MASSAGING APPARATUS

The present invention relates to massaging apparatus, and more particularly to such an apparatus that incorporates an array of oscillatory transducers transmitting vibrations to a cushioned member, such as a mattress, chair, seat, pad, or the like, and that provides for singular or simultaneous multiple movements useful in massage of the torso or body parts of the user. Movement or motion, as used herein refers to simultaneous movements, a single movement, multiple programmable movements separately or in unison, or any combination thereof, and massage includes the production of travelling vibratory motion, rolling motion or even in-place vibratory movement as applied to specified or random areas of the body or user of the apparatus.

In the past, it has been the conventional practice to provide therapeutic chairs having vibrators in the seat and the seat back for imparting a vibratory motion or movement to the person occupying the chair. In other instances, such as when mattresses are employed, a vibrator is placed under or in the box springs or on the bed frame so that vibrating oscillations are transmitted into the structure of the mattress. Such movements are therapeutic to the user's body portions receiving the vibration; however, the movements are extremely limited to mere jiggling or, at best, rapid back and forth movements. Generally, these movements are a series of hard raps to the cushion of the mattress or chair. The imparted movements or vibrations are very local in their reception to the user's body or occupant of the chair or mattress, and are usually hard impacts or raps to the bone structure or body physiology of the occupant.

Therefore, a long-standing need has existed to provide a novel massaging or therapeutic apparatus, such as a chair or mattress, having integrally installed transducers arranged in selective groups or arrays which will impart a variety of vibratory movements to the occupant of the chair or mattress and which will move

along the legs and back of the occupant in a noticeable rolling manner in order to impart travelling motions.

Controls should be available with pulse generating means and a sequencing means for automatic or manual operation of the vibratory movements.

Accordingly, the above problems and difficulties are obviated by the present invention which provides a novel massaging or therapeutic apparatus having a cushion incorporating means for providing a vibrating motion in the cushion member of the apparatus itself for transmittal of the motion and vibrations to a variety of areas of the body of the user. In one form of the invention, a remote sequence controller provides energy to a plurality of transducers carried in receptacles on the cushion, and the transducers are arranged in groups or arrays so that the transducer groups or arrays are driven in accordance with a programmable pattern. In the case of an electrical power source, electrical energy is supplied to a pulse generating network that provides timing and control signals which energize oscillating transducers. Means are employed for mounting the transducers to the cushion member of the apparatus so that the vibrating movements of the transducers are translated into vibrating movements subsequently imparted to the user of the apparatus. Additional means are incorporated into the electrical system for controlling the amount or level of vibration, and may take the form of automatic and manual operating circuits, timing circuits, a signal debouncing circuit, and the like. Display and operating means as well as switch controls are connected to the controller for displaying vital information via lights, graphs, recordings or the like during operation of the apparatus, as well as for providing system turn-on and turn-off capabilities.

Therefore, it is among the primary objects of the present invention to provide a novel massaging or therapeutic apparatus having the means for producing a variety of simultaneous motions to the structure of the

apparatus via oscillatory or vibratory movements, generated electromechanically, that are incorporated into the structure of the cushion member itself.

Another object of the present invention is to provide a novel massage or therapeutic means for producing simultaneous motion to selected cushion member areas of the apparatus which takes into account physiological aspects of the human body, such as the position of the spine and the legs.

Yet another object of the present invention is to provide a novel massage or therapeutic apparatus in the form of a pad, chair, mattress and the like, having a variety of optional components, such as a monitoring display, stereo sound means and motion-inducing means for providing a plurality of movements to the body of the chair or mattress occupant.

Still another object of the present invention is to provide a novel massaging apparatus having the ability of providing simultaneous dual movements to selected body portions of the occupant, of providing a variety of ancillary functions, such as adjustable vibration controls and automatic vibration amplitude limiting.

A further object of the present invention is to provide a novel massaging apparatus having a variety of independent and collective movements so that control is maintained by the occupant or user of the apparatus wherein such control function includes the starting and termination of multiple movements that can be operated singularly, dually, or any combination of movements.

Still a further object resides in providing a closed system having electrical means for pulsing a motor device so as to induce a travelling vibratory motion or movement to the occupant of a pad, chair or mattress via a cushion member as an example.

Another object resides in providing a novel massaging apparatus having an electromechanical or electrical drive means for supplying energization to selected motor transducers in a group of transducer arrays

in accordance with a programmable or selected sequence of vibratory or wave motions.

Massaging apparatus embodying the present invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings in which:

Figure 1 is a diagrammatic drawing illustrating the massaging apparatus of the present invention which takes the form of a cushion, pad or mattress, and which includes control means for actuating and operating a multiple array or groups of oscillations or vibration generating transducers;

Figure 2 is an enlarged fragmentary view, in perspective, illustrating a vibration generator carried on the pad shown in Figure 1;

Figure 3 is a transverse cross-sectional view of the vibration generator and pad as taken in the direction of arrows 3-3 of Figure 2;

Figure 4 is a block diagram illustrating an electrical system for energizing the transducers and groups or arrays thereof illustrated in Figure 1; and

Figure 5 is a circuit schematic of the electrical system illustrated in Figure 4.

Referring to Figure 1, a massaging apparatus incorporating the present invention is illustrated in the general direction of arrow 10. The novel massaging apparatus may be used in a variety of forms, such as upholstered items of furniture, as seats, chairs or may even be a separate cushion, mattress or pad on which the user lies in a prone position. The massaging apparatus 10 as an example includes an elongated pad 11 laid flat, as illustrated in solid lines, or folded, as shown in broken lines, to fit a chair, couch, etc. When pad 11 is folded, an upwardly folded end section 12 constitutes a back portion, a central or mid section 13 constitutes a seat and upper leg portion, and a downwardly folded end section 14 constitutes a lower leg portion.

As further illustrated, five groups of

oscillating or vibrating pairs of transducers 15 to 19 are carried on the pad for translating the mechanical, for example rotary, movement or motion of each transducer into oscillatory or vibratory motions induced into the material of the pad which, preferably is composed of an open-celled foam composition. Transducers illustrated by numeral 15 in a first group provide a vibratory zone related to the upper back of the person as the person bears against the portion 12 of the pad. Transducers indicated by numeral 16 of a second group provide a zone of vibration for the lower back. Transducers 17 of a third group provide a zone for the user's seat. The pair of transducers represented by numeral 18 of a fourth group provide vibratory massaging movements for the upper legs while transducers 19 of a fifth group provide a zone for vibratory massaging of the lower legs. These zones are in operation whether the pad is laid out flat or is folded into a seat configuration. The plurality of transducers, which are arranged in the various zones or groups for inducing modulating or vibratory movements into the cushion material, are energized or activated in tandem for each group from a common source. This source is represented by a hand-held controller 20 which is coupled to the transducers via a plug 21 and socket 22 after being plugged into a common A/C power source or line via power plug 23.

The controller 20 is used to perform several functions. A manually operated slider control 24 is employed as a speed control. A pushbutton 25 is employed for manual sequencing of the transducers among the various groups or arrays. A 3-position switch 27 is employed for selection between three levels of intensity. A conventional on/off switch 28 is employed as a power switch. A display 30, for example of lights, indicates the particular zone or group of transducer pairs that are in operation at any one time.

In the present disclosure, it is noted that the transducers 15 to 19 are arranged in multiples, such as

pairs, and are located in a multiplicity of groups, arrays or zones across the length of the pad 11. Preferably, both the transducers and the groups or arrays thereof are located in alignment with one another a substantial distance inwardly from the head, and foot and sides of the pad so that the arrays of the transducers are situated where the body of a reclining person would rest. Therefore, transducers 15 are associated with the upper back zone while transducers 16 are associated with a second group associated with the lower back zone. Again, transducers 17 relate to the seat while transducers 18 pertain to the upper leg zone and transducers 19 relate to the lower leg zone. The groups or arrays are arranged in substantially fixed spaced-apart relationship and each group may be composed of two or more transducers of different sizes, weights or dimensions. However, it is to be understood that an array or group of single transducers may also be used to constitute a particular operating zone.

The apparatus of Figure 1 produces a vibration effect including travelling vibratory movements, localized vibratory or oscillatory motions, rolling movements or combinations thereof by suspending one or more transducers inside the cushioned pad or the like, wherein the transducers are activated or energized by electrical means via the controller 20. The employment of a plurality of such transducers in a multiple of groups provides zones of vibratory movement which may be located in fixed areas, in selectable areas or when programmed appropriately, to move smoothly across the cushion pad surface in a travelling movement. Also, induced vibrations may be programmed to be applied in more complex patterns or even randomly.

Referring now to Figures 2 and 3, it can be seen that the vibratory or oscillatory transducers take the form of an electric motor, such as motor 15, which is mounted in a depression, cavity or receptacle 31 provided in the face of the pad, such as pad portion 12. Cavity 31 thereby forms an edge marginal region 31a on the face of

the pad or cushion 11. The foam composition surrounding the motor is soft and pliable; however, it is stiff enough to carry vibrations from the motor 15 for dispersal throughout the foam composition into the body of the user reclining on the pad 11. The motor 15 includes an eccentric weight 32 mounted on its drive shaft so that a jiggling or oscillating movement is generated as the drive shaft is rotated. The motor 15 is mounted to the underside of a mounting plate 33 by means of a pair of straps, such as straps 34. Plate 33 is provided with an opening 33a for enabling motor 15 to be placed within cavity 31. Downwardly depending spikes, such as spike 35, are embedded into the foam composition so that the mounting plate 33 will not move once it has been adhesively bonded to the edge marginal region 31a at the surface of the pad. The adhesive bonding is indicated by an adhesive layer identified by numeral 36. Therefore, it can be seen that as the motor 15 is driven via the electrical circuit, the motor will vibrate by virtue of the eccentric drive shaft arrangement so that oscillating movement will be introduced into the cushion material via the mounting plate so that the immediate area of each motor produces a massaging action into the adjacent body portion of the user.

Referring now in detail to Figure 4, numeral 20 represents the hand-held controller which provides a switch 40 permitting the user to select a variety of operations and operating parameters by interconnecting a power supply 41 to a pulse generator 42 so that a timed pulse train is forwarded to an interface means 43 that is connected to the output plug 21 for connection with the input socket 22 leading to the plurality of transducer groups in the pad or mattress 11.

The switch means 40 includes the provision for a duration timing circuit 44 which will automatically shut the power off after a preselected period of time, such as 15 minutes. Within this operating time selection switches 45 are moved by the user not only to turn the unit on and

off to supply power but to adjust travelling speed, intensity and a variety of other operating parameters. Once selection of the parameters has been chosen by the operator and the switches so actuated, the power is supplied to a pulse train generator 46 that constitutes a duty cycle of spaced-apart rectangular pulses which are introduced to a counter 47. Once the counter has been actuated, an output is sequentially provided to a power level interface 48. It is to be understood that the sequence is in series and is not a parallel output on all lines since it is this sequence which will determine the automatic energization of the respective transducers in the various zones. However, should the selector switch in the switch means 45 be set at manual, then a single output line from the counter will be activated so that only the selected transducer zone or group will be energized. The power level interface 48 brings the output from the counter to a desired power level for operating of the transducers and the visual display means 50 where the operating lights for the zones, such as light 30, are located. However, the output from the power level interface is provided directly through the plug 21 and socket 22 relationship to the various transducers in the respective zones or groups.

The strength of vibration, as well as speed of motor, is determined by the manual setting of the switches in the switch means 45. The operating parameters derived from switch position will be described later with respect to the circuit description.

Referring now in detail to Figure 5, it can be seen that the switch arrangement 45 is divided between the blocks 45 and 45′ wherein SW1 in block 45′ (shown as switch 28 in Figure 1) is the on/off switch connecting the power supply 41 to the unit. It is understood that the power supply includes an AC adaptor for converting 120 volt AC to a 14 volt DC output for use by the hand-held controller. The switch SW2 in block 45′ (shown as switch 27 in Figure 1) is employed for controlling the amplitude

of the current supplied to the motors in order to control the vibration intensity of each motor or motor pair. Switch SW3 in block 45 (shown as switch 25 in Figure 1) is a pushbutton type to be used by the user in manually sequencing the application of power to the transducers in the respective zones when the switch SW4 in block 45 (shown as switch 26 in Figure 1) is in the manual position. However, if switch SW4 is in the auto position, the sequence is automatic thus obviating the need and function of switch SW3 so that the pulsation or movement of the pulses from one body portion or zone to another is automatic. The placement of switch SW4 in its auto position also inserts a potentiometer or variable resistor into circuit. Potentiometer VR1 which is also depicted in Figure 1 as slider control 24 is employed for selecting travelling speed and includes nomenclature of slow and fast so that the user has a visual view of the two positions as the slider is moved. Movement of the slider resistor VR1 selects a repetition rate of the pulse train generated by a multivibrator 51 in the pulse train generator 46 taking the form of an electronic chip U2 in the generator 46 having part number LM555. The chip 51 in the generator 46 also operates as a debouncer to feed clean pulses to the counter 53 in the counter 47 during manual sequencing operation to ensure the desired order of sequencing and to avoid erratic motor energization. The duration timer 44 includes a pulse counting chip 52 having part number 4060 and is identified by U1. The output from the pulse train generator 46 is to a counter 47 having chip U3, identified by numeral 53, which is part number 4017. The output from the counter 53 is in a spaced sequence along its multiple output lines and is fed directly to the interface circuit 48 having a power chip U4, as identified by numeral 54, and having part number ULN2004A. After the proper power level has been achieved, the output from the interface circuit 48 is provided to the light 50 for display on the hand-held unit or controller 20 so that the user may know which of the

vibrating groups or arrays of transducers are being energized. In parallel, the output from the power level interface 48 is also provided to the respective groups of transducers in the ordered sequence selected by the switch SW4 in block 45 when set in its automatic position or the manual setting of the switch SW4 when manually sequenced via the manual advance pushbutton SW3 in block 45.

In view of the foregoing, it can be seen that the massaging apparatus of the present invention is useful in the field of vibration for the comfort and therapeutic purposes as applied to a user and which may be incorporated into a variety of consumer items, such as mattresses as used in bed furnishings, reclining type chairs, and a lightweight easily transportable foam pad which is approximately six feet long by two-and-a-half feet wide and three inches thick. When used as a pad, the pad may fold over upon itself and a handle may be provided for easy carrying. All of the above products, mattress, recliner, portable pad and the like are, divided into five massaging zones, each zone associated with specific body areas, such as upper back, lower back, seat, upper leg and lower leg. Generally, these will be product designs using foam inner cores or cavities intended to be occupied by vibrating or oscillatory transducers so as to provide resilient and comforting massaging movements. Each area contains at least two small direct current motors spinning an eccentric weight to cause the vibration. The motor assemblies are embedded in the foam cores or cavities which accept the motor assembly dimensions, and the assembly is fastened with a suitable adhesive, including the mounting plate, to the foam in order to permanently retain the motor and mounting plate position.

The hand controller 20 is similar in appearance to a cable wired TV or VCR remote control and it contains the electronics which operate the motors in either an automatic or manual mode. In automatic, power is applied to each area motor pair sequentially from "upper back" (shoulder blade area) to "lower leg" (shin area) then back

to shoulders and continuing in this circulating "wave motion" manner. The rate or speed is continuously variable with a slider on the hand controller with a dwell time from approximately 10 seconds down to 1 second on each zone. In the manual mode, any zone or pair of motors can be energized at user's selection and will be allowed to remain in the chosen location until manually stopped or changed by means of the user using the pushbutton switch.

An overriding time function is provided by duration timer 44 and its pulse counting chip 52 in combination with transistor Q1 whenever the system is turned on, and is employed to automatically shut the system off after a period of 15 minutes. To restart another operating sequence, the on/off switch must be turned on again. Power is supplied to the system by a wall adaptor rated at 14 volts DC at 500 ma. Only the motors are installed in the furnishings.

All other electronics are in the hand control.

CLAIMS

1. A massaging apparatus comprising:

a cushion;

vibrators secured to said cushion for imparting vibratory energy thereto and to a user;

a pulse train generator for generating a series of pulses;

a counter electrically coupled to said pulse train generator for receiving the series of pulses and for producing a plurality of independent outputs therefrom through counter output line means;

a power level interface circuit electrically coupled to said counter for receiving the outputs therefrom and for transmitting the outputs to said vibrators; and

a power supply electrically coupled to said generator and said vibrators for energization thereof.

2. Apparatus according to Claim 1 further comprising automatic/manual mode operation means coupled to said generator for respective automatic and manual actuation thereof, said automatic mode operation means including means for providing a cycling rate of the pulses, and a switch alternately positionable for selecting one of automatic and manual operation of said generator.

3. Apparatus according to Claim 2, for manual mode operation, in which said automatic/manual mode operation means further includes:

a pushbutton operated switch coupled to said generator for enabling activation of one of said counter output line means for selective energization of said vibrators, when said alternately positionable switch is positioned to enable the manual mode operation.

4. Apparatus according to Claim 2, for automatic mode operation, in which said automatic/manual mode operation means further includes:

means coupled to said generator by said switch for varying the automatic cycling rate, when said switch

is positioned to enable the automatic mode operation; and

circuitry for enabling said counter output to be applied in sequence to said vibrators.

5. Apparatus according to Claim 4 further including means coupled to said interface circuit for providing a visual display of those of said vibrators which are energized.

6. Apparatus according to Claim 1 further including a duration timer coupled to said power supply for preventing power to be supplied to said generator and said generator-coupled counter and thereby for limiting the time of operation of said vibrators, and means coupled to said vibrators for establishing an intensity level of energization thereof.

7. A massaging apparatus comprising a cushion, vibrators coupled to said cushion for imparting vibratory energy thereto and to a user, a pulse generator for generating a train of electric rectangular-shaped pulses and means including a counter coupled to said pulse generator for selectively and sequentially applying the pulses to independent ones of said vibrators.

8. Apparatus according to Claim 7 in which said pulse generator includes a multivibrator.

9. Apparatus according to Claim 8 further including a display for indicating which of said vibrators is vibrating, and a power level interface circuit coupled to said vibrators and said display.

10. A massaging method utilizing a massage cushion with vibrators therein, comprising the steps of generating a train of rectangular-shaped pulses and selectively and sequentially applying the pulses respectively to the vibrators in a selected sequence so that selected ones of the vibrators vibrate in response to the pulses.

11. Massaging apparatus substantially as hereinbefore described with reference to, and as illustrated by, the accompanying drawings.

12. A massaging method substantially as hereinbefore described with reference to the accompanying drawings.