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MECHANICAL MANIPULATING MECHANISM

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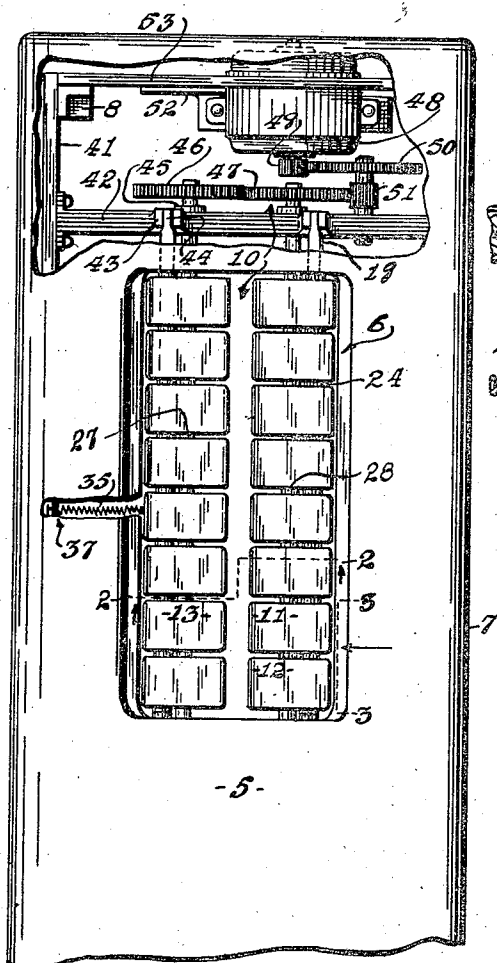


Fig. 1.

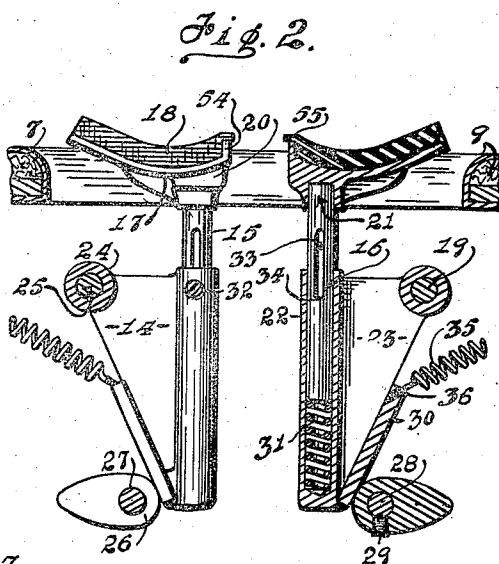


Fig. 2.

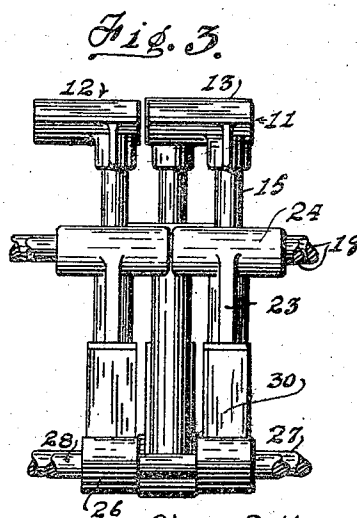


Fig. 3.

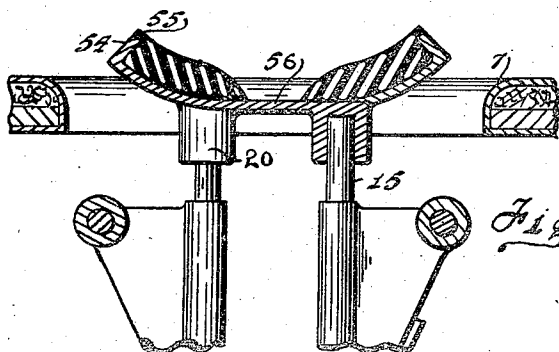


Fig. 4.

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MECHANICAL MANIPULATING MECHANISM.

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This invention relates to mechanical manipulation of the muscles of the human body, especially the spinal muscles, and pertains particularly to improved motions and effects for such machines.

The invention has for its principal object the provision of a machine which will quite positively draw the spinal muscles laterally outward from the spine in a suitable and predetermined period of time and subsequently allow them to return, without appreciable imparted acceleration, to normal position of their own volition.

It is the general consensus of opinion of those skilled in the art that a muscle, being somewhat yieldable, has a certain inherent inertia, and while in manipulation it may be positively moved outward, it should not be hastened in its return, it being one of the objects of manipulation to encourage the circulation of the congested lymph and venous flow.

Another object of the invention is to provide a manipulating mechanism which may be applied to a usual surgical table so that the patient may be in a fully relaxed reclining position, and which mechanism when so applied may resiliently support the patient with a view to providing against uncomfortableness, while further improving the effect of the manipulating mechanism, as will be hereinafter apparent.

Another object of the invention is to provide means whereby the mechanical manipulation may be effected through resilient material, such as a sheet or clothing, without effecting the efficiency of the machine.

My invention contemplates the use of a plurality of movable applicator elements for manipulating the muscles, and it is therefore another object of the invention to provide an applicator, which while being suitably resilient and devoid of any abrading effect will positively "take hold", as it were, of the muscles without discomfort to the patient.

Another object of the invention is the provision of convenient attachments for machines of the above character whereby to some of the muscles, such as those lying in the region of the neck, may be imparted a motion directly opposed to that being simultaneously imparted to the lower spinal muscles.

Another object of the invention is to provide a machine of the above character and for the above purposes that will be of reasonable first cost and is suitable for private or home use; particular consideration being given to simplicity of mechanism, sanitation, strength and accessibility for repair, replacement, adjustment and removal of parts for cleaning.

Other objects of the invention are to provide general practicability in the way of portability and adjustment to meet various conditions.

Still other objects and advantages will appear hereinafter.

I have illustrated by the accompanying drawings a preferred embodiment of my invention, but I do not limit myself thereto, inasmuch as it is conceived that the embodiment shown and hereinafter described may be substantially altered without enlarging the scope of the invention, within the appended claim.

In the drawings,

Figure 1, is a plan view of a surgical table to which the said embodiment of my invention is shown as applied; parts being shown broken away to reveal underlying parts.

Figure 2, is a view in enlarged detail section seen on a line 2—2 of Fig. 1, looking in the direction indicated by the arrows.

Figure 3, is a view in longitudinal section seen on line 3—3 of Fig. 1.

Figure 4, is a view in vertical section of an attachment for the machine.

More specifically, 5 indicates a table of the usual surgical type which is formed with a rectangular aperture 6 running longitudinally of the table and suitably spaced with relation to respective ends of the table so that a patient lying thereon will have the muscles adjacent the spine disposed over said aperture. The table consists of a board top 7, supported by legs 8, and having padding 9 over the entire upper surface thereof; the padding extending to and over the margins of the aperture.

The manipulating mechanism, indicated by 10, is disposed immediately below the aperture and is supported by the table. Disposed on substantially the same plane as the table top forming part of the said mechanism there are provided a plurality of independently movable applicators 11, 12 and

13, etc., which it is the object of the remainder of the mechanism to actuate and control. Said applicators consist essentially of a triangular rocker arm 14, an applicator shaft 5 15 slidable vertically in a bore 16 formed in said rocker arm, a rigid detachable applicator element 17 carried at the upper end of said shaft, and an applicator cushion 18 mounted on said applicator element.

10 The applicators are arranged in two sets, one set to each side of the longitudinal center line of the aperture, and for revolvably holding each set of said applicators a non-rotatable shaft 19 is provided. Each shaft 15 extends parallel with an adjacent margin of the aperture, and is so spaced from the other that the inner adjacent margin of opposed applicator elements are normally spaced apart a distance only slightly greater 20 than that of the human spinous processes of the spinal column.

Elements 17 are each provided with an integral boss 20, having a bore 21 into which the applicator shaft fits snugly. The boss 25 on each element is located to one side of the center line of the element so that with the applicator elements arranged and spaced as shown, the rocker arms of one set are staggered relative to those of the other set. This 30 arrangement permits of opposed rocker arms moving synchronously toward each other without possibility of interference in spite of the comparatively small space between them.

35 The rocker arm is provided with a socket portion 22 in which bore 16 is provided, and a web 23 integral therewith and also integral with a transverse boss 24. Said boss is formed with a bore 25, whereby the 40 rocker arm may be revolvably mounted on either of shafts 19.

Each shaft is equi-distant from the median line of the table and the distance is determined by the character of the arc 45 which it is desired to have the applicator elements move through.

Cams 26 are provided for actuating the rocker arms to impart motion to the applicator elements. Said cams are of the "quick lift" type for a purpose apparent herein- 50 after. The cams are arranged in sets, one set of cams for each set of applicator elements, and one cam for each rocker arm. A pair of cam shafts 27 and 28, respectively 55 are provided to which the cams are adjustably fixed by means of set screws 29. As the cams rotate in the direction indicated by the arrows they act upon a pad 30 provided on each of the respective rocker 60 arms.

It will be seen by the design of the cam and the angularity of the pad, taken in conjunction with the design of the cam, that the cam will move the rocker arm quickly 65 without appreciable shock, and said rocker

arm will remain substantially inactive through the major part of a complete revolution of the cam shaft.

Within the bore of each rocker arm a spring 31 is provided which supports the 70 weight of the applicator element and its shaft, and which will also resiliently support part of the weight of a patient.

The springs are so designed that all the applicators combined will be capable of re- 75 siliently supporting a patient of normal weight without the applicators being depressed too far downward. The upward movement of each applicator shaft is limited by a set screw 32 which extends into 80 a slot 33 in said shaft; the slot terminating as at 34. The combined action of the set screw and slot likewise prevent the applicator elements from turning.

While the cams act to forcibly actuate the 85 rocker arms in one direction, means are required for returning said rocker arms to normal position, and for this purpose, and in conformance with some of the objects of the invention, yieldable return means is provided in the form of a spring 35. Said 90 spring is fixed to the rocker arm as at 36, and extends over to a frame member 37 of the table to which it is secured. The tension required for each spring is determined 95 by the force with which it is desired to have the applicators returned to normal position, and the springs may be changed or the tension thereof altered to meet different conditions. 100

The table includes the removable top 7 to provide accessibility to the mechanism, and a rectangular frame 41 for supporting said top; the frame in turn being held by a plurality of legs 8. At one end of the table, 105 adjacent the corresponding end of the aperture a transverse truss 42 is provided for holding the cam shafts and rocker arm supporting shafts. Said truss is provided with bosses 43, into each of which a flattened end 44 110 of a corresponding rocker arm supporting shaft is fitted, whereby each shaft is held against rotation. Below these bosses bearings 45 are provided in which the cam shafts are rotatably held. 115

The cam shafts are each provided with a gear 46 and 47 respectively fixed thereto, and said gears are in mesh with each other so that the cam shafts run in opposed directions. An electric motor 48, or other suitable source of power is provided for operating the mechanism, and said motor rotates 120 a main drive gear 49. A plurality of other gears 50 and 51 are interposed between the gear 47 and gear 49 to provide for great reduction of speed, it being intended that the cam shafts require several seconds to complete one revolution. The motor is supported 125 on a bracket 52 which is in turn supported by transverse member 53 of the frame. 130

One of the salient features of the invention resides in the form of applicator element 17 and the cushion 18 thereon. At the inner end of said applicator element a vertically extending lip 54 is provided. This lip while serving to retain cushion 18 in position conforms to a decrease in the thickness of the cushion as at 55. Said cushions are preferably made of moulded rubber and are sufficiently resilient to provide for comfort. It will be seen that the portion of decreased thickness, being backed by the metal lip of the applicator element will be substantially less compressible and yieldable than the remaining portion of the pad. It is found that by virtue of this relative incompressibility, that portion of the pad is capable of extreme frictional engagement, and it is found that applicator elements so designed will positive "take hold", as it were, of a muscle and move it outward with it without discomfort to the patient. In fact the applicator is found to be equally capable when the clothing is interposed between it and the patient.

The operation of the mechanism will be better understood from the following: In Fig. 1 the applicators are all shown as being in neutral or normal position. It will be seen that, when in their neutral position, the two sets of applicators as a whole conform in spacing and position to the spinal column and its adjacent muscles. In actual use, however, at no time are all the applicators in similar position. By properly setting the cams, any desired consecutive order of operation, or "timing" of the applicators may be effected. Preferably they are set so that a consistent sequence is carried out, but this is entirely at the option of the operator.

When a patient lies upon the table with the back resting over the aperture his weight will be borne largely by the applicators, which will be depressed accordingly, and which as a group will conform to the spinal column and adjacent muscles. The weight borne by any particular applicator will determine the degree to which that applicator will function. It will be apparent from the foregoing that as the cams are revolved, each applicator will be forced through an upward and outward arc. The period during which this comparatively positive movement takes place will be about one-fourth of that required for a complete revolution of the cam shaft.

By virtue of the cushion design, that muscle resting upon an applicator will be drawn slowly but quite positively outward, according to the weight it exerts on the applicator, away from the spinal column, thereby allowing congested venous and lymph fluid to circulate. When the applicator has completed its advance stroke the cam allows it to re-

turn. Its return is prompted partially by the spring and partially by the weight coming on the applicator, although it will be apparent, since all the remaining applicators act to practically release the weight from that particular applicator, the latter will be returned, under usual conditions, by the spring. The spring is designed, however, so that if the muscle is sluggish in returning said spring will not act to force it back too positively. The long interval of time allowed for the applicator to return, coupled with the flexibility given it by the spring, allows ample time for congested venous and lymph fluid to distribute itself in conformance with the changing position of the adjacent muscle or muscles.

During the advance or retrograde movement of the applicator the provision of the yieldable mounting for the applicator results in the cushion remaining in operative contact with the muscle at all times. Each and every applicator functions in the same way, and inasmuch as each applicator may change in elevation, or may return to normal independent of any of the others, the manipulation of all muscles as a whole, subject to the machine, will be complete and thorough and closely in conformance to the amount and degree of positiveness of manipulation required by each respective muscle.

Such extreme adaptability and flexibility of the machine not only renders it highly efficient in its treatment, but also provides for the maximum of comfort to the patient and prevents undue stress on any muscle or other part of the anatomy subjected to treatment.

In Fig. 4 I have illustrated one form of applicator, which by proper proportion of the cushion thereof may be used for manipulating muscles in the neck or abdomen. This form of applicator is recommended as an attachment for the machine and is designed to move through an upward and inward path instead of an upward and outward path. This is made possible by an elongated portion 56 of the applicator element which extends from the shaft to which it is attached, across the center line of the aperture to the opposite side thereof. Thus by the provision of a few such attachments for the machine to conform to muscles of various form, a variety of motions and effects may be obtained, while the machine as a whole retains its efficiency. Obviously by placing a pair of such attachments on the upper end of the machine the spine may be given the usual treatment, while the muscles of the back of the neck may be treated by an upward and inward motion.

While I have shown a specific construction and arrangement of parts for carrying out my invention, I do not limit myself thereto, but may employ any construction

or arrangement of parts without enlarging the scope of my invention, within the appended claim.

I claim:

5 In an applicator for machines of the class described, a horizontally ranging plate having a straight forward edge, a vertically rising lip at said forward edge, a resilient cushion overlying said plate, said cushion
10 being of sufficient thickness, where it overlies said plate that the portion of the cushion which is to the rear of said lip has its upper surface disposed at a higher elevation than the upper termination of said lip, an exten-

sion to said cushion overlying said lip, the 15 upper surface of said extension being on substantially the plane of the upper surface of the adjacent portion of the cushion whereby the entire cushion presents a substantially continuous surface; the remaining 20 edges of said plate being devoid of such lips and the like whereby unrestrained lateral displacement of the cushion may take place; said upper surface being uncovered and adapted for direct contact with a yield- 25 ing portion of the human body.

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