippers extending into said tubes through the slotted portions thereof and held therein against removal therefrom, said slotted portions being of sufficient width to permit limited movement of said flippers transversely of said slotted portions without releasing said flippers from said tubes.

2. A buoyant shoe according to claim 1 characterized in that the parts of said flippers which extend into said slots are flexible to pass through said slots and expandible in said tubes to prevent passing of said parts of the flippers out of said tubes through the slots therein.

3. A buoyant shoe according to claim 1 in which the upper parts of said flippers have neck portions formed to pass into the slot of a tube, and each having a resilient wing extending outwardly from said neck portion and foldable toward said neck portion and passing through said slot into said tube and flexing outwardly away from said neck and said slot when within said tube, the ends of said wings being positioned to engage the tube in spaced relation to said slot to prevent withdrawal of said upper part of said flipper from said tube, said wings fitting loosely in said tube to permit limited movement of said flippers relative to said tube, transversely thereof.

4. A buoyant shoe according to claim 3 in which said tubes are molded in said body portion and secured in place by adhesion to said body portion.

5. A buoyant shoe having a footwell in the upper surface thereof to receive the foot of the user, and a foot harness within said footwell comprising an elastic strap positioned to extend over the front portion of the foot and another strap formed to receive the heel of the user, said straps being adjustable toward and from each other to fit feet of different sizes, means for securing said straps in adjusted positions, in the foot well, slotted tubes secured to said shoe at opposite sides of said foot well, said straps having ends of greater thickness than the width of the slots in said tubes and slidable lengthwise of said tubes to adjust said straps relative to each other, and means for locking said straps against movement relative to said tubes.

6. A buoyant shoe according to claim 5, in which the ends of said straps are of greater thickness than the widths of said slots to form stop means to prevent the ends of said straps from passing out of said tubes through said slots, the ends of said straps also having portions adjacent to said stop means which are of such thickness as to fit snugly within said slots to prevent movement of said straps lengthwise of said tubes.

7. A buoyant shoe according to claim 6, in which said tubes are provided adjacent to one end thereof with enlargements of said slots through which said enlargements of said straps when flexed may be passed lengthwise into said tubes.

8. A buoyant shoe according to claim 6 in which said straps adjacent to the ends thereof are provided with ridges which are spaced apart and deformable by a wall of a slot when pulled into said slots to prevent the ends of said straps from moving lengthwise of said tubes.

9. A buoyant shoe having a one-piece body portion extending from end to end of the shoe and formed of a unitary block of sealed cell rigid foam plastic, said body portion having a foot well extending downwardly from the upper surface thereof to receive the foot of a user, a foot harness within said foot well comprising straps positioned to fit the foot of a user, slotted tubes molded in said body portion and secured in place by adhesion to said body portion and having slots opening in the lower portion of said foot well, said strap having the end portions thereof formed to fit into said tubes, and means on said straps for preventing the ends of said straps from passing out of said tubes through said slots.

10. A buoyant shoe formed of a closed cell foam material and having a foot well recessed in the upper portion thereof, and surrounded on all sides by said material, a foot harness in said well for releasably securing a foot

of the user, said foot well having a rear wall sloping gradually at an angle of approximately 25° from the bottom of said foot well to the upper surface of said buoyant shoe to enable water to flow upwardly along said rear wall out of said foot well and off said upper surface of the shoe when the shoe is moved forwardly.

11. A buoyant shoe having a one-piece body portion extending from end to end of the shoe and formed of a solid block of sealed cell rigid foam plastic to produce a buoyant shoe which is waterproof and incapable of leaking when cut or punctured, and a reinforcing member comprising a bamboo pole completely embedded in the body portion of the shoe and extending lengthwise of the lower portion of said body portion throughout a substantial portion of the length of the shoe.

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