May 28, 1957 H. H. SCHWARTZ 2,793,640

APPARATUS FOR HYDROTHERAPEUTIC TREATMENT

Filed March 21, 1952 2 Sheets-Sheet 1

FIG. 1

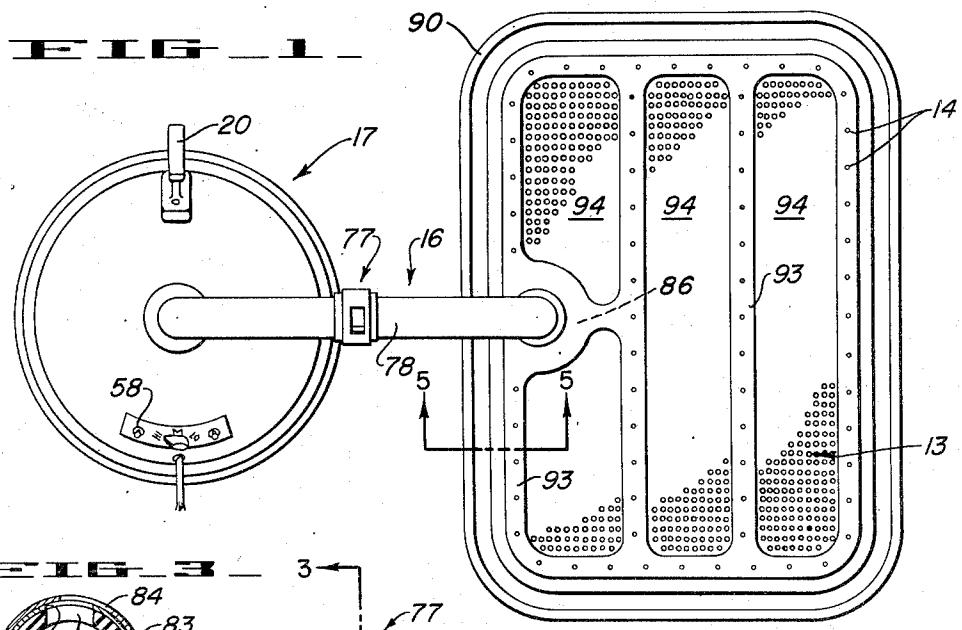


FIG. 3

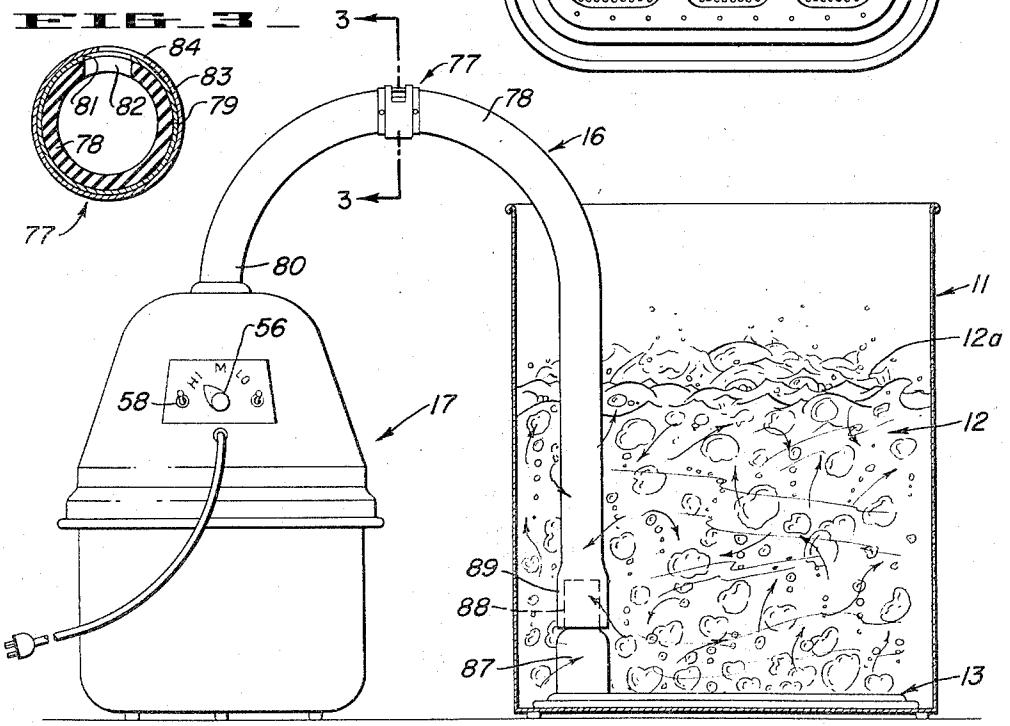


FIG. 2

INVENTOR.
Hal H. Schwartz

BY Manfred B. Harren
His Attorney

May 28, 1957 H. H. SCHWARTZ 2,793,640

APPARATUS FOR HYDROTHERAPEUTIC TREATMENT

Filed March 21, 1952 2 Sheets-Sheet 2

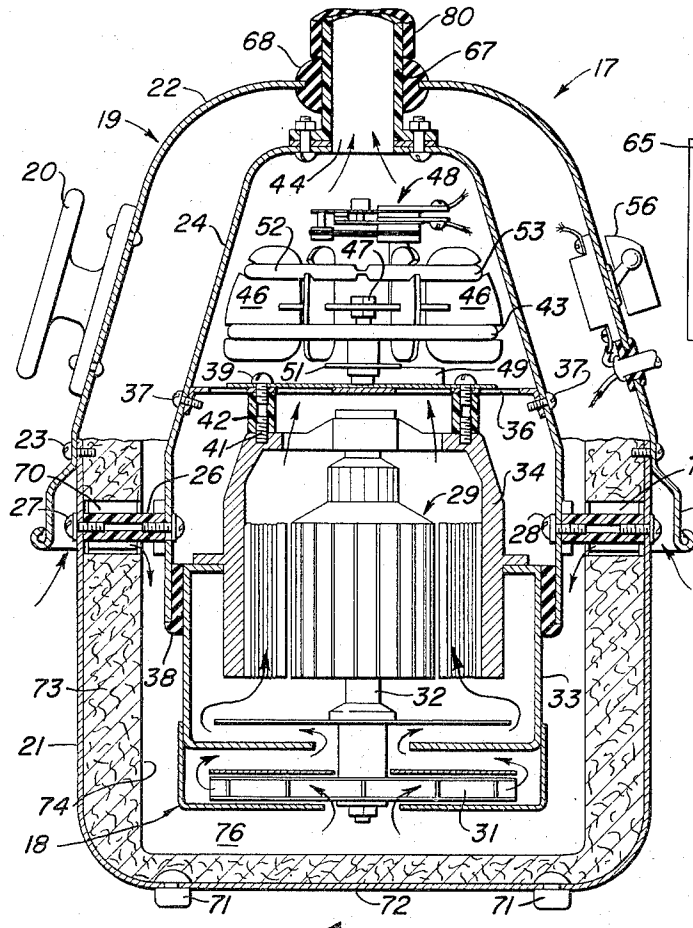


FIG. 4

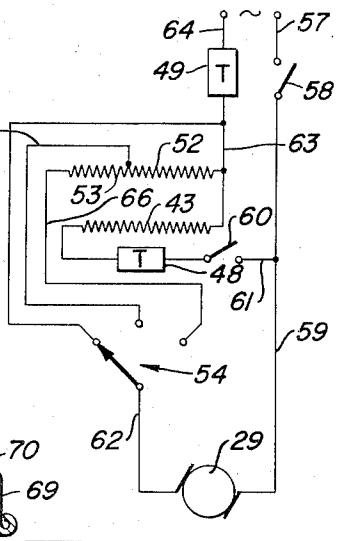


FIG. 8

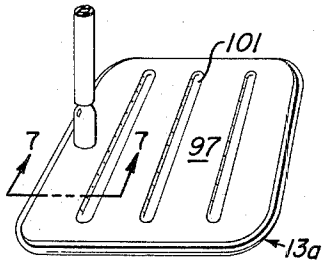


FIG. 6

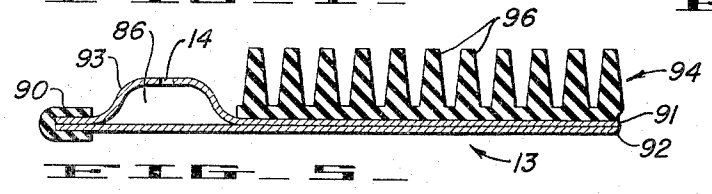


FIG. 5

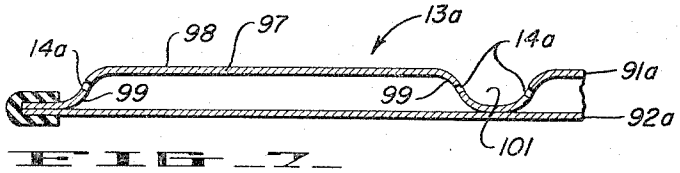


FIG. 7

INVENTOR.
Hal H. Schwartz
BY
Manfred D. Warren
His attorney

United States Patent Office 2,793,640 Patented May 28, 1957

2,793,640

APPARATUS FOR HYDROTHERAPEUTIC TREATMENT

Hal H. Schwartz, Mill Valley, Calif., assignor to Vibra-Bath Corporation, a corporation of California

Application March 21, 1952, Serial No. 277,788

1 Claim. (Cl. 128—66)

The invention relates to devices providing and agitating a water bath for therapeutic treatment of a human body immersed therein.

Hydrotherapeutic baths have, in general, consisted of two broad classifications or types. In one the patient is immersed in a warm water bath and the water is caused to flow or circulate over the body or portions thereof being treated. A common form of this type is sometimes called a whirlpool bath, wherein the apparatus is provided with a water pump which discharges a jet or stream of water into the bath at a point below the surface of the water and the body undergoing therapy is positioned in the path of the jet. Air is sometimes introduced into the jet so as to increase the level of tolerance of the body to elevated water temperatures and also to soften the impact of the moving water stream with the portion of the body undergoing therapy. The other type of hydrotherapeutic bath is one in which the water is relatively still as a body but aerated in a manner similar to a natural carbonated mineral bath. In this type, air or other gas is released into the bath to form myriads of tiny bubbles in a foaming, effervescent effect, which flow gently up and over the skin of the bather. In accordance with the present invention and as a principal object thereof, I have provided a new and improved type and character of agitation of a water bath for hydrotherapeutic treatment, in which is obtained a more effective manipulative and massaging action of a specific character than heretofore available.

Another object of the invention is to provide in a hydrotherapeutic bath of the character described a multidirectional churning agitation and in which the agitative action may be quickly and easily correlated with the depth and size of the bath to obtain a most effective or optimum action throughout a desired area.

A further object of the present invention is to provide an apparatus of the character described in which air is introduced into the bath to cause the aforesaid churning action and the air is heated to offset the cooling evaporative action of air bubbles in the bath without excessive heating of the bath.

A still further object of the present invention is to provide an apparatus of the character described in which the novel manipulative action of the churning water may be supplemented where desired by a mechanical massaging action.

Yet another object of the present invention is to provide a hydrotherapeutic apparatus of the type described which is of simple and rugged construction with a minimum number of parts and wherein all moving parts are removed from the bath, and which is readily portable and

easy to set up and instantly use at most any location without special installation being required.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following descriptions of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawings and description may be adopted within the scope of the invention as set forth in the claim.

Referring to said drawings:

Figure 1 is a plan view of a hydrotherapeutic apparatus constructed in accordance with the present invention.

Figure 2 is a side elevational view of the apparatus with the container for the bath being shown in section.

Figure 3 is a cross-sectional view, on an enlarged scale, of a valve forming part of the apparatus and is taken substantially on the plane of line 3—3 of Figure 2.

Figure 4 is an enlarged vertical cross-sectional view taken through the center of the blower unit forming a part of the apparatus, the internal electrical wiring being deleted for clarity of illustration, and shown in schematic form in Figure 8.

Figure 5 is an enlarged fragmentary cross-sectional view of a portion of the air manifold only, taken substantially on the plane of line 5—5 of Figure 1.

Figure 6 is a perspective view on a reduced scale of a modified form of air manifold.

Figure 7 is an enlarged fragmentary cross-sectional view of a portion of the modified air manifold and is taken substantially on the plane of line 7—7 of Figure 6.

Figure 8 is a schematic wiring diagram of the electrical parts and their connections.

The hydrotherapeutic device of the present invention, and as shown in the accompanying drawings, includes a container 11, for a water bath 12, and an air manifold 13, mounted in the container beneath the surface of the water and provided with a plurality of apertures 14 generally distributed over the manifold, together with conduit means 16 connected to the manifold and adapted to provide communication between the manifold and a source of air providing a relatively large volume of air at a relatively low pressure, whereby optimum volumes of air will be released into said bath for producing a turbulent churning action therein. In accordance with the present invention, the total area of the apertures is proportioned to coact with the relatively large volume and relatively low pressure air supplied to the manifold and with the head of liquid overlying the apertures to provide a relatively small pressure drop across the apertures whereby air will pass from the manifold into the bath in relatively large horizontally spaced masses producing a maximum churning action in the bath.

It has been found that, in an apparatus constructed in accordance with the present invention and employing an air manifold of approximately 1½ square feet of horizontal area disposed in the ordinary bath depth of approximately one to two or three feet below the surface of the liquid bath, the novel churning and vibrating type of action herein depicted of the bath may be obtained by furnishing a volume of air to the manifold ranging between 15 to 60 cubic feet of air per minute at a pressure of ¾ to 2½ pounds per square inch above atmospheric pressure. The relatively large volume of air thus intro-

duced into the bath through the horizontally distributed apertures at the range of pressures indicated causes the formation of large intermittent air masses throughout the bath over the manifold which, in their rising action, create the novel multidirectional agitation and churning of the water and produce currents which impinge with more or less equal vigor against and effectively manipulate, displace and massage the various portions of the body in the bath over the manifold.

Any suitable source of air under pressure may be used capable of furnishing the relatively large volume of low pressure air as above described. Preferably and as here shown this source comprises an electric motor driven blower air supply unit **17** which will provide the needed large volumes of air at relatively low pressure. This unit also preferably houses auxiliary air heating means and controls so as to comprise a completely self-contained, portable air supply unit for the apparatus, and which may be conveniently connected to the air manifold **13** by the above described conduit means **16**.

As may best be seen from Figure 4 of the accompanying drawing, the air supply unit **17** includes an electric motor and blower assembly **18** mounted in a two-part housing **19**, preferably having a carrying handle **20** secured thereto and consisting of a generally cylindrical, pail-shaped lower shell portion **21** and an inverted mating upper shell portion **22** here releasably secured to the portion **21** by screws **23**. An inner shell **24** is mounted in concentric relation within the housing **19** and is supported therein by means of spacer members **26** secured to the housing portion **21** and **24** respectively by screws **27** and **28**. The unit **18** includes an electric motor **29** having a rotary impeller **31** mounted on and driven by the motor shaft **32** for rotation within a blower cage **33**, the assembly being here secured concentrically within the inner shell **24** by fastening a mounting frame portion **34** of the unit to an open spider member **36** in turn secured, as by screws **37**, across the shell **24** while the frame **34** is secured to the member **36** by opposed screws **39** and **41** engaging the opposite ends of spacer members **42**. Additionally the cage **33** is centered by a surrounding gasket **38** engaging between the cage and the lower end of shell **24**.

As an important feature of the present invention, means is provided for heating the air delivered from the air supply unit **17** to the air manifold **13** in order to offset, at least in a large part, the cooling evaporative action of the air introduced into the water bath. In this manner the required temperature may be maintained in the bath for at least short intervals of treatment without using a heater directly in the bath or adding heated water thereto. It is also desirable that the air be heated in order to avoid an uncomfortable chilling which may be encountered when the body is placed quite close, within about two inches, of the apertures, where cold air is used. As here shown, this means for heating the air is incorporated in the air supply unit **17** and consists of an electrical heating element **43** disposed in the air stream passing from the blower **18** to the exhaust opening **44** of the air supply unit. As may best be seen in Figure 4, the heating element **43** is here supported on insulating members **46** which are in turn carried by a supporting post **47** mounted upon the spider member **36**. It is also essential for the comfort and protection of the patient that the air not be overheated. Air jets having a temperature in the neighborhood of or above 180° F. will produce burning of the skin in a matter of minutes where the body is positioned upon or in close proximity to the manifold. The danger of burning is particularly important in the treatment of paralyzed, insensitive body portions. A desirable and effective range of air temperature is from about 90° F. to 180° F. In order to prevent overheating of the air a thermostatically operated electric switch **48** is connected in the electric circuit to the element **43** and is mounted in heated air flow down stream of the element so as to open the electric circuit, whenever the temperature of the air rises above its preset value, preferably 170° F. to 180° F.

As a further safety measure, a second thermostatically operated electric switch **49** may be mounted as here shown in the cool air stream ahead of the heating element with the thermostat **49** being adapted to warm up and shut off the current through the heating element should the flow of air through the air supply unit be halted for any reason, such as motor failure or blockage of the air inlet or discharge openings. Preferably the thermostat **49** is provided with suitable baffles or fins **51** arranged to prevent radiant heating of the safety thermostat and shutting off of the unit while the air is flowing.

As previously described, a definite coaction exists between the volume and pressure of air supplied to the apertures, the total area of the apertures, and the head of liquid over the apertures. It is frequently desirable to vary the depth of the liquid bath in the container **11** for various types of hydrotherapeutic treatment. In order to accommodate the apparatus to such variations in the depth of the liquid, means is provided for controlling the volume and pressure of air delivered to the manifold through the conduit **16**. In the present apparatus, this means is embodied in a manually adjustable control for the electric motor speed and includes one or more resistors **52** and **53** insertible in the lead to the motor **29** to provide the aforesaid control of the motor speed. Selective insertion of the resistors in the lead is accomplished by a multiple pole switch **54** mounted on the housing **19** and having manually engageable knob and indicator member **56** movable to positions designated as high, medium and low. Preferably, when used with a manifold of about 1½ square feet as herein described, the low position of the selector switch **54** will energize the air supply unit to furnish approximately 15 cubic feet of air per minute at a pressure of approximately ¾ of a pound per square inch above atmospheric pressure, while in the high position the unit will furnish in the neighborhood of 60 cubic feet per minute at a pressure of approximately 2½ pounds per square inch above atmospheric pressure. This range of pressures and volumes has been found to produce the above described novel multidirectional churning action through the liquid of the bath as contrasted to a mere effervescent effect above noted. By the use of the control **54**, the intensity of this multidirectional churning action may be selected for most effective therapeutic treatment within the range indicated.

A schematic circuit diagram is illustrated in Figure 8 of the electrical parts and their connections. A power supply lead **57** is connected to one side of an on-off switch **58** which has its other side connected by leads **59** and **61** to the motor **29** and the air temperature thermostat **48**, respectively. The motor **29** is connected by lead **62** to the selector arm of switch **54**. As here shown, the motor speed control switch **54** is of the three-pole type providing low, medium and high speed of the motor **29** and with the poles so designed in the drawing. In the high speed pole, the pole is connected by conductor **63** to the other power lead **64** through the high temperature thermostat switch **49** so that in the "high" position of the switch full line voltage is applied to the motor. The "medium" pole of the switch is connected by conductor **65** to one side of resistor **52** having its other side connected to lead **63** and the power lead **64**, so that in the "medium" position the line voltage is reduced by the drop through resistor **52** prior to reaching the motor. The "low" pole is connected by conductor **66** to one side of resistor **53** having its opposite end connected to resistor **52** so that in the "low" position of the switch resistors **53** and **52** are positioned in series with the motor to effect a further voltage drop. The electrical heating element **43** is wired between the thermostat switch **48** and the high temperature thermostat switch **49** as indicated, so that the heating element will be normally energized upon closing of the master switch **58**. Preferably,

an on-off switch **60** is interposed in the lead **61** between the master switch **58** and the thermostat **48** in order to permit selective turning off of the circuit to the heating element **43** while the motor **29** is running.

As above noted, one of the important features of the present invention lies in the complete portability of the air supply unit and the attached conduit means and air manifold. The unit may, accordingly, be easily transported from container to container, if desired, and is ideally adapted for home use and treatment by utilizing the bathtub of the patient for the container. In view of the wide extent and variety of installations possible with this apparatus, it is essential that all of the electrical parts be carefully insulated, particularly with respect to the outer casing **19** of the air supply unit **17** and that precaution be taken against wetting of the parts and possible short-circuiting of the motor. In the present apparatus this insulation of the parts is achieved by forming the spacer members **26** and **42** and the gasket **38** of suitable non-conducting material and by providing the exit opening **44** in the form of a tube member **67** also composed of non-conducting material and being further provided with a sealing gasket **68** between the tube **67** and the upper member **22** of the housing **19**. Further protecting of the motor **29**, from water which may be accidentally splashed from the bath, is provided by extending the lower edge of the upper member **22** downwardly and outwardly to form a bell-shaped skirt portion **69** adapted to surround and conceal peripheral openings **70** provided in the housing member **21**. Additional insulation may be provided by non-conducting foot members **71** here secured to the bottom portion **72** of the member **21** as shown in Figure 4. By the complete electrical isolation of the casing and other manually engageable parts, an electrical ground may be obviated.

In order to provide an air supply unit **17** having a desired quietness of operation, for convenient use in homes and hospitals, clinics, or the like a layer **73** of suitable sound insulating material such as glass wool or the like may be mounted, as here shown, around the inner sides and bottom of the member **21**. The inner surface **74** of the sound insulating material **73** is preferably spaced from and arranged in concentric relation to the cylindrical sleeve portion **33** of the frame **34** in order to provide a passageway **76** for air flow from the intake openings **70** to the blower impeller **39**.

Auxiliary means **77** is here shown mounted in the conduit means **16** for providing a finer control of the volume and pressure of air delivered therethrough to the manifold **13**. For convenience in transportation and installation, the conduit means is shown in the present apparatus as comprising a flexible hose **78** formed of rubber or the like, which has an end **80** formed for detachable engagement over the tube **67** of the air supply unit. The means **77** consists of a valve here shown of a bleeder type adapted to allow a portion of the air coming through the conduit to be vented to the atmosphere. As may best be seen in Figure 3, the valve consists of a cylindrical metal ring **79**, embracing the hose **78** and having an opening **81** formed therein in alignment with a corresponding opening **82** provided in the hose. A second, closely fitting metal ring **83** is slidably mounted in concentric relation about the ring **79** and has formed therein an opening **84** which may be adjustably moved into and out of alignment with the openings **81** and **82** to permit bleeding off of any desired amount of air from the conduit **16**. As will be appreciated, either the three-speed motor control previously described or the valve means **77**, which may be inserted in the line as a flow-restricting or cut-off valve, if desired, may be utilized separately or in cooperation for controlling the pressure and volume of air delivered to the manifold, with the valve means **77** having the added virtue of adapting the apparatus for use with other sources of air under pressure and providing increased accuracy of control when used in connection with the variable speed motor of the air supply unit **17**.

As may best be seen in Figures 1, 2 and 5 of the accompanying drawings, the air manifold **13** is here of generally flattened form and is adapted for mounting in the container **11** in a horizontal position at a spaced distance beneath the surface **12***a* of the water bath **12**. The air manifold is of plate-like configuration, adapted to focus and intensify vibrations transmitted to the liquid by the manifold and is provided with an integrally formed air distributing chamber **86**, communicating with the conduit **16**. The manifold **13** may be connected to the conduit **78** by means of an upwardly extending tubular portion **87** affixed to the air manifold and having an upper end portion **88** over which the end **89** of the hose **78** may be releasably engaged. Various materials may be used in the manifold such as metal or plastic and, as here shown, the manifold **13** is fabricated from a pair of relatively thin metal plates **91** and **92**, rigidly secured together, with the upper plate **91** being formed with raised rib portions **93** which cooperate with the flat lower plate **92** to define the aforementioned air distributing member **86**. As may be seen from Figure 1 of the drawing, the rib portions **93** are proportioned and arranged to provide a general distribution of the apertures **14**, which are formed in the upper sides of the rib portions over the horizontal area of the air manifold. The container **11** may be of any suitable dimensions and shape permitting the desired head of liquid over the apertures as previously described. Preferably, the manifold is provided with a rubber cushion or bead **90** around its peripheral edge to preclude marring or other damaging of the container.

The most active churning action in the bath occurs in a zone starting several inches above the manifold. Sometimes, however, it is desirable or necessary to support the body to be treated directly upon the manifold. In the latter instance it is essential that means be provided for supporting the body away from the apertures **14** in order to prevent blocking of the streams of air issuing therefrom. As may be best seen in Figure 5, such a supporting means has been incorporated in the present device in the form of a plurality of pads **94** mounted on the upper surface of the manifold between the rib portions **93** and formed with upwardly extending fingers **96** of soft, resiliently flexible material such as rubber or the like, with the fingers **96** being proportioned to support the body above the manifold and away from the apertures **14**. As a further feature, the fingers **96** are proportioned and arranged to provide a massaging action on the portions of the body resting thereon. As will be apparent, the aforementioned novel multidirectional churning action will manipulate and rock the body back and forth in a manner which will cooperate with the soft, compressible nature of the fingers **96** to effect a massaging action.

A modified form of air manifold **13***a* is illustrated in Figures 6 and 7, wherein a different form of construction is adapted for supporting the body to be treated away from the air openings. In this form of the invention the manifold **13***a* is also of generally flattened form and is composed of a pair of plates **91***a* and **92***a* similar in construction to the manifold **13** illustrated in the preferred embodiment. The means for supporting the body away from the apertures **14***a* is here provided by forming the upper plate **91***a* to provide comparatively broad planar rib portions **97** adapted to support the body directly on their upper surfaces **98** and having generally vertically extending sides **99** defining recessed valley portions **101** between the relatively elevated planar portions **98**. The air discharge apertures **14***a* are formed in the vertical sides **98** spaced beneath and away from the relatively raised planar portions **97**. In this manner the body will normally be supported on one or more of the portions **97** out of contact with the apertures **14***a* to permit free flow of the air streams into the bath.

I claim:

A hydrotherapeutic device for agitating a liquid bath for treating a body immersed therein comprising, an air manifold of generally flattened form adapted for immersion in said bath below the surface thereof and being formed with a plurality of apertures generally distributed over said manifold, pad means secured to said manifold and having upwardly projecting fingers of soft resiliently flexible material adapted to support the body away from said apertures, and a blower connected to said manifold for furnishing a relatively large volume of air at a relatively low pressure to said manifold for discharge into said bath through said apertures.

References Cited in the file of this patent

UNITED STATES PATENTS

1,350,974	Kolshorn	Aug. 24, 1920
1,699,198	Millmather	Jan. 15, 1929
1,716,109	Bruggmann	June 4, 1929
1,896,938	Borowsky	Feb. 7, 1933
1,982,259	Martin	Nov. 27, 1934