

Sept. 3, 1963

L. E. DAILEY
TRANSDUCER DEVICE
Filed July 11, 1960

42,034
3,102,535

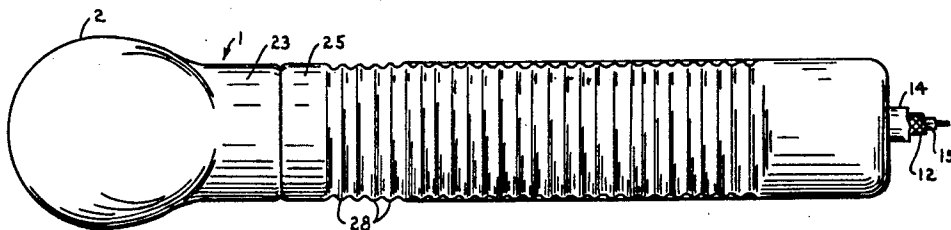


Fig.-1

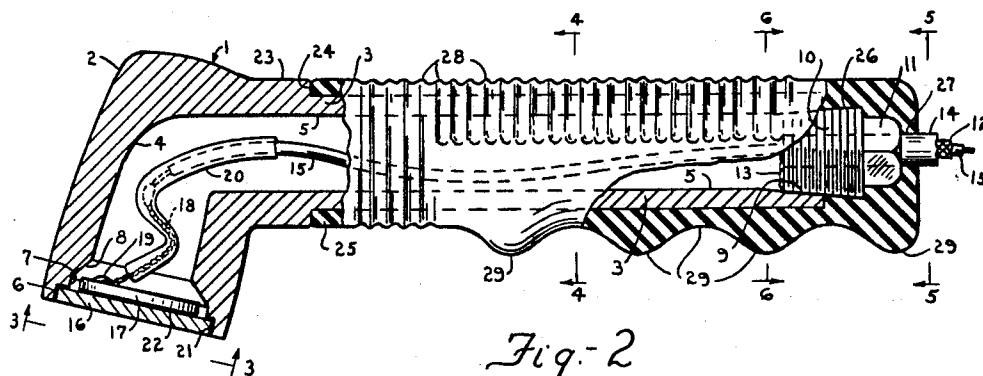


Fig.-2

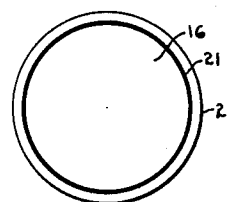


Fig.-3

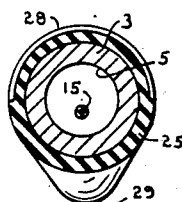


Fig.-4

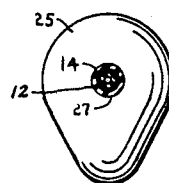


Fig.-5

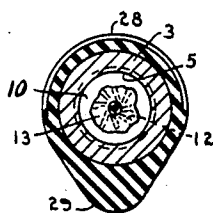


Fig.-6

INVENTOR.
LEON E. DAILEY

BY *Charles S. Renfoll*
ATTORNEY

1

3,102,535

TRANSDUCER DEVICE

Leon E. Dailey, Gary, Ind., assignor to Dailey Ultrasonics, Inc., Gary, Ind., a corporation of Indiana
Filed July 11, 1960, Ser. No. 42,034
3 Claims. (Cl. 128—24)

The subject invention relates generally to an electrical appliance and more particularly is directed to a device commonly referred to as a transducer which is utilized for physical therapy.

Devices of the above character have proven very beneficial in the vibratory or sound treatment of various internal physical infirmities such as arthritis, rheumatism, sprains, dislocations and strained ligaments, muscles and the like and are being progressively used by the medical profession, athletic directors and masseurs.

One of the principal objects of the subject invention is to provide a transducer device which is comprised of a minimum number of components or parts which can be economically manufactured on a production basis.

More particularly in the above respect the device includes a head or enlargement and an elongate tubular portion which are preferably cast or formed in one piece.

Another object of the invention is to provide the head with recesses for respectively receiving a pressure member or applicator and an element operatively connected to the member.

An important object of the invention is to provide a device in which a cooling medium or agent, such as oil, is not required to condition or cool the pressure member and element.

A specific object of the invention is to provide a device in which the pressure member and element above alluded to are operatively connected in a unique manner.

A significant object of the invention is to provide a metal screw plug for an open end of the tubular portion and fasten a conductor or ground wire thereto in a novel way so as to afford an efficient electrical and mechanical connection between said plug and portion.

A further object of the invention is to provide a device which includes a handle grip attached to the tubular portion in a manner whereby to enclose the plug and support a cable containing the above mentioned conductor including a conductor which is connected to the element.

Additional objects of the invention reside in providing a device which is relatively light in weight, safe to operate, efficient in operation and durable.

Other objects and advantages of the invention will become apparent after the description hereinafter set forth is considered in conjunction with the drawing annexed hereto which exemplifies a preferred form of the invention.

In the drawing:

FIGURE 1 is a top plan view of the device;

FIGURE 2 is an elevational side view, with portions in section to illustrate details of construction;

FIGURE 3 is a bottom view of the head of the device, when looking in the direction of the arrows 3—3 in FIGURE 2;

FIGURE 4 is a transverse section taken substantially on line 4—4 of FIGURE 2;

FIGURE 5 is one end view of the device; and

FIGURE 6 is a partial section showing the mode of connecting a conductor or ground wire to a plug carried by a tubular portion of the device.

Referring more particularly to the drawing, the device preferably includes an elongate cast or one-piece tubular body generally designated 1 provided with a head 2 and a tubular portion or extension 3. The head is elongate and offset at an oblique angle with reference to the longitudinal axis of the extension. The head is also provided with a chamber 4 and the extension with

2

a bore 5 communicating with the chamber. The head is further provided with an annular large recess 6, an annular smaller recess 7 adjacent the recess 6 and a tapered recess 8 adjacent the recess 7 as depicted in FIGURE 2.

The free end of the extension 3 is preferably internally threaded at 9 for detachably receiving a tubular externally threaded plug 10. The plug has a squared portion 11 to facilitate manipulation of the plug and also has an inner face or end portion to which a tubular braided conductor or ground wire 12 is soldered as indicated at 13 in FIGURE 6.

A cable or conduit 14 extends through the plug and into the extension 3. An insulated conductor wire 15 and the ground wire 12 are confined in the conduit. The ground wire 12 surrounds the wire 15 and terminates adjacent the inner end of the plug for connection with the plug as stated above. The wire 12 serves as a return through the metal body and shields the wire 15 to prevent external interference.

An annular pressure or applicator member 16 is seated in the large annular recess 6 in the head and an annular element 17 responsive to electrical impulses is disposed in the recess 7. The inner end of the conductor wire 15 is soldered to a short stranded conductor wire 18 and the latter is soldered to the element as indicated at 19. A sleeve of insulation 20 surrounds the soldered connection between the conductors 15 and 18 and adjacent portions of the latter. The chamber 4 and tapered recess 8 afford clearance for a surplus of the wires disposed therein and clearance between the soldered connections and the head to prevent electrical contact. The member 16 is preferably press-fitted and secured in the recess 6 by cement 21 and the element 17 by a bonding agent 22 which will be described subsequently.

The extension 3 includes a portion 23 adjacent the head and a reduced cylindrical portion forming a shoulder or abutment 24 at the junction between these portions. A resilient tubular handle grip of insulating material 25 is cemented or otherwise secured about the reduced portion of the extension with its inner end engaging the abutment 24. The outer end of the grip is provided with a recess 26 which substantially conforms to and receives the outer extremity of the plug 11 as evidenced in FIGURE 2. This end of the grip is also provided with an aperture 27 which snugly receives the cable 14 extending therethrough. Attention is directed to the fact that a portion of the free end of the grip extends about and beyond the end of the extension 3 as well as about and beyond the end of the plug 11 in order to conceal the extension and plug and at the same time protect same, including the cable. That portion of the grip surrounding the cable affords a resilient support therefor so as to substantially prevent breakage thereof at the point of entry into the plug.

The grip includes an upper portion and an annular portion thereof adjacent its fore end which are preferably provided with ridges or corrugations 28 and the underside of the grip is undulated at 29 to promote a good gripping action or hold on the device.

Referring more specifically to the pressure member and element the member is preferably constructed of metal and the element preferably of a ceramic material which is preferably permanently united with the rear side or face of the member by a bonding agent or cement 22 known as "Epoxy" which has proven the most efficient and reliable of any presently known.

The physical principle employed to generate ultrasonic energy utilizes the "piezo-electric" phenomenon peculiar to ceramic crystals. When the element or crystal is subjected to an electrical field the element expands along one

3

axis and contracts along another. The elements may be cut or formed to oscillate at any particular frequency and function only at the frequency for which it is prepared. Thus, having selected the desired frequency at which an ultrasonic generator is to operate the transducer element, the element is cut to conform and the oscillator is designed to produce the same frequency. Therefore, by applying the oscillating electrical current from the oscillator through the cable to the element or crystal, the element alternately expands and contracts synchronously with the oscillations applied to it to produce or create mechanical motion.

According, it will be manifest that the sequence in the function of the generator is creation of high frequency electrical current in an oscillator system, application of this current to a ceramic element in which it is converted to mechanical motion, transmittance of this motion through the force of the pressure member or applicator to which the element is bonded and transmission of this motion into the area of an individual to be treated when the member is brought into contact therewith. The element may be constructed of any desirable material but ceramic material has proven most satisfactory as it will not disintegrate or fracture, as compared to a quartz element, when subjected to electrical impulses or shock when the device is accidentally dropped.

The structure above described also offers a setup whereby oil, which is utilized in some conventional transducers, is not required, thereby reducing the wattage needed for efficient operation.

Having thus described my invention, it is obvious that various modifications may be made in the same without departing from the spirit of the invention, and, therefore, I do not wish to be understood as limiting myself to the exact form, construction, arrangement, and combination of parts herein shown and described.

I claim:

1. A massage device of the kind described comprising a body having a head provided with a chamber and a reduced tubular portion extending from the head, an exposed pressure disc member carried by the head for en-

4

gagement with a human body and a disc element responsive to electrical current mounted on the member, a metal plug carried by the tubular portion, an insulated electrical conductor extending through the plug, tubular portion, into the chamber and electrically connected to said element, and a conductor wire electrically connected to said plug.

2. A subassembly for use in a massage device, said subassembly comprising a metal pressure member, a ceramic element united with said member, a short insulated stranded conductor having one end soldered to said element, another insulated conductor wire and means connecting the same to the opposite end of the stranded conductor, and a flexible sheath of insulation surrounding said last-mentioned connection and portions of said conductors.

3. A device of the kind described comprising an elongate body having a head provided with an integral reduced tubular cylindrical portion of appreciable length internally threaded at one end, a tubular externally threaded plug engaging the threaded end of said portion, a resilient handle grip surrounding said tubular portion and provided with a portion extending beyond said tubular portion and said plug and surrounding at least a portion of the latter.

References Cited in the file of this patent

UNITED STATES PATENTS

2,255,553	Funk	Sept. 9, 1941
2,728,869	Pohlman	Dec. 27, 1955
2,830,578	De Groff	Apr. 15, 1958
2,876,764	Guttner et al.	Mar. 10, 1959

FOREIGN PATENTS

531,947	Great Britain	Jan. 14, 1941
1,025,720	France	Jan. 28, 1953
1,040,035	France	May 20, 1953

OTHER REFERENCES

"Electronic Engineering," page 391, September 1950. (Copy in Division 55.)