Jan. 1, 1963 L. J. HOYER ETAL 3,071,130

THERAPEUTIC DEVICE

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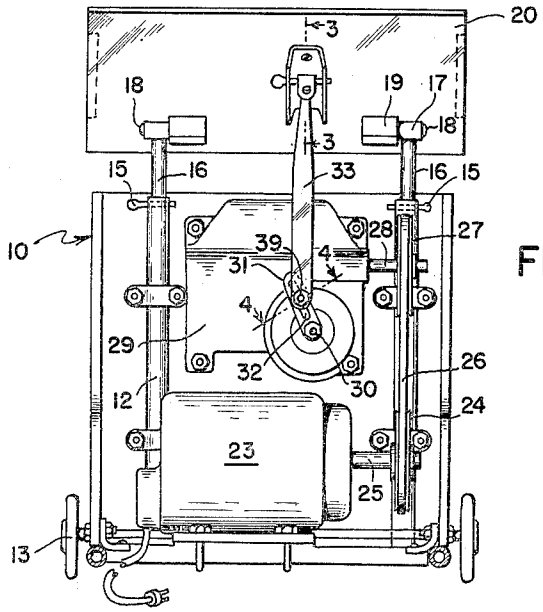


FIG. 2

FIG. 3

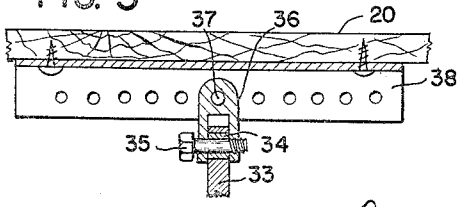
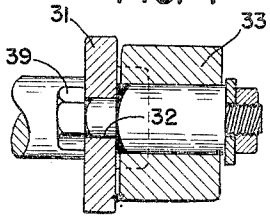


FIG. 4



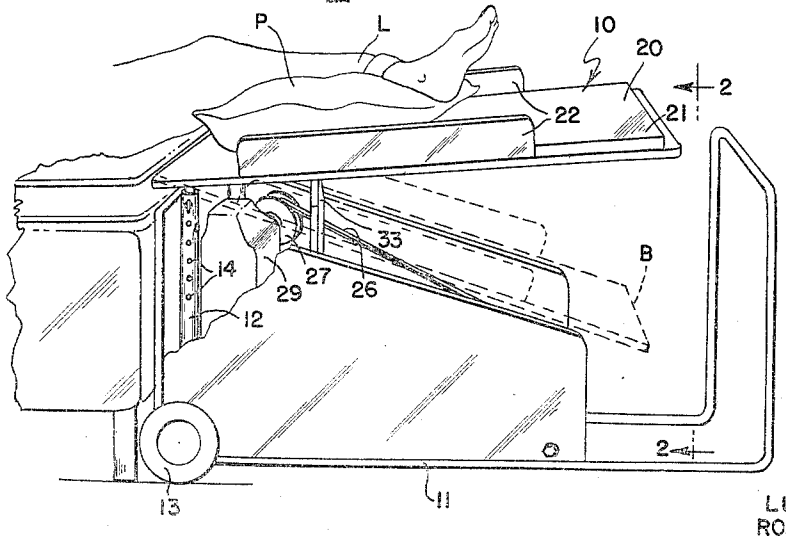


FIG. 1

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THERAPEUTIC DEVICE

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This invention relates to therapeutic apparatus and more particularly relates to a device for producing prolonged exercising or movement of the extremities of a person.

It has been found that in treating the thigh, leg and foot of a person, there is frequently only little or very slow response to normal treatment because the circulation of blood through these parts of the body may have been impaired by age, accident or disease. It is helpful if the leg can be flushed and drained of blood in a continuing manner over a prolonged period.

An object of our invention is the provision of a new and improved therapeutic device of simple and inexpensive construction and operation for producing a continued raising and lowering of a person's leg and foot over a prolonged period.

Another object of our invention is the provision of a novel therapeutic device which is well adapted for inducing flow of blood into and out of the foot and leg of a person while he remains comfortably seated in a chair and which may be safely operated even though the person may fall asleep.

These and other objects and advantages of our invention will more fully appear from the following description made in connection with the accompanying drawings wherein like reference characters refer to the same or similar parts throughout the several views and in which:

FIG. 1 is a perspective view of the invention viewed from one side;

FIG. 2 is a section view taken approximately at 2—2 in FIG. 1;

FIG. 3 is a detail section view taken approximately at 3—3 in FIG. 2; and

FIG. 4 is a detail section view taken approximately 4—4 in FIG. 2.

One form of the present invention is shown in the drawings and is described herein. The therapeutic device is indicated in general by numeral **10** and includes a frame structure **11** including a pair of upright post-forming pipes **12** disposed adjacent the rear end of the frame and above the dolly wheels **13**. The pipes **12** are apertured at **14** for receiving pins **15** which extend therethrough and through corresponding apertures in upright telescoping rods **16** which are slidably carried in the interior of pipes **12**. The rods **16** carry bearings **17** at their upper ends through which extend pivot pins **18** into pivot bearings **19** which are secured on the lower side of the elongate and substantially planar, rigid leg-supporting and confining plate or member **20**. The leg-supporting member **20** is tiltable about the pivot pins **18** to any of a plurality of inclined and horizontal positions so as to raise and lower the front end of the member **20**. The leg-supporting member **20** is provided with a cushion **21** and is also provided with side rails **22** which are affixed along the edges of the member **20** in upstanding position so as to prevent sideward movement of the person's leg off the member **20**. As shown in FIG. 1, it may, in some instances, be desirable to employ a pillow P on the member as well as the cushion **21** to further elevate the position of the leg and to provide comfort for the leg.

Means are provided to produce oscillatory tilting of the leg-supporting member through a desired arc, such as between the full line position shown in FIG. 1 and the

dotted position B. In the form shown such means includes a motor **23** affixed on the frame **11** and having a pulley **24** carried on the spindle **25** thereof and driving a belt **26** which is trained over pulley **27** on the input spindle **28** of a speed-reducing gear mechanism **29**. The speed reducing mechanism **29** has an output shaft **30** to which is affixed a rotating crank arm **31** which has a longitudinally extending slot **32** therein. A connecting link **33** is connected through a bushing **34** and bolt **35** in swingable relation to a fitting **36** which is swingably connected by pin **37** to the bracket **38** which is affixed at the bottom side of the member **20**.

A bolt **39** interconnects the lower end of link **30** to the crank arm **31** at a desired position along the length thereof and by merely loosening the bolt **39**, the rotating connection between the crank arm **31** and the link **33** may be adjusted along the length of arm **31** so as to vary the magnitude of oscillatory tilting of the leg-supporting member **20**.

It has been found highly successful to produce tilting oscillation of the leg-supporting member **20** through an arc of approximately 30° with the member **20** being disposed at approximately 5° above horizontal in its uppermost position such as that shown in FIG. 1.

The speed-reduction mechanism **29**, together with the motor **23** produces the tilting oscillation of the member **20** such that one complete downward and upward movement tilting cycle of the member **20** takes approximately 60 to 80 seconds. It will be understood that with the crank arm **31** rotating slowly, the member **20** will be substantially stationary for a number of seconds at its uppermost position and at its lowermost position.

As one example of the use of the device **10**, a diabetic patient, 62 years of age, was in an automobile accident and as a result one of his legs had to be amputated as a result of arteriosclerotic and trophic changes. In an attempt to forestall the need for amputating the other leg, the patient's other leg was exercised through the use of the instant invention. In his remaining lower leg, there was limited arterial supply and no pulses were palpable below the knee. Only two toenails were normal in appearance; a cellulitis of the lateral malleolus of the ankle showed abrasion of the skin. There was need to flush and drain the blood in the leg and through the use of the instant invention, the flow of blood was induced such that when disposed in the uppermost position the leg had a near-pallor appearance and when the leg was in the lowermost position the leg had a red flushed appearance. Through prolonged exercising of the leg, hour after hour, the leg was saved and amputation was found unnecessary.

In addition, the device **10** has many other therapeutic applications. It is evident that its effects include reduction of arteriolar spasm, increase of venous blood velocity hastening capillary proliferation and thus favors natures growth and repair processes. The use of the device **10** promotes repair of wound healing, skin and vascular grafts, and prevention of arterial and venous thrombosis in elderly and post operative patients.

The device **10** may also be used by elderly persons to prevent blood clots due to prolonged sitting and to avert gangrene and consequent amputation in those with poor circulation and may also be used after surgery or accident where the victim or patient cannot move voluntarily to avert blood clots which are the commonest complication.

It will, of course, be understood that various changes may be made in the form, detail, arrangement and proportion of the parts without departing from the scope of our invention which consists in the matter described herein and set forth in the appended claims.

What we claim is:

1. A leg exercising therapeutic device for use by a

person sitting in a chair, comprising a frame, an elongate leg-supporting member oriented in a generally horizontal position and having a rear end to be disposed adjacent the chair at the approximate elevation of the chair seat so as to comfortably accommodate the person's leg thereon, said member having a forward end, pivot means mounting said rear end on the frame and permitting swinging of said member for raising and lowering said forward end to produce raising and lowering of the leg and foot of the person sitting in the chair, and a mechanical oscillator on the frame and connected with the member for raising and lowering the forward end of said member to produce sustained movement of the person's leg and inducing flow of blood into and out of the leg.

2. A leg exercising therapeutic device, comprising a frame, an elongate leg-supporting member having front and rear ends and being oriented in a generally horizontal but forwardly and upwardly tilted position, said rear end being disposed at an elevation to comfortably accommodate and support the leg of a person sitting in a chair, pivot means on said frame and mounting said rear end of the member to permit swinging movement thereof and lowering and raising of said forward end to produce lowering and raising of the leg and foot of the person sitting in the chair, and a mechanical oscillator on the frame and connected with the member for swingably lowering said member from said tilted position and downwardly through a predetermined arc and then producing upward swinging movement in successive cycles and thereby producing sustained lowering and lifting of the person's leg to produce flow of blood into and out of the leg.

3. A leg exercising therapeutic device, comprising a frame, an elongate leg-supporting member having forward and rear ends and being oriented in a generally horizontal, but forwardly and upwardly tilted position, said frame including vertically adjustable post means beneath the rear end of said member, pivot means interconnecting the upper end of said post means and the rear end of said member and permitting swinging of the member about a horizontal axis to permit raising and lowering of the forward end of said member and thereby producing raising and lowering of the leg and foot of a person sitting in a chair and a mechanical oscillator on the frame and connected with the member for producing swinging movement thereof and lowering of said forward end from said

position and thence raising the forward end to said position again and thereby producing sustained exercising movement of the leg for inducing flow of blood into and out of the leg, whereby the elevation of the rear end of the member may be adjusted to vary the manner of exercising of the leg.

4. A leg exercising therapeutic device, comprising a frame, an elongate leg-supporting member having front and rear ends and being oriented in a generally horizontal but upright position, pivot means on said frame and mounting said rear end at a position to comfortably accommodate the leg of a person sitting on a chair and permitting swinging movement of the member about a horizontal axis, a mechanical oscillator on the frame and including a source of rotary power, a revolving crank arm turning about a horizontal axis, an upright connecting link connected with said member, and adjustable means connecting said crank arm and said link at any of a plurality of positions along said arm to vary the magnitude of oscillatory tilting movement of said member and thereby producing the desired movement of the leg to induce the proper flow of blood into and out of the leg.

5. The invention set forth in claim 3 wherein said mechanical oscillator includes a source of rotary power, a revolving crank arm turning about a horizontal axis, an upright connecting link secured to said member, and adjustable interconnecting means securing said link to said arm at any of a plurality of positions along said arm, whereby to produce the desired magnitude of oscillatory tilting movement of said member and of the person's leg in relation to the exercise of the leg to be produced and thereby inducing the proper flow of blood into and out of the leg.

6. The invention set forth in claim 4 wherein said elongate leg-supporting member is disposed at approximately 5° from horizontal in said tilted position and wherein said mechanical oscillator produces tilting movement of said member through an arc of approximately 30°.

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