Dec. 24, 1946. J. T. AYDELOTTE 2,413,133

ARCH NORMALIZER

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FIG. 1.

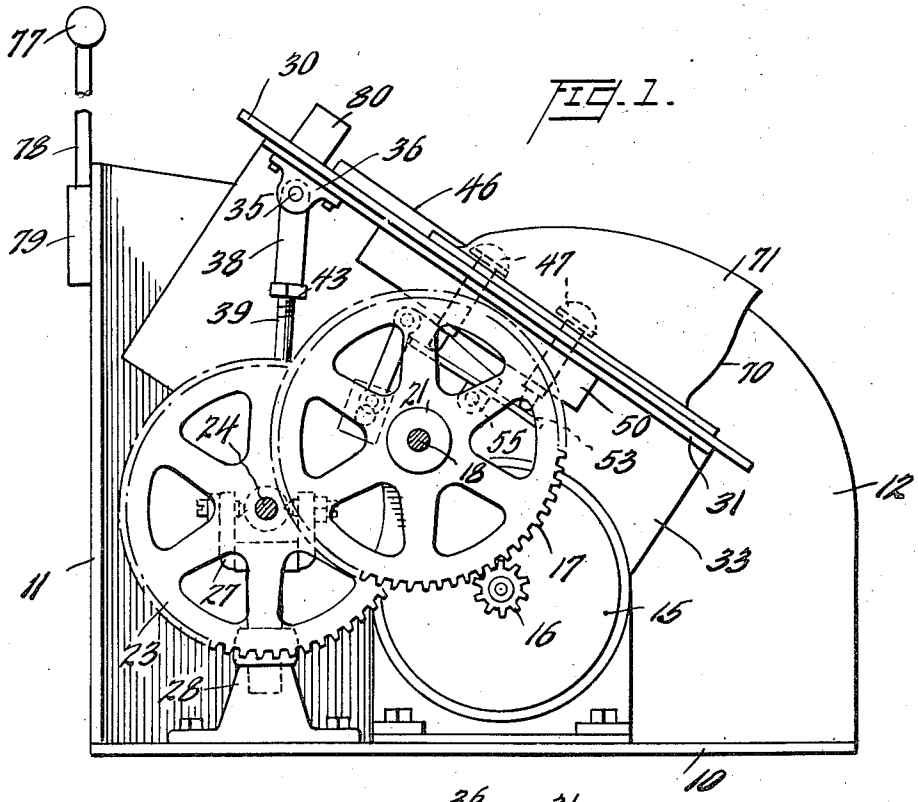
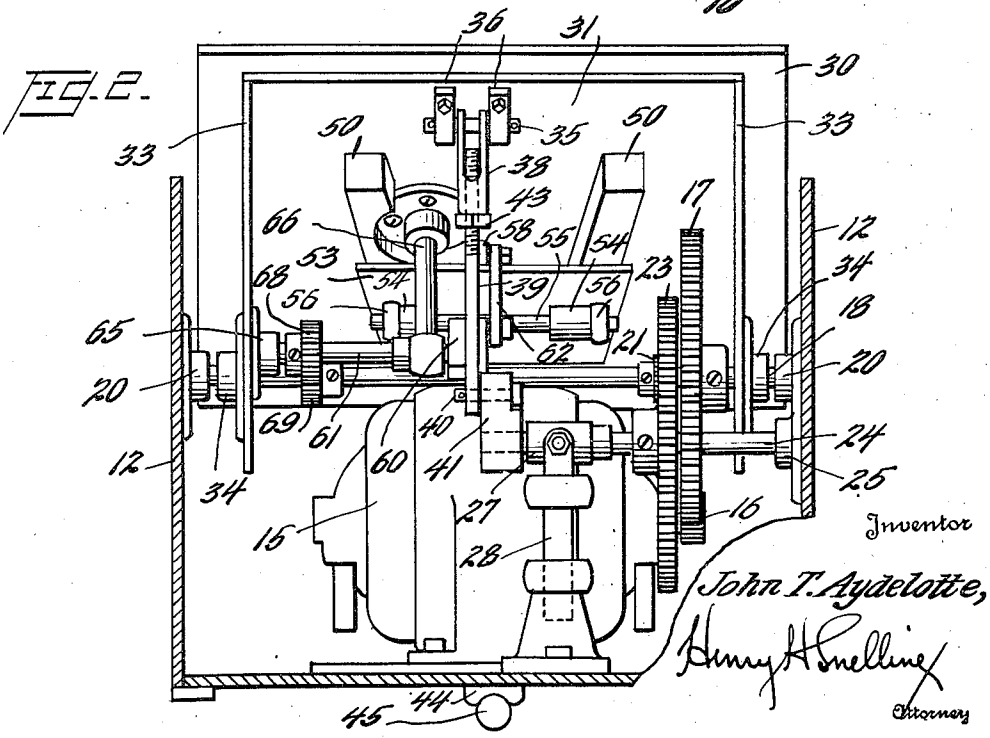


FIG. 2.



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FIG. 3.

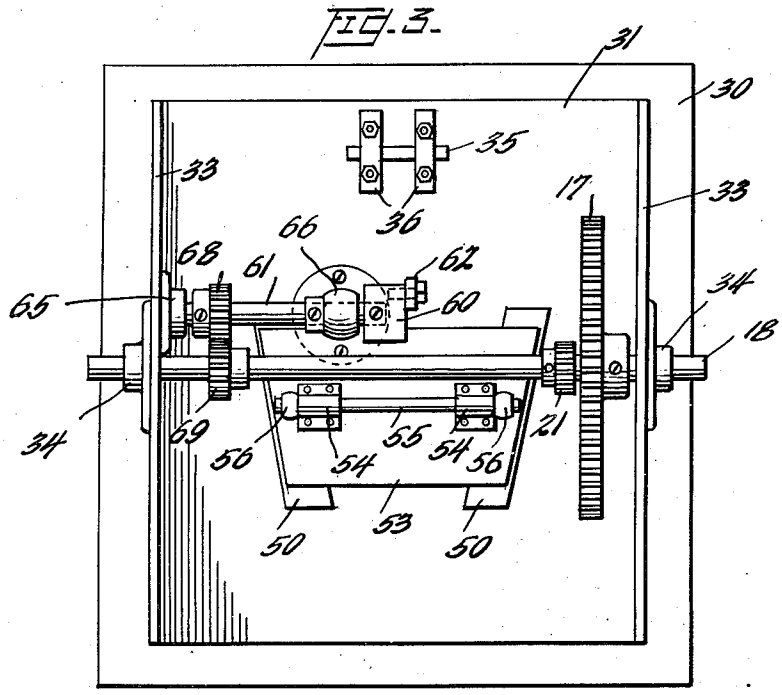
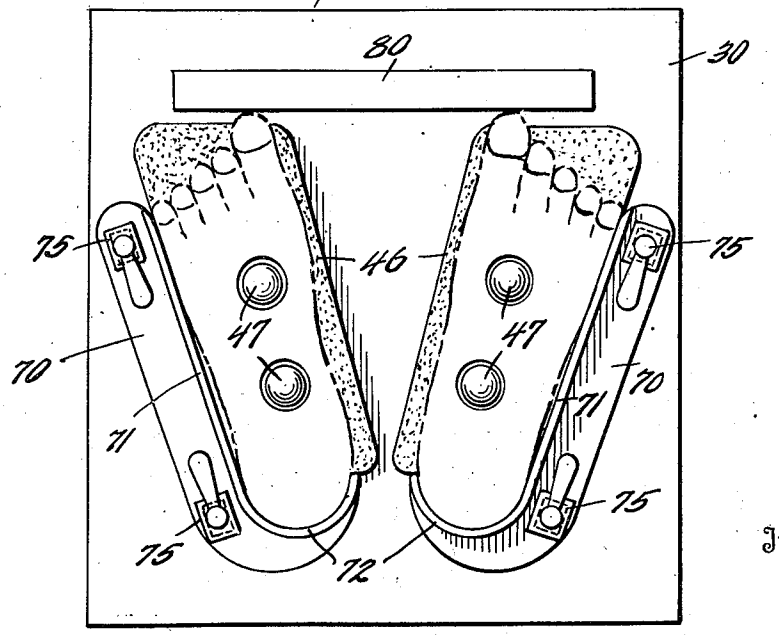


FIG. 4.



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FIG. 5.

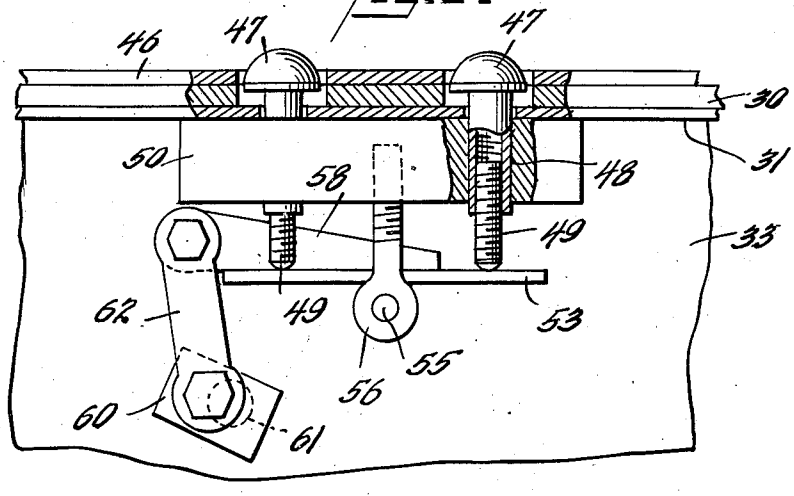
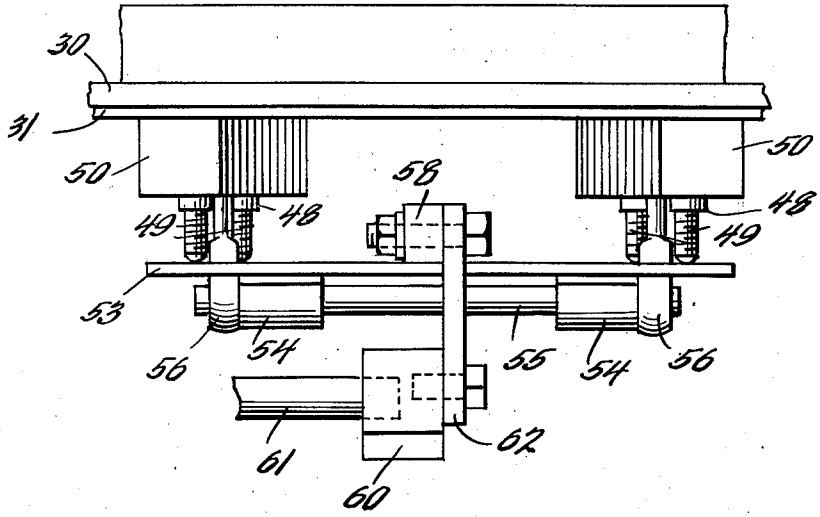


FIG. 6.



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UNITED STATES PATENT OFFICE

2,413,133

ARCH NORMALIZER

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Application September 8, 1943, Serial No. 501,575

18 Claims. (Cl. 128—48)

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This invention relates to devices for strengthening the muscles of the feet by exercise and has for its principal object the provision of an arch normalizer which massages the arches of the foot while causing a movement of the long muscles which pass beneath the arch from opposite sides, these combined movements exercising all of the joints in the feet and ankles.

Other objects of the invention relate to details making for convenience in operating and to increase the efficiency of the device, as more particularly pointed out in the claims.

The design of this machine is based on the fact that the bones which form the two arches of the foot are supported by two long muscles which are attached at their upper ends to the leg bones at points just below the knee and at their lower ends pass under the arches of the foot from opposite sides, thus serving as a sling to hold in place the key bones of the arch when these muscles are in healthy exercised condition. The sling is particularly effective since the one muscle is on the outside of the foot and the other, which passes at the rear of the leg enters below the arch on the opposite side, the inside. The tendons of these two muscles each have a number of points of attachment and they completely cross each other. Both muscles provide for the extension of the foot on the leg and the outer muscle (peroneus longus) takes care of eversion while the other (tibialis posticus) coming from the inside takes care of inversion, neither however having sufficient exercise in these days of perfectly flat streets and other surfaces on which walking is done.

My thought is that if these two muscles are strengthened by exercise they will naturally raise the key bones of the arch to their proper positions and will hold them there. Obviously the best exercise would be had by walking barefoot on uneven surfaces but since this will not be practiced, this machine in no small way accomplishes exactly the same function, by giving plenty of exercise to both of the muscles in both front to back movement and side to side movement. The action of the vibrators is to massage the bottom (plantar) surfaces of the foot as in this way the bones of the arch are moved upwardly into their normal positions and it is the function of the two muscles recited to hold them in this position. The combination of the movements is most effective, putting the muscles in tension and causing movement of all of the joints in the foot and the ankle.

A surprising feature of my machine is the fact

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that it gives a restful sensation to feet which are, as far as anyone can see, in perfect condition, being without any indication of any displacement of any of the several bones of the arches of the feet.

In the drawings, illustrating one form of my device which has been found satisfactory in my practice:

Figure 1 is a side elevation with one side bracket or plate removed.

Figure 2 is a front elevation with the front plate of the cabinet removed.

Figure 3 is a bottom plan view of the foot supporting table.

Figure 4 is a top plan view.

Figures 5 and 6 are views of the rocker plate and vibrator assembly.

The cabinet of my device includes a bed 10, a front plate 11 and two side plates 12 forming a box, open at its top and back. Centrally secured to the bed is a motor 15, the pinion 16 of which drives a wheel 17 fast to a main shaft 18 mounted in bearings 20 on the respective side plates 12. A pinion 21 fast on main shaft 18 drives the gear 23 fast on shaft 24 which is the table tilting shaft and is mounted at one side in a bearing 25 on the side plate 12 and at the other side in a bearing 27 carried by a pedestal 28 secured to the bed 10 somewhat forward of the motor 15.

A table 30 upon which the feet of the patient are supported is secured to the steel base 31 which has at each side a bracket 33 for mounting the table so as to oscillate on the main shaft as for example by the bearings 34 carried by the parallel brackets. A pin 35 loosely mounted in a pair of lugs 36 secured to the table base 31 is frictionally held in a yoke 38 threaded to a pitman 39 pivoted as at 40 to a crank arm 41 on the end of the table tilting shaft 24 which projects through the pedestal bearing. As a result of the mechanism thus described the motor causes the foot supporting table to oscillate about the axis of the main shaft at a speed which may be roughly twenty-five times per minute, this giving about one tilt per second. The angle of tilt is adjusted as may be desired, giving usually a deflection as much as 35° on each side of horizontal. This angle can be increased or decreased by means of the threaded connection between the pitman 39 and the yoke 38, a lock nut 43 being provided to keep the parts in desired relation.

While the bed of the cabinet may rest directly on the floor I prefer to provide a channel 44 at the bottom of the bed 10 so that the entire cabinet

may be mounted on a steel cylinder **45** to provide for lateral tilting of the table in addition to the forward and backward oscillation of the table about the axis of the main shaft as such an additional tilt at right angles to the main tilt tends to strengthen the ankles of the patient.

In order to massage the patient's arches I provide one or more vibrators positioned directly under the longitudinal arch of the foot. These vibrators may each consist of a rubber cushion **47** mounted on an internally threaded sleeve **48** in which is mounted a tappet **49**, the threaded engagement providing for an appreciable alteration in simple fashion of the throw of the vibrator.

The stem of the vibrators may be a simple rod in which case the movement of the head **47** will be constant but the effective movement may be altered by using a pad **46** with holes therein for the vibrators. I prefer a throw of about a half-inch and about three cycles per second. The vibrators are mounted in guide bars **50**, secured to the table **31** sloped to make an angle of 12 to 15 degrees right and left for most convenient positioning of the feet. The vibrators may be reciprocated in any desired manner, a convenient scheme being to have the tappets or stems engage a rocker plate **53** oscillating by means of bearings **54** turning about a shaft **55** suspended from the guide bars **50** by suspension eyes **56**. An arm **58** secured to the rocker plate **43** is operatively connected with a crank **60** on shaft **61** by means of a link **62**. This gives a rapid oscillation to the rocker plate **53** and a consequent rapid reciprocation of the rubber heads **47** of the vibrators, the shaft **61** turning at about 165 R. P. M.

As best seen in Figure 2, the shaft **61** is mounted in a bearing **65** carried by the bracket **33** of the table base **31** and by a pedestal bearing **66** suspended from the table base **31**. The shaft **61** receives its motion through a pinion **68** carried thereon and continuously meshing with a pinion **69** on the main shaft **18** as shaft **61** rocks about shaft **18**. All of the pinions and gears are illustrated in conventional type but it is my preference that they be helically cut and run in oil in order to minimize the sound.

For convenient reception of the feet above the vibrator heads **47** I provide a pair of foot retainers **70** each including a vertical side plate **71** to engage the outer side of the foot and a curved heel engaging portion **72**. These retainers **70** are mounted for ready adjustment on the table **30** in any desired manner, as preferably by the clamps **75** which will enable the positioning of the retainer so as to bring the arch directly over the pusher heads. A handle bar **77** is found convenient and may be somewhat in excess of four feet above the table. The vertical posts **78** of the handle bar may be received in sockets **79** secured to the front corners of the cabinet.

After the foot retainers have been adjusted by the doctor in proper position for the particular patient and preferably a toe board **80** is placed against the toes to afford a more convenient gripping of the table **30**, the patient tilts about the main axis and the vibrators operate to massage the lower surface of the foot as a result of the motor and if the cylinder **45** is used the patient moves the cabinet from side to side, which serves to strengthen the ankles and to render the other actions more effective.

What I claim is:

1. A foot engaging table tiltable about a horizontal axis, and power means for rocking the table about a second axis at right angles to said axis.

2. The device of claim 1 plus means for vibrating the arch bones of a foot on said table while the table is being tilted about one or both of said axes.

3. In a foot exercising device, a pivoted table, a plurality of pairs of reciprocating members, adjustable means on the table for positioning the patient's feet on the table with the arches above the reciprocating members, and means for tilting the table about its pivot and for simultaneously reciprocating the members to massage the bottom of the feet as the table is oscillated thru an angle of very roughly 30°.

4. The combination with a tilting table of a rocker plate pivoted about an axis moving with the table and a plurality of pairs of headed members positioned to manipulate the bones of the arch of the foot and operatively associated with rocker plate.

5. In combination, a cabinet, a table pivoted in the cabinet about a main shaft, an auxiliary shaft journalled in the table, a table tilt shaft, crank means connecting the table and the table tilt shaft, a rocker assembly, a plurality of vibrators operated thereby, crank means connecting the auxiliary shaft and said rocker assembly, an electric motor, and gearing connecting said motor with said shafts to tilt the table and to oscillate the rocker assembly.

6. A foot supporting table, power means for rocking the table about a horizontal axis, means for varying the degree of rocking of the table up to 35° on each side of the neutral position, and means for massaging the bottom surface of the foot resting on the table to approximate manual manipulation while the table is being rocked, said combination of movements roughly approximating walking barefoot on uneven surfaces.

7. The device of claim 6 in which the massaging means includes a pair of pads to engage each foot and power means for reciprocating the pads of each pair in sequence with a movement of very roughly a half-inch.

8. The device of claim 3 in which the pairs of members reciprocate in sequence at a relative slow rate, roughly three cycles per second.

9. A foot supporting table, means for slowly rocking the table about a horizontal axis, and means for massaging the bottom surface of the foot below the arch to move the arch bones while the table is being rocked.

10. In combination, a table, means for slowly rocking the table at a rate approximating one tilt per second, a vibrator positioned to engage the surface of the foot resting on the table so as to give a massaging movement to the arch bones of the foot simultaneously with the extension and contraction of the foot muscles caused by the rocking of the table.

11. In combination, a foot support, means for slowly rocking the support thru an angle sufficient to stretch the arch bones supporting muscles of the leg, and means for moving the arch bones upwardly as the table rocks, such movement being thru a distance of about half an inch.

12. In an arch normalizer, a table for supporting a patient in a standing position, means for vibrating the arch bones of the feet of the patient, means for moving one end of the table upwardly and downwardly to alter the plane of support to exercise the patient's leg muscles, and means for engaging the patient's feet to prevent slipping of the patient as the table is moved.

13. In combination, means for intermittently stretching the arch bones supporting muscles of the leg at a relatively slow rate, and means for imparting an intermittent pressure to the bottom of the foot to move the arch bones as the supporting muscles are being stretched.

14. In an arch normalizer, a table for supporting a patient's feet, means for moving the table to stretch the arch bones supporting muscles of the legs, and vibrating means for moving the arch bones of the feet slowly as the supporting muscles are being stretched.

15. The device of claim 14 in which the vibrating means includes a plurality of reciprocating members for each foot.

16. The device of claim 14 in which the vibrating means includes a pair of pads reciprocating in sequence for each foot thru an amount of very roughly a half inch and at a slow rate of about three cycles per second, and the table moves at a rate very roughly approximating 25 cycles per minute.

17. The device of claim 14 in which the tilting means is power driven and includes an adjustable connection whereby the degree of tilting may vary up to 35° on each side of a neutral position, and the vibrating means includes a pair of members engaging the soles of the feet and mechanically operated in sequence by a rocker plate, connected by gearing to the table tilting means.

18. In a machine for exercising the feet to strengthen the arches, the combination of a foot supporting table mounted for movement to stretch the leg muscles with means, carried by the table, for moving the arch bones away from the table as the table tilts to stretch the leg muscles, whereby all of the joints in the foot and ankle are exercised, and the strengthening of the muscles by the exercise will tend to raise the key bones of the arch to their proper positions and will hold them there.

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