March 23, 1954 W. H. BADGER ET AL 2,672,860

SPINAL MANIPULATION AND RELAXATION DEVICE

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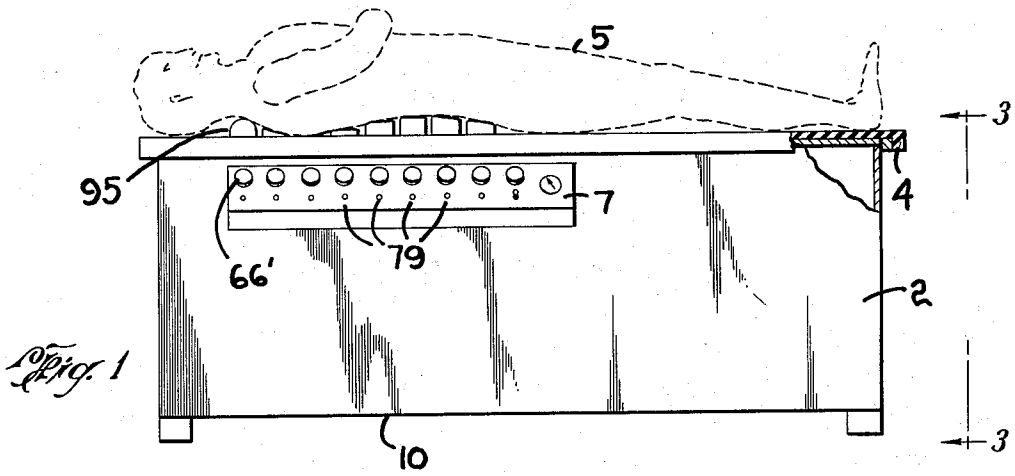


Fig. 1

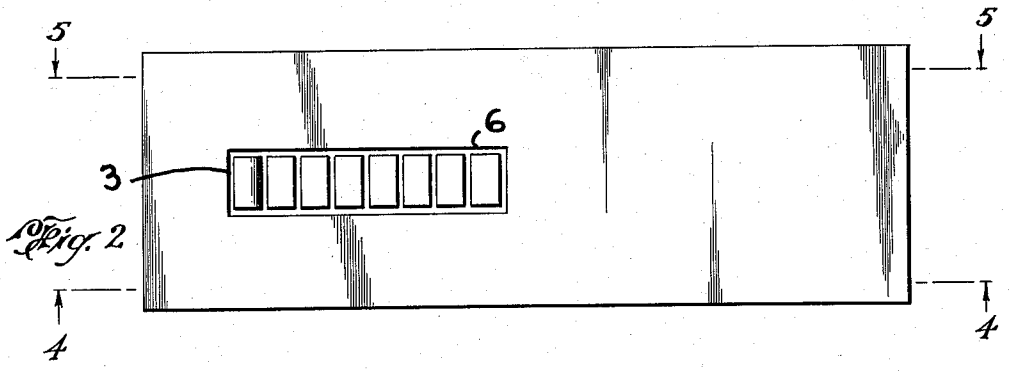


Fig. 2

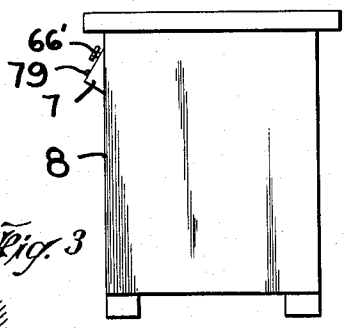


Fig. 3

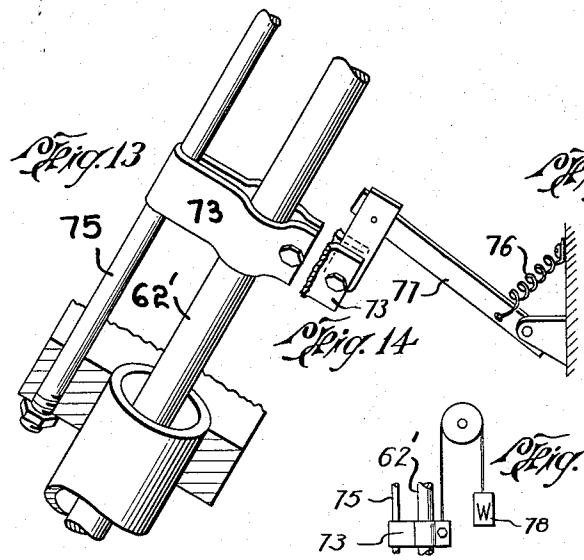


Fig. 13

Fig. 14

Fig. 15

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SPINAL MANIPULATION AND RELAXATION DEVICE

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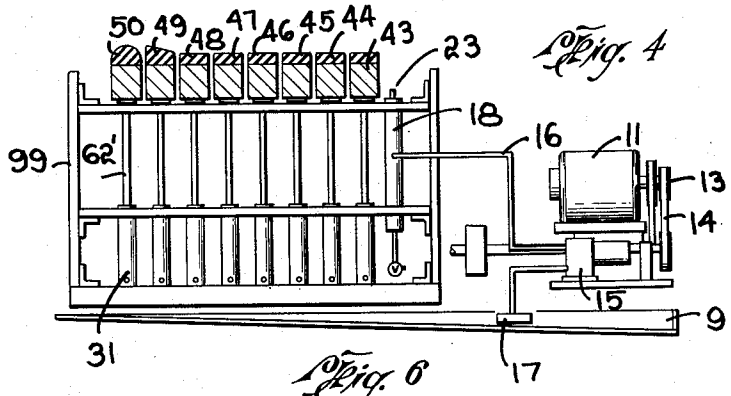
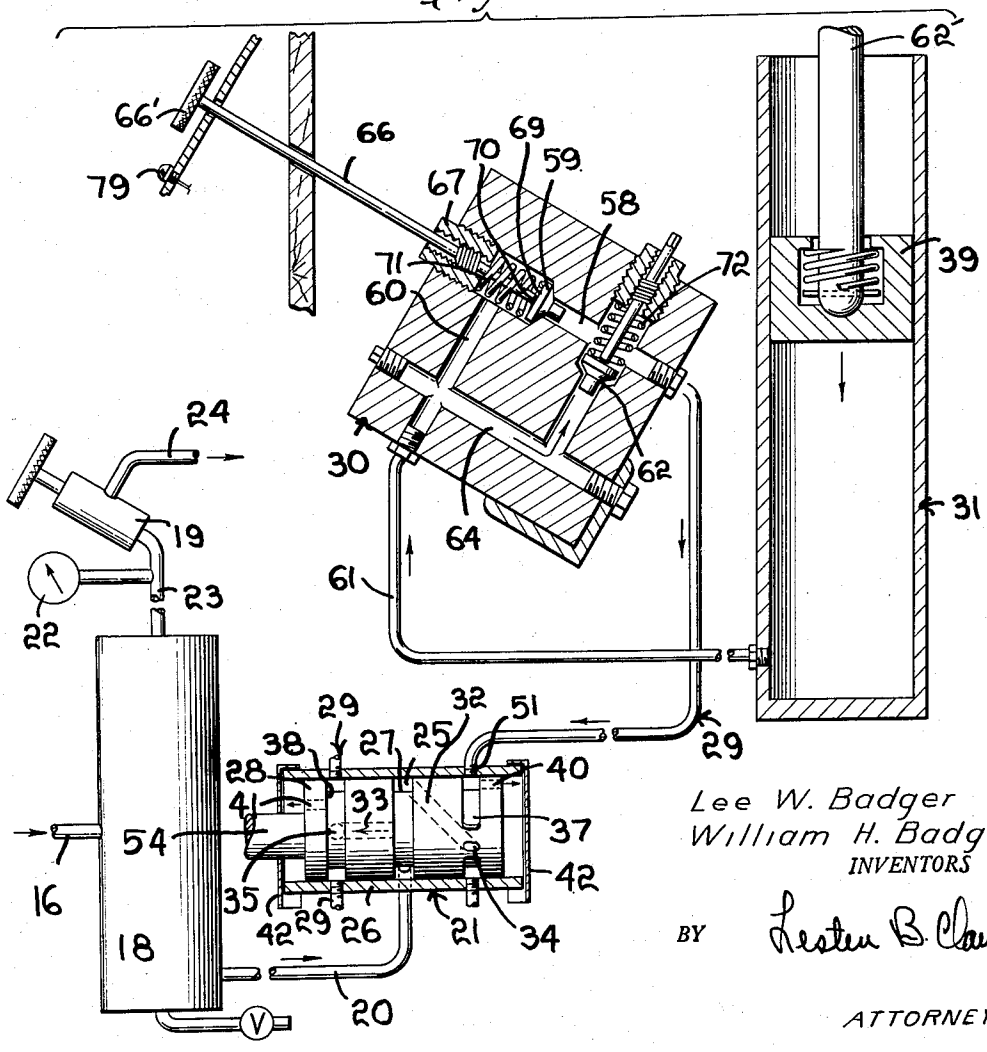


Fig. 4

Fig. 6



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Fig. 5

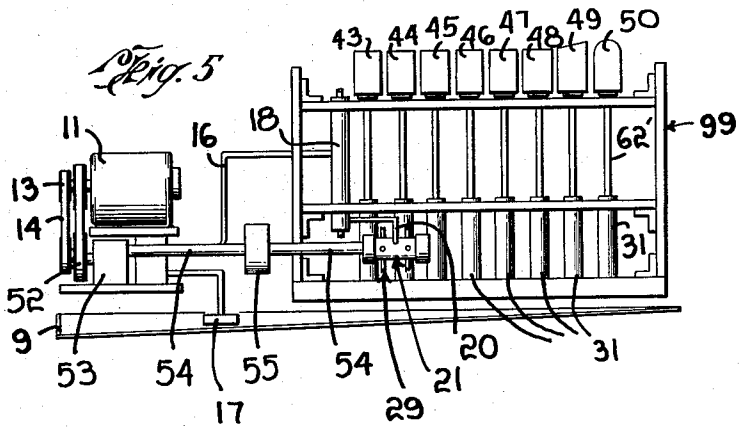


Fig. 7

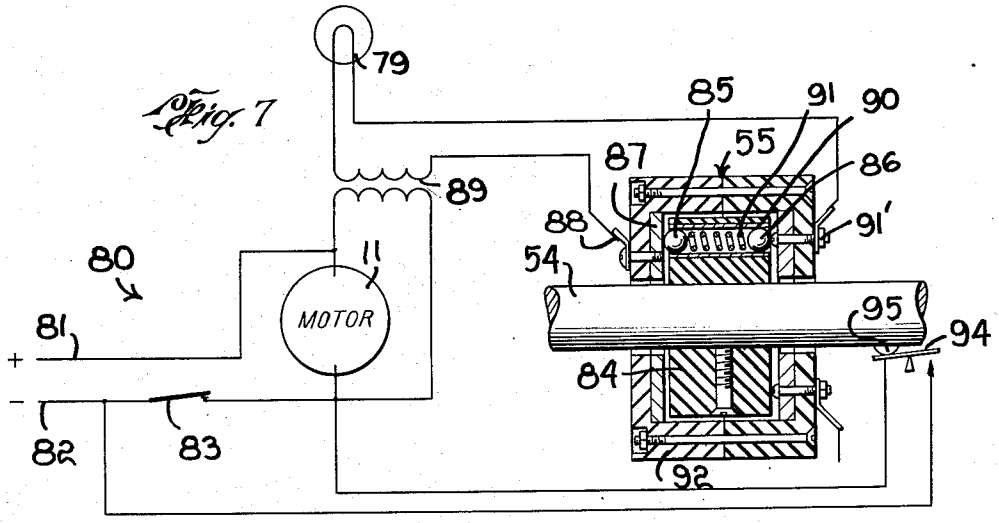


Fig. 8

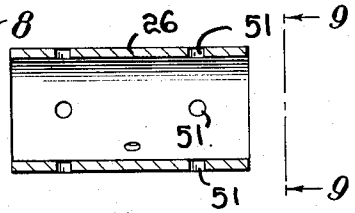


Fig. 9

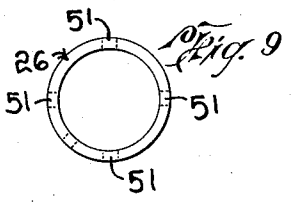


Fig. 11

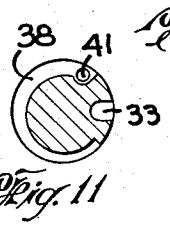
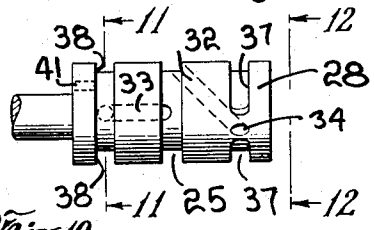


Fig. 12



Fig. 10



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UNITED STATES PATENT OFFICE

2,672,860

SPINAL MANIPULATION AND RELAXATION DEVICE

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Houston, Tex.

Application November 28, 1950, Serial No. 197,927

14 Claims. (Cl. 128—33)

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The invention relates to a massaging device and more particularly to an improved construction thereof.

One of the major disadvantages of mechanical massaging devices is that the construction is such that each massaging element will move a predetermined amount regardless of the weight of the patient and regardless of the curvature of that particular portion of the body being massaged. Such mechanical devices can be reset to vary the massaging pressure, but in general, the mechanisms are complicated and require more time in setting the machine to each individual patient than the actual operation of such machine for a short massaging time.

An object of the present invention is to provide a device which is provided with a plurality of massaging elements, each of such massaging elements being adapted to fit the natural curvature of the body of the patient being massaged.

An object of the present invention is to provide a device which is provided with a plurality of massaging elements, each of such massaging elements being adapted to fit the natural curvature of the body of the patient being massaged, there being means associated with each of the massaging elements for readily adjusting the pressure of each massaging element exerted against the body of the patient.

Still another object of the invention is to provide in a massaging table a plurality of hydraulically operated massaging elements which are adapted to fit the natural curvature of the patient.

Still another object of the invention is to provide a massaging table having a plurality of movable massaging elements thereon adapted to fit the normal curvature of the body portion of the patient being massaged, means to regulate the amount of pressure exerted by each of such massaging elements and means to stop each of the massaging elements on a down stroke or as they move away from the body of the patient just slightly below body contact.

Still another object of the invention is to provide in a massaging table for massaging the spine of a patient, a plurality of independently movable massaging elements, means to regulate the amount of movement of such elements, means to indicate which of said elements is being forced against the body of the patient and rotary valve means for automatically operating each of the massaging elements in a predetermined manner.

Other and further objects and advantages of the invention will become more readily apparent

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from a consideration of the following drawings and description wherein:

Fig. 1 is a side elevation illustrating the massaging elements positioned on a table with a patient reclining thereagainst, and showing the massaging elements as conforming to the natural curvature of the body.

Fig. 2 is a top plan view of the form of the invention illustrated in Fig. 1.

Fig. 3 is an end view taken on the line 3—3 of Fig. 1.

Fig. 4 is a vertical cross-section partly in elevation illustrating the preferred embodiment of the operating mechanism for the movable massaging elements and taken on the line 4—4 of Fig. 2.

Fig. 5 is a side elevation taken on the line 5—5 of Fig. 2 looking toward the opposite side of the device as illustrated in Fig. 4.

Fig. 6 is a vertical sectional view of the control valve used in regulating the amount of pressure exerted by each massaging element and also shows the rotary valve and a schematic flow diagram for supplying fluid to one of the cylinders and pistons for moving a massaging element.

Fig. 7 is an electrical diagram illustrating that portion of the electric circuit connected to a rotary switch for actuating light indicating means to indicate which of the movable members is under pressure from the rotary valve.

Fig. 8 illustrates the housing of the rotary valve.

Fig. 9 is a view on the line 9—9 of Fig. 8.

Fig. 10 is an elevation of the rotary valve used to discharge pressure to each of the massaging element pistons.

Fig. 11 is a section on the line 11—11 of Fig. 10, more clearly illustrating the exhaust and intake ports in the rotary valve.

Fig. 12 is the end view taken on the line 12—12 of Fig. 10, and shows the discharge and intake ports of the rotary valve in dotted line.

Fig. 13 illustrates the mechanism used to guide the movable massaging elements and to prevent their rotation on up and down strokes.

Figs. 14 and 15 illustrate modifications that might be used in place of the spring 72 and the adjustment therefor in the exhaust portion of the control valve illustrated in Fig. 6.

In Fig. 1, a table 2 is illustrated in which a plurality of movable massaging elements are longitudinally arranged to extend through the top thereof as illustrated at 3 in Fig. 2. The top of the table may be provided with any suitable covering such as rubber 4 to provide comfort for the patient illustrated at 5 in dotted line as reclining thereon. The movable massaging elements are

arranged in an opening 6 and while any number of elements may be used, it has been found that eight of such elements as illustrated in the drawing serve to massage the spinal column of the patient. A control panel 7 is provided on the side 8 of the table as better illustrated in Fig. 3.

Referring to Fig. 4, the operating mechanism and the details of construction of the preferred embodiment of the invention are illustrated. Such mechanism may be housed beneath the table 2. A sump 9 may be secured to or positioned adjacent the bottom 10 of the table to provide a source of liquid such as oil to actuate the movable massaging elements. A prime mover 11 supplies power through the pulley 13 and connected belt 14 to a pump 15 which draws the fluid into the supply line at 16. A strainer 17 is provided in the sump to inhibit the entry of foreign materials with the fluid into the supply line 16.

As better seen in Fig. 6, the supply line 16 discharges into the separator 18 which separates any bubbles of air or other gas from the liquid to insure smooth operation of the apparatus. Connected into one end of the separator 18 is the control valve 19 which regulates the amount of liquid pressure delivered through the discharge line 20 to the rotary valve 21 to actuate the pistons and massaging elements connected thereto as hereinafter described.

It seems obvious that heavier weight people might require more pressure exerted against their body to effect thorough massaging thereof than a lighter person. To this end, a gauge 22 is provided in the line 23 leading from the separator to the control valve 19 whereby the amount of hydraulic pressure operable on the pistons to actuate the massaging elements may be regulated and determined. The line 24 from the control valve 19 exhausts the fluid back to the sump 9 for reuse.

In order to better understand the operation of the machine, Fig. 6 illustrates the operating mechanism for one of the massaging elements, each such massaging element is provided with a similarly constructed operating mechanism to effect control and actuation thereof through the rotary valve 21 and line 29. As illustrated in the drawing, the piston 39 is on a down stroke, however, in order to better understand the invention, the actuation of such piston will be described both on an up stroke and a down stroke cycle.

Fluid passing through the line 20 into the rotary valve 21 is discharged into the annulus 25 formed between the housing 26 of the valve 21 and the annular cut-away portion 27 on the rotor 28 of the valve. Two ports are drilled longitudinally in the rotor 28 to discharge the liquid to the lines 29 leading to the control valve 30, which valve is provided for each of the cylinders 31. These ports are illustrated in dotted line at 32 and 33 respectively and terminate on the peripheral surface of the rotor in the form of openings 34 and 35 respectively. The ports 32 and 33 are 135° apart as illustrated more clearly in Fig. 12. It is to be noted that the rotor 28 is provided with a peripheral groove 37 and 38 extending thereabout and terminating at a spaced distance from each side of each of the openings 34 and 35 on the periphery of such rotor so that when the rotor is rotated, only one of such ports will be aligned with the discharge line 29 leading to the operating and control valve 30 for each of the cylinders at a time.

The grooves 37 and 38 are to receive exhaust liquid from the lines 29 leading from each of the cylinders 31 when the piston 39 is on a down stroke. Ports 40 and 41 extending through the end of the rotor discharge the fluid from the line 29 on the down stroke of the piston 39 and such fluid leaks past the end cover 42 on the housing 22 and back to the sump 9.

The housing 26 as illustrated in Fig. 8 is provided with eight discharge ports leading to each of the eight control valves 30 and cylinders 31 to operate the massaging elements 43, 44, 45, 46, 47, 48, 49 and 50. The discharge ports in the housing 26 are illustrated by the numeral 51, it being understood, of course, that each of such ports is connected to a line 29, valve 30, cylinder 31 and piston 39 to move each of the massaging elements as liquid is supplied through the line 29 by rotation of the rotor 28.

The prime mover 11 is provided with a belt 52 which is connected to the gear box 53, which in turn transmits power through the shaft 54 through the switch 55 and rotates the rotor 28 in the housing 26. For purposes of convenience and to fully explain the operation of the invention, it will be assumed that in Fig. 6 the rotor 28 has been rotated so that the opening 34 is aligned with one of the ports 51 connected to one of the lines 29. When this is the condition, all of the other seven pistons will move downwardly due to the weight of the person reclining thereon so that oil is flowed back through each of the seven lines 29 to discharge into the grooves 37 and 38 back to the sump 9. In other words, the openings 34 and 35 on the rotor and the grooves 37 and 38 are so arranged that only one piston is receiving hydraulic pressure from the line 20 at a time.

The oil flows upwardly through the line 29 and into the valve 30. It passes through the passage 58 past the valve 59 and into the passageway 60. It then passes into the discharge line 61 leading to the cylinder 31. The fluid then acts upon the piston 39 to move it upwardly whereby the piston rod 62' and the massaging element connected thereto moves upwardly.

As soon as the discharge port 34 moves past one of the ports 51, the discharge port 35 is then aligned with a port 51 whereby the liquid pressure is exerted alternatively on one piston and then another as the openings 34 and 35 deliver hydraulic pressure to the lines 29 and pistons 39 to move one massaging element up at a time.

When the piston moves downwardly as illustrated in Fig. 6, after the port 34 or port 35 whichever is open to the line 29, has moved out of pressure passing engagement therewith, the oil will be passed back through the line 61 into the passage 64 past the valve 62 and back through the line 29 into the grooves 37 and 38 and back to the sump 9. The amount of pressure that each individual massaging element exerts against the spinal column of a patient may be regulated independently of the others by setting the valve 59. An elongated stem 66 is threaded through the plug 67 and engages the top of the valve 69. Rotation of the stem 66 by means of the knob 66' in the proper direction moves such stem downwardly so that it abuts against the top of the valve 69 to close such valve completely and inhibit the passage of fluid to the passage 60. On the other hand, the stem may be rotated so that a space is maintained between the end of the stem 70 and the top of the valve 69 whereby the cap 59 may move upwardly against the spring 71 to pass fluid to the passage-way 60. Ordinarily the spring 71 will only be of sufficient tension to insure flow of the fluid on a down stroke through

the passage 61, through passage-way 64 and to the valve 62.

The spring tension on the valve 62 maintained by the spring 72 is such that it just does not quite balance the weight of the piston assembly. This weight of the piston assembly can, of course, vary depending upon the construction, and the spring tension is set to not quite balance such weight; because of this, the valve 62, when all fluid has been moved out of the cylinder due to the weight of the person against such massaging elements on the discharge or downstroke side, will trap sufficient fluid in the cylinder 31 so as to prevent the piston from moving all the way down to the bottom of the cylinder during any one cycle. Each element will thereby conform to the contour of the patient's spinal column since the amount of clearance between each element and the spine will be about $\frac{1}{16}$ to $\frac{1}{8}$ inch. If the weight of the piston assembly changes, spring 72 can be adjusted to trap the proper amount of fluid on a downstroke. Of course, since the spring 72 does not quite balance the weight of the piston assembly, the piston 39 will eventually fall to the bottom of the cylinder when the machine is turned off and when no additional pressure is exerted against such piston whereby the elements will be in proper position to receive the next patient.

From the foregoing, it can be seen that anyone or all of the massaging elements can be quickly and easily taken out of operation by means of the stem 66, and on the other hand, if one particular part of the spine needs more massaging or more pressure thereagainst than another part, the stem 66 allows more pressure to be exerted against the piston 39 and to effect movement of the massaging element against that portion of the spine.

In order to guide the massaging elements upwardly against the spine of a patient and to prevent such massaging elements from turning, a bracket 73 is secured to the piston 62 and is arranged to slidably engage the rod 75 as illustrated in Fig. 13. This prevents rotation of the massaging elements on up and down strokes. Figs. 14 and 15 illustrate modifications, which may be utilized in lieu of the spring 72 on the discharge side of the cylinder. In Fig. 14 a spring 76 secured to a bracket 77 which is, in turn, connected to the bracket 73, so that such spring 76 will allow the pistons to move downwardly so long as pressure is exerted thereagainst by the patient, but when the weight of the piston assembly is the only pressure exerted against the fluid being discharged from the cylinder 31, the spring offsets such weight and helps to trap the fluid in the cylinder. Fig. 15 shows a weight 78 for accomplishing the same purpose. In order to determine which of the massaging elements is receiving pressure from the rotary valve assembly, a plurality of control lights 79 are provided on the panel 7.

Reference to Fig. 7 will explain a portion of the electrical circuit used in this invention and particularly that portion relating to the correlation of the light with the particular piston under pressure.

In Fig. 7 the electrical circuit is denominated generally by the numeral 80. Power from any suitable source is passed through the leads 81 and 82 with a switch 83 being provided to break the circuit. The rotary switch 55 on shaft 54 is illustrated in detail. This rotary switch is so arranged that a contact will be provided to supply a source of energy to the light 79 on the control panel 7, depending upon which of the massaging elements is receiving fluid pressure from the hydraulic system.

The shaft 54 extends through the rotary switch and secured to such shaft is a non-conducting rotor 84. This rotor is provided with contacts 85 and 86 held in spaced relation by spring 91, one of such contacts being arranged to engage the metal plate 87 to which is secured the contact 88. When the electrical circuit is energized, power will flow through the motor and the transformer 89 to the switch 83, thereby energizing plate 87 and contact 85. Energy is transmitted from contact 85 by means of the conductor 90 and spring 91 to the contact 86. As the shaft 54 and rotor 84 rotate, the contacts 85 and 86 move in an arcuate path therewith. A plurality of contacts 91' extend through the housing 92 of the rotary switch 55 and as the contacts 85 and 86 are rotated, the contact 86 will engage one of the contacts 91', thereby completing the circuit and lighting the light 79. The contacts 91' are arranged in the housing 92 of the rotary switch 55 so that when the port 34 or 35 is discharging fluid to a particular cylinder, the contact 86 will engage the particular contact 91' correlated with such cylinder to show which cylinder is under fluid pressure.

It is desirable to have the massaging element 50 in "up" position when the device is turned off, and to this end, a switch 94 is provided whereby the circuit will be energized even after the switch 83 has been opened until the cam 95 engages the switch 94 and opens it. The cam 95 is arranged on the shaft 54 and is correlated with the rotary valve so that when the port or opening 34 is aligned to supply fluid pressure to the cylinder which operates massaging element 50, the switch 94 will be opened to stop prime mover 11. This, when switch 83 has been previously opened, de-energizes the circuit and stops the rotary valve so that massaging element 50 is in up position.

This is advantageous in that massaging element 50 is arranged to engage the spinal element at the base of the skull as illustrated at 95 in Fig. 1, and should be in an elevated position when a patient is inclined on the table at the beginning of the massaging treatment to fit the natural curvature of the spine at this point.

From the foregoing, it can be readily seen that a device is provided which adjusts itself to compensate for the natural curvature of a patient's spine.

This is advantageous in that different persons have various types of spinal columns which are deformed to various degrees. In view of the fact that each of the cylinders can be adjusted by means of the stem 66 to determine the amount of pressure exerted against the person's spine, the massaging element connected thereto will move up depending upon the adjustment.

Generally, at the beginning of the treatment, all of the valves 59 will be so adjusted depending upon the weight of the patient being treated. For example, if a woman is to be treated, the control valve 19 is adjusted so that possibly a total amount of 50 pounds pressure can be exerted against any one of the pistons 39. After setting the main control valve 19, each of the independent valves 59 connected to each of the massaging elements can be adjusted depending upon the amount of lift desired and the condition of that particular patient being treated.

If a heavier person is to be massaged by this

machine, it may be necessary to increase the pressure operable upon the pistons 39 up to, say 100 lbs. by means of the control valve 19. Here again, each of the massaging elements can be readily adjusted to increase or decrease the stroke of the pistons 39 and corresponding connected massaging elements to suit the particular needs of the patient as determined by the doctor.

As a practical matter, it has been found desirable to move massaging element 50 the first one opened to hydraulic pressure when the system is energized as previously described. Massaging element 46 is next subjected to fluid pressure by movement of the rotary valve, 49 next, 45 next, 48 next, 44 next, 47 next and 43 last. As a practical matter, it has been found desirable to have about 4 to 6 cycles per minute, so that the stroke of each piston consumes approximately 15 seconds. Of course, this can be varied if desired.

The cylinders 31, piston rod 62 and massaging elements 43 through 50 inclusive are mounted in a frame denoted by the numeral 99. Any suitable type of support framing may be utilized to provide the results desired.

Broadly, the invention relates to a device which is provided with a plurality of massaging elements, such device including a construction for readily adjusting the amount of pressure exerted by each of the massaging elements independently of the pressure exerted by the others.

What is claimed is:

1. A massaging device, including a plurality of massaging elements, rods secured thereto, a piston secured to each of said rods, a cylinder to receive each of said pistons, a rotary valve to supply hydraulic pressure to said cylinders to move said pistons and connected massaging elements, and a control valve secured between said rotary valve and each of said cylinders to regulate the amount of hydraulic pressure acting on each of said pistons independently of the pressure acting on other pistons.

2. A massaging device, including a plurality of massaging elements, rods secured thereto, a piston secured to each of said rods, a cylinder to receive each of said pistons, a rotary valve to supply hydraulic pressure to said cylinders to move said pistons and connected massaging elements, and a control valve secured between said rotary valve and each of said cylinders to regulate the amount of hydraulic pressure acting on each of said pistons independently of the pressure acting on other pistons, said control valve including an inlet valve to receive hydraulic pressure from said rotary valve and a discharge valve to discharge hydraulic pressure from said cylinder, said discharge valve including spring means to counterbalance the weight of said piston, rod and connected massaging element.

3. A massaging device for massaging the spinal column of a patient, comprising a table upon which the patient reclines, a central opening therein occupying a region covered by the patient's spinal column, a plurality of hydraulically operated massaging elements arranged in end to end succession in said opening mounted for reciprocating movement to points above the table surface, motor operated means to confine the reciprocation of said elements to a fixed sequence, and manually operable means to modify response to the motor operated means to vary the range of reciprocation of each of said elements independently of said other elements, said last means including a valve means to regulate the amount of hydraulic pressure exerted against said massage elements.

4. A massaging device, including a plurality of massaging elements, means to move said elements, said means including a rod secured to each of said members, pistons on one end of each of said rods, a cylinder to receive each of said pistons, conduits to supply liquid under pressure to said cylinders, a rotary valve to regulate and supply pressure liquid from a source to one of said conduits at a time, a valve in each of said conduits to control the amount of liquid pressure exerted against each of said pistons, said valve including check means to trap fluid in said cylinder equal to the weight of said piston, rod, and connected massaging element.

5. In a massaging device for massaging the spine of a patient, a plurality of movable massage elements, means to move said elements to massaging relation with the patient, said means including a hydraulic system having a motor driven pump and valve to supply pressure fluid in given sequence to said elements for their cycled reciprocation, and means in said system to modify the delivery of pressure fluid actuating any massage element independently of the pressure acting on other massage elements.

6. A device for massaging the spine of a patient, including a plurality of massaging elements, means to move said elements to massaging relation with the patient, said means including a rod secured to each of said members, pistons on one end of each of said rods, a cylinder to receive each of said pistons, conduits to supply liquid under pressure to said cylinders, a rotary valve to regulate and supply pressure liquid from a source to one of said conduits at a time, a valve in each of said conduits to control the amount of liquid pressure exerted against each of said pistons, said valve check means to trap liquid in said cylinder equal to the weight of said piston, rod, and connected massaging element.

7. A massaging device, comprising, a support frame, a plurality of movable massage elements mounted therein, means mounted on said frame to reciprocate said elements, said means including a rod secured to each of said members, pistons on each of said rods, a cylinder to receive each of said pistons, conduits to supply liquid under pressure to each of said cylinders, valve means to supply pressure liquid from a source to one of said conduits at a time, valve means in each of said conduits to control the amount of liquid pressure exerted from said supply valve to each of said cylinders, and indicating means correlated with said supply valve to indicate which of said cylinders is receiving liquid pressure from said supply control valve.

8. A massaging device, comprising a support frame a plurality of movable massage elements mounted therein, means mounted on said frame to reciprocate said elements, said means including a rod secured to each of said members, pistons on each of said rods, a cylinder to receive each of said pistons, conduits to supply liquid under pressure to each of said cylinders, valve means to control the total liquid pressure which can be exerted against each of said pistons, valve means to selectively supply pressure liquid to one of said conduits at a time, valve means in each of said conduits to control the amount of liquid pressure exerted from said supply valve to each of said cylinders, and indicating means correlated with said supply valve to

indicate which of said cylinders is receiving liquid pressure from said supply control valve.

9. In a hydraulically operated massaging device, a plurality of hydraulically operated massaging elements, conduit means to supply pressure liquid to each of said elements and control valve means connected to said conduit means to regulate the pressure liquid operating on said massaging elements, said control valve means including a one way acting valve on the inlet side thereof to receive liquid from said conduit means and a one way acting valve on the discharge side thereof to discharge liquid into said conduit means.

10. In a hydraulically actuated massaging device, a plurality of hydraulically actuated massaging elements, conduit means to supply pressure liquid to each of said elements, valve means to selectively supply pressure liquid to said conduit means and associated massaging element, and control valve means connected to said conduit to regulate the pressure liquid operating on each of said massaging elements, said control valve including a one way acting inlet valve to receive pressure liquid from said conduit means, and a one way acting discharge valve to discharge pressure liquid to said conduit means.

11. In a massaging device, a plurality of reciprocable massaging elements, means to hydraulically reciprocate said elements, said means including a hydraulic system having a motor driven cycling valve to supply pressure liquid to all of said elements in fixed sequence, and manually controlled valve means in said system to regulate the pressure liquid supplied through said cycling valve to each of said massaging elements independently of the pressure acting on the other massage elements.

12. In a massaging device, a plurality of reciprocable massaging elements, means to hydraulically reciprocate said elements, said means including a hydraulic system to supply pressure liquid to each of said elements, and valve means in said system to regulate the pressure liquid operating on each of said massaging elements independently of the pressure acting on the other massage elements, said valve including a one way acting inlet valve to supply pressure liquid to said elements and a one way acting discharge valve to discharge pressure liquid from said elements.

13. In a hydraulically actuated massaging device, a plurality of reciprocable massaging elements having pressure liquid actuating devices a control valve to regulate the flow of liquid to said devices in sequence, another control valve between the first control valve and each device comprising a one way acting inlet valve to supply liquid to the device and a one way acting discharge valve to discharge pressure liquid from the device.

14. In a massaging machine, a series of movable pads, a fluid pressure responsive motor for operating each pad, a motor driven fluid pressure supply valve for directing pressure fluid to the respective motors in fixed sequence, and a manually controlled valve interposed between the supply valve and each pressure responsive motor for enabling timing of response of a given motor independently of the response of other motors.

WILLIAM H. BADGER.
LEE W. BADGER.

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