Aug. 17, 1948. H. S. JONES 2,447,123

THERAPEUTIC DEVICE

Filed Aug. 9, 1944

Fig-6

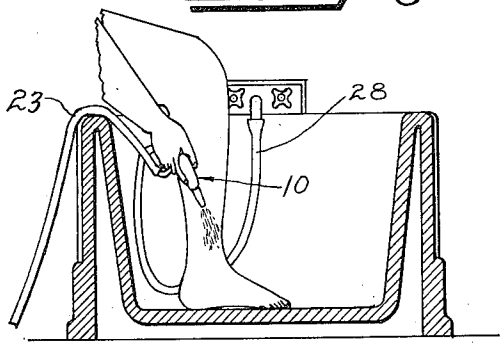


Fig-1

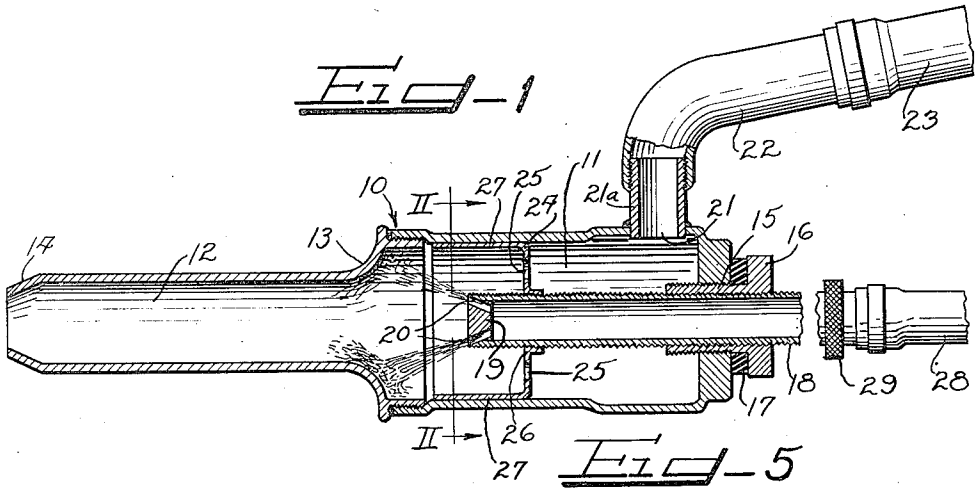


Fig-5

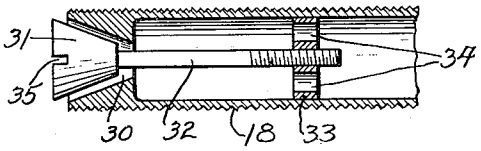


Fig-2

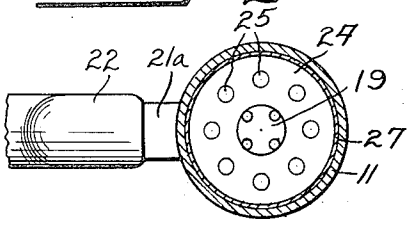


Fig-4

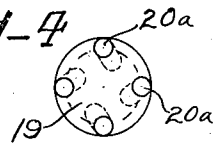
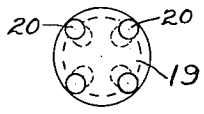


Fig-3



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THERAPEUTIC DEVICE

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5 Claims. (Cl. 261—116)

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This invention relates to a therapeutic device for mixing and projecting liquid and gas, and more particularly to a device for use in hydrotherapy for mixing air with a stream of water and projecting the mixed stream against an afflicted portion of the body.

In the relief and cure of various bodily ailments, the application of water, usually hot water, is a common treatment. In such treatment, running water is preferable because the source may be maintained at a constant desired temperature, while still water cools with relative rapidity, so that treatment at the desired temperature is maintained for only a short period. In order to increase the beneficial results of the treatment, the water is agitated, and air is introduced to supply oxygen to the skin, so that the submerged portion of the body may remain in the water for relatively long periods of time.

The device of this invention may be used to administer such treatments, and is adapted to be used either under water or in air. This latter feature is important, because it permits a more stimulating treatment to be administered, and enables more perfect control. The device is simple and inexpensive, and enables the administering of hydrotherapeutic treatments in the home, eliminating the need for expensive and complicated equipment which is largely limited to hospitals and the like. The device is just as effective in use under water as devices now in use, and in addition, allows the water to be directed as desired readily and conveniently.

The device of this invention, furthermore, may be used in many other ways. For example, it may be used in washing and rinsing hair, in bathing, and in various other ways.

The device of this invention is intended to be hand held for use and mixes air with the stream of water in the form of small bubbles, and projects the resulting milky stream of water and air in a desired direction. The device is adjustable in accordance with varying water pressures, so that a proper mixture is obtained regardless of the pressure. In the present device, air is positively mixed with the water, in contrast to prior devices, in which the introduction of air into the bath is a more or less haphazard matter.

It is an object of this invention to provide a device for mixing and projecting a liquid and gas.

It is also an object of this invention to provide a device for mixing and projecting a liquid and gas which is adjustable to assure proper mixing regardless of variation in the pressure of the liquid.

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It is a further object of this invention to provide a device for mixing a liquid and gas having no moving parts, the mixing being accomplished within the device by simple means.

Still another object of the invention is the provision of means in a device for mixing liquid and gas to prevent the gas from entering the mixing chamber in such a strong stream as to resist mixing with the liquid.

A still further object of the invention is the provision of a device for mixing liquid and gas in which the mixing is accomplished by directing streams of the liquid against means within the device which changes the direction of stream travel and thereby entraining bubbles of gas, the flow of which is induced by the flow of the liquid.

Other and further objects and advantages of the present invention will be apparent to those skilled in the art from the following description and the appended drawings.

In the drawings:

Figure 1 is a longitudinal sectional view of the device of this invention;

Figure 2 is a cross-sectional view of the device taken on the line II—II of Figure 1;

Figure 3 is an end view of the means for directing the liquid within the device;

Figure 4 is an end view similar to Figure 3, but illustrating a modified form of directing means;

Figure 5 is a longitudinal sectional view of the liquid conduit in the device, showing in elevation another form of liquid directing means; and

Figure 6 is a view showing the projection of a stream of mixed liquid and gas against a portion of a human leg, a bathtub being shown in cross section.

For convenience, the invention is described as embodied in a hand held hydrotherapeutic device for the application of a stream of mixed hot water and air to the human body, although it will be understood that cold water may be used, or that liquids and gases other than water and air may be mixed and projected by the device, and that the use of the device is not limited to hydrotherapy.

As shown in the drawings, the device comprises a casing 10 forming a chamber portion 11 and a forward nozzle 12. Although the device is shown as formed in two parts and as generally cylindrical, it will of course be understood that it may be of more or fewer than two parts and need not be cylindrical. The nozzle portion 12 is of a smaller cross-sectional area than the chamber 11, and has a flared or tapered rear portion 13 merging with the wall of the chamber 11. The

nozzle portion is narrowed about its mouth, to define a restricted outlet as indicated at 14, to increase the velocity of the stream issuing from the nozzle. Threaded through the rear wall of the chamber 11 is a sleeve 15 having a flange 16 on its outer end to compress a packing 17 or the like between the flange and the chamber wall to seal the opening in the wall. The interior of the sleeve 15 is threaded to receive a tube or conduit 18 which is externally threaded along a considerable portion of its length to correspond to the internal thread of the sleeve. The conduit 18 thus extends through the sleeve 15 into the chamber 11 to conduct water under pressure into the casing 10 and through the nozzle. The forward end of the conduit 18 is closed in any suitable manner, as by a plug 19. Passages 20 extend through the plug 19 at an angle, the forward ends of the passages being spaced farther apart than the inner ends, so that water from the conduit 18 is directed divergently toward the tapered wall 13. An opening 21 is provided in the casing 10 near the rear wall of the chamber 11 in which a nipple 21*a* or the like may be secured in any suitable manner, as by soldering. A bent tube 22 may be secured to the nipple 21*a* in any suitable manner, and a flexible tube, such as a rubber hose, may be attached to the bent tube 22. The opening 21 provides an inlet for air into the chamber 11. The flow of air is induced by the flow of water through the conduit 18, passages 20, and the nozzle 12. To prevent the air from flowing in too strong a stream to mix with the water, a baffle is provided to break up the air stream into a plurality of streams distributed about the periphery of the chamber 11. This baffle may take the form of a plate 24 extending across the interior of the chamber 11 and having a plurality of apertures 25 therein to permit passage of air through it. The plate 24 is disposed between the inlet 21 and the closed end of the conduit 18. For this purpose, the plate has a central opening of a size to accommodate the conduit 18, with a flange or collar 26 formed adjacent the opening, which may be threaded so that the conduit 18 may be screwed through it. At the periphery of the plate 24 a relatively deep flange 27 may be formed, so that the plate 24 and flange 27 comprise a cup-like member fitting snugly within the chamber 11. It will be obvious that by this construction the plate 24 is held in proper position across the interior of the chamber 11. It will also be seen that baffle means other than the plate 24 may be used, and that means other than those set forth may be utilized to hold the baffle in desired position.

In operation, water passes under pressure into the conduit 18 through a flexible tube 28 from a suitable source, and flows through the passage 20 to strike against the tapered wall 13 with considerable force. At the same time, air flows through the inlet 21 and the apertures 25 of the baffle plate 24 under the influence of the flow of water through the passages 20. The water impinging on the tapered wall 13 creates a turbulent zone in which the air and water are thoroughly mixed, the air being broken up into small bubbles which are entrained in the water and which because of their small size do not readily separate from the stream of water. The stream of mixed water and air flows through the nozzle 12 and issues from the nozzle opening 14 as a milky stream, which may be projected in any direction desired. It will be obvious that different pressures of the water passing through the conduit 18 will result in variations in the force with which the water or other liquid strikes the tapered wall 13, as well as of the quantity of water which flows through the passages 20, and this in turn results in variations in the proportion of water in the air and water mixture. In addition, the quantity of air flowing through the inlet 21 is governed by the flow of water through the passages 20, and since this varies in accordance with the water pressure, the proportion of air in the air and water mixture also varies in accordance with the liquid pressure. To assure a proper mixing of the air and water in the correct proportions to accomplish the desired result, the device may be adjusted in accordance with the water pressure. This adjustment is accomplished by screwing the conduit 18 so as to advance the closed end thereof closer to the tapered wall 13 or to retract it farther from the wall 13. In general, the closed end of the conduit 18 is advanced when the water pressure is low, and retracted when the pressure is high. For convenience in adjusting the position of the conduit 18, a projection 29, which may be knurled, is provided on the outer portion of the conduit.

In Figure 4 there is shown a modification of the closed end of the conduit 18 which is adapted to impart a whirling motion to the streams of water as they impinge upon the tapered wall 13, to assist in the mixing action of the water and air as previously described. In this modification of the invention, the structure is substantially the same as that already described, except that for the passages 20 through the plug 19 there are substituted passages 20*a*. The passages 20*a* are each angled both axially and radially, so that the water issuing therefrom tends to whirl about the surface of the tapered wall 13, as well as rebound therefrom, and thus produces a somewhat different mixing action from that accomplished by the first described form of the invention.

In Figure 5 there is illustrated another modification of the invention, which is similar to those already described, except for the structure of the inner end of the conduit 18. In this modification, the inner or forward end of the conduit 18 is formed with a rearwardly tapering opening 30. A conical plug 31 corresponding in size and shape to the opening 30 is disposed in centered relation to the opening, and held in position by means of a rod 32 extending from the small end of the plug to a bridge member 33 secured inside the conduit 18. The bridge 33 may be of any suitable structure, and by way of example is illustrated as a plate of substantial thickness and having a diameter corresponding to the internal diameter of the conduit 18. A plurality of apertures 34 are provided in the bridge 33 for passage of water through the conduit. In the center of the bridge 33 is a threaded opening into which the rod 32 extends, the rod 32 being provided with threads to coact with the threaded opening of the bridge 33. A screw driver slot 35 may be provided in the larger end of the plug 31 for convenience in turning the plug and the rod 32. It will be seen that the plug 31 may be adjusted in or out of the opening 30 to provide lesser or greater clearance between the plug and the opening, and thus regulate the quantity of liquid passing through the opening, by rotating the plug to screw the threaded end of the rod 32 backward or forward in the bridge member 33. With this construction, the water is projected against the tapered wall 13 in the form of a conical sheet, so that a more uniform distribution of

the water is obtained, and the mixing of the water and air is facilitated.

In Figure 6 the device is shown as being utilized in the treatment of a human leg, the leg being in the open air, and not submerged in water. The flexible tube 26 supplying liquid to the conduit 13 is shown as attached to the tap of an ordinary bathtub. The flexible tube 23 to conduct air to the bent tube 22 and nipple 21a for passage into the chamber 11 through the inlet 21 is illustrated in this figure, although it will be obvious that when the device of this invention is not submerged, and air is being drawn into the chamber 11, the flexible tube 23 is not necessary. When the device is used under water, the tube 23 is attached to the bent tube 22 and of course is made of such length that it extends out of the submerging liquid under all normal circumstances.

The submersion of a portion of the human body in water, particularly in hot water, cannot be too prolonged under ordinary circumstances because oxygen must be supplied to the exterior of the skin to aid in getting rid of excretions issuing from the pores and to permit the skin to "breathe." This oxygen, of course, may most readily be supplied by supplying air. In addition to furnishing oxygen, the air causes a bubbling or effervescence of the water which has a beneficial stimulating effect on the nerves and tissues, and also has a slight massaging effect. The device of this invention increases the beneficial result, by reason of the mixture of the air and water in the device before the stream of water is introduced into the bath liquid. The air is carried by the water in the projected stream to the afflicted spot or surface where it is desired, and is not disseminated throughout the bath liquid, a large proportion of which at any given time is not being utilized in the treatment. Furthermore, the prior mixing of the air and water in the device results in the air being entrained in the water in the form of small bubbles, which do not readily escape from the stream projected by the device, so that the projected mixed stream retains its identity and force over a considerable distance, and does not readily mix with the submerging liquid, so that the treatment is more concentrated, as it were, and greater benefits are produced in a shorter time. Moreover, a given quantity of air in the form of many small bubbles is more effective than in the form of a few large bubbles in the treatment of conditions in which hydrotherapy is indicated.

The device of this invention provides another great advantage, namely, that it may be used on any part of the human body without submerging the part. The quantity of water required for treatment is considerably reduced, thus reducing the cost of treatment. Furthermore, with this invention, hydrotherapeutic treatments may be administered without the use of complicated and expensive equipment, making it possible to administer such treatments in the patient's home, in many cases by the patient himself.

The fact that the device may be used to treat a part of the body without submerging the part also provides another important advantage. The air bubbles in the mixed stream strike against the body with sufficient force to give a light massaging action. This results in a most beneficial stimulation, and one might say exhilaration, of the body parts, which cannot be achieved by prior devices, since the pressure of the bath liquid into which the air is injected necessarily weakens the impact of the air on the submerged body parts. The use of this device instead of a shower bath has a similar stimulating effect, and results in a most refreshed feeling.

Although the device of this invention has been illustrated as of a convenient size to be grasped by the hand, it will be obvious that the scale may easily be varied, and that if desired, the device may be mounted as a part of permanent hydrotherapeutic equipment.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. A nozzle comprising a casing having a rear chamber portion and a reduced forward discharge portion having a restricted outlet opening, an air inlet in said chamber portion, an apertured baffle in said chamber portion forwardly of said air inlet, a water conduit extending into said chamber and through said baffle, and a plug fixed in and closing the forward end of said water conduit and having a plurality of divergent passages therethrough extending in the direction of the juncture of said chamber portion and reduced portion.

2. A hand-held therapeutic apparatus comprising a casing and a nozzle coaxially arranged for mixing and discharging air and water, the junction between said nozzle and casing forming a convergent throat, an air stream inlet adjacent the rear end of said casing, a water inlet tube entered in said casing through its rear end and having its discharge end adjacent said throat, a perforated baffle plate across said casing and encircling said tube and disposed between the air inlet and the tube discharge end to break up the air stream entering through said inlet, means at the discharge end of said tube to project the discharge water in a plurality of jets against said convergent throat to thereby create a zone of turbulence to mix with the air stream, and said last means comprising means forming water passages so angled relatively to the convergent throat as to impart a whirling action to the jets as they strike said throat.

3. A therapeutic device comprising means providing a casing having a chambered interior, a nozzle extending from one end of said casing having the major portion thereof of less cross-sectional area than the cross-sectional area of said chamber and having a discharge opening of restricted size, the other end of said casing supporting a cylindrical tube axially of the casing and extending through said other end of said casing with the outer or rearward end of said tube terminating outwardly of said casing end and the inner or forward end of the tube terminating near but spaced from said nozzle, the inner or forward end of said tube being closed by an apertured plug, the plug apertures in their lengths diverging from the axis of the tube and disposed to direct discharge from said tube toward the junction between said casing and nozzle, means for providing an air inlet to said chamber, and said tube being axially adjustable in said casing to properly mix air and liquid in accordance with the liquid pressure.

4. A therapeutic device comprising means providing a casing having a chambered interior, a nozzle extending from one end of said casing

having the major portion thereof less cross-sectional area than the cross-sectional area of said chamber, the other end of said casing supporting a tube axially of the casing and extending through said other end of said casing with the outer or rearward end of the tube terminating outwardly of said casing end and the inner or forward end of the tube terminating near but spaced from said nozzle, means immovably fixed in the said inner or forward end of the tube to direct water discharge from said tube toward the junction of the nozzle and chamber, means providing an air inlet to said chamber, and said tube being threaded in said other end of said casing for axial adjustment of the tube with respect to the casing to regulate the liquid and fluid mixture in accordance with the liquid pressure.

5. A therapeutic device comprising means providing a casing having a chambered interior, a nozzle extending from one end of said casing having the major portion thereof less cross-sectional area than the cross-sectional area of said chamber, the other end of said casing supporting a cylindrical tube axially of the casing and extending through said other end of said casing with the outer or rearward end of said tube terminating outwardly of said casing end and the inner or forward end of said tube terminating near but spaced from said nozzle, the inner or forward end of said tube being closed by an apertured plug, the plug apertures in their

lengths diverging from the axis of the tube and disposed to direct discharge from said tube toward the junction between the casing and nozzle, means providing an air inlet to said chamber, the other end of said casing having a wall centrally apertured, and said tube being threaded in said aperture for axial adjustment of the tube with respect to the casing to regulate the air and water mixture in accordance with the water pressure.

HARRY SLOPER JONES.

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