June 14, 1960 T. G. WILHELM 2,940,442

INTERMITTENT TRACTION THERAPY APPARATUS

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Fig. 1.

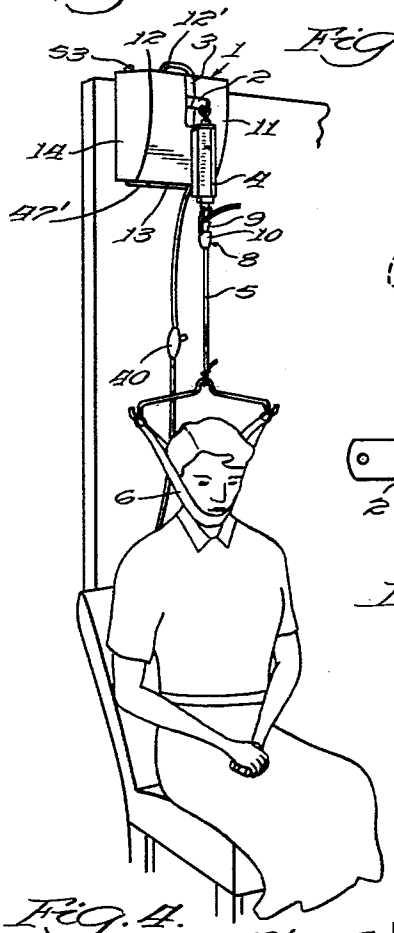


Fig. 2.

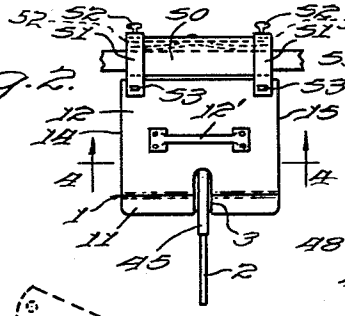
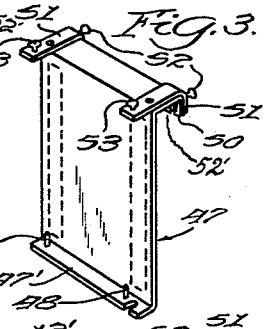


Fig. 3.



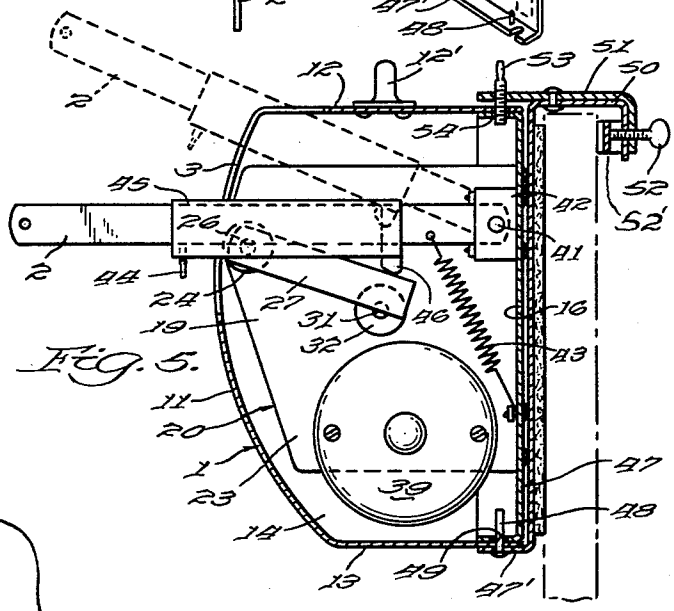


Fig. 5.

Fig. 4.

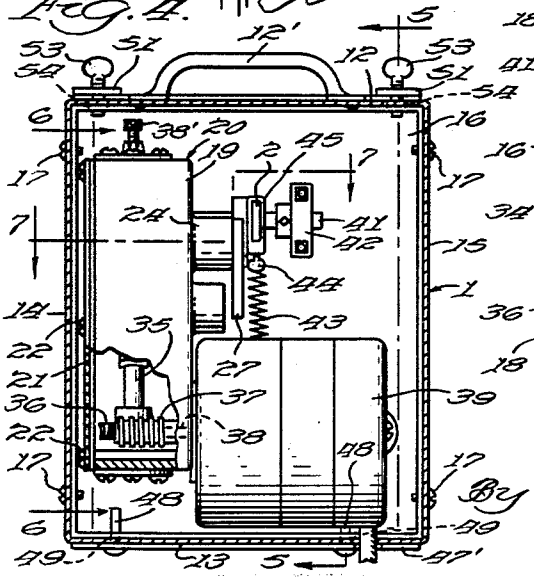
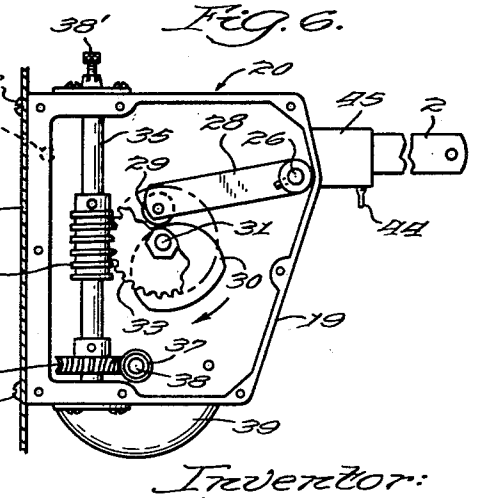


Fig. 6.



Inventor:
Tru G. Wilhelm.
By Harold J. LeVesconte
Atty.

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Fig. 7.

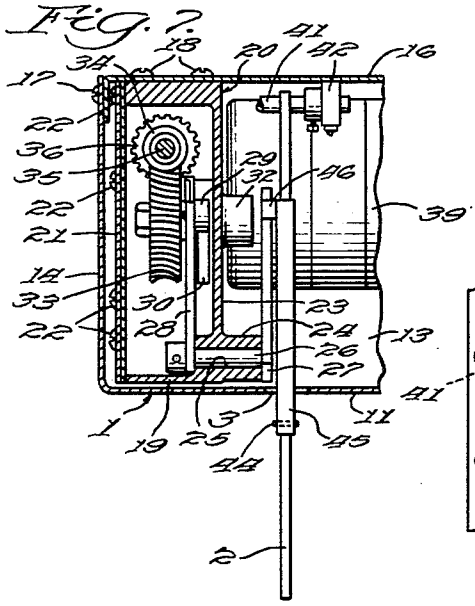
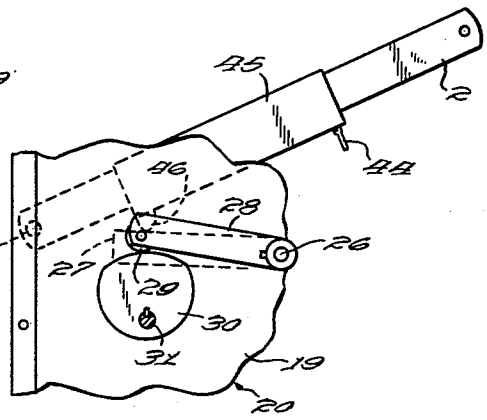


Fig. 8.



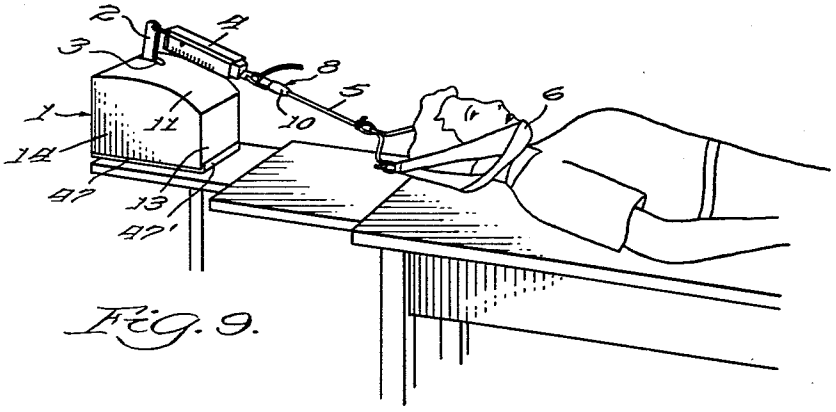


Fig. 9.

Fig. 11.

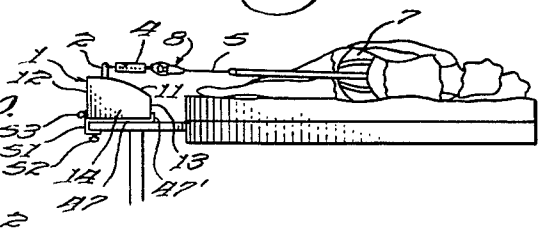
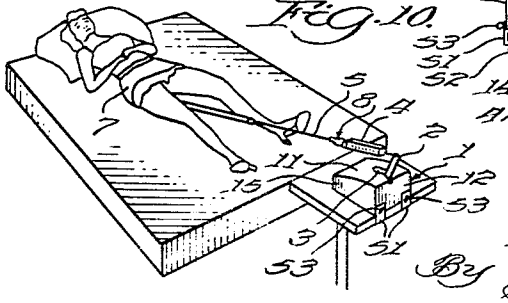


Fig. 10.



Inventor:
Thos G. Wilhelm.
By Harold J. LeVesconte
Atty.

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INTERMITTENT TRACTION THERAPY APPARATUS

Tru G. Wilhelm, 436 Bethany Road, Burbank, Calif.

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10 Claims. (Cl. 128—75)

This invention relates to therapeutic apparatus and more particularly to a means for imparting intermittent traction especially to the vertebrae of persons.

In the treatment of spinal injuries or disease conditions, the use of traction is desirable but often the required amount of tractive force required for the best results is greater than the level of tolerance of the patient for continued application of traction. On the other hand, a patient may be subjected to momentarily applied tractive forces which are much greater than those which may be applied continuously.

With these considerations in mind, it is the principal object of the invention to provide a device which will impart to a patient intermittently applied tractive forces of a magnitude which is at or near the level of tolerance of the patient for such forces.

Another object of the invention is to provide an intermittent traction producing device in which the amount of force exerted, the frequency of the applications of traction, the length of stroke of the device, and the adjustment of the means connecting the device to the patient are all susceptible of independent adjustment to achieve the application of the desired or prescribed amount of traction on the patient.

Still another object of the invention is to provide an intermittent traction producing device susceptible of use on a patient in either a seated position or lying on a table.

A still further object of the invention is to provide an intermittent traction producing device which is of small size and readily transportable and which may be readily installed for use and as readily dismounted after use.

Still another object of the invention is to provide an intermittent traction producing device which is simple and sturdy in construction and which is capable of long and continued use without the need for servicing.

With the foregoing objects in view, together with such additional objects and advantages as may subsequently appear, the invention resides in the parts and in the construction, combination and arrangement of parts described, by way of example, in the following specification of a presently preferred embodiment of the invention; reference being had to the accompanying drawings which form a part of said specification and in which drawings:

Fig. 1 is a perspective view showing the device as applied to imparting traction to the cervical spine of a seated patient,

Fig. 2 is a top plan view of the device,

Fig. 3 is a perspective view of the bracket means for mounting the device,

Fig. 4 is an enlarged front elevational view of the interior of the device, the casing being broken away substantially on the line 4—4 of Fig. 2 and a portion of the gear case being broken away to show interior construction,

Fig. 5 is a side elevational view of the device; the casing being broken away substantially on the line 5—5 of Fig. 4,

Fig. 6 is a side elevational view of the interior of the gear case with the cover removed as indicated by the line 6—6 of Fig. 4,

Fig. 7 is a fragmentary top plan view taken on the line 7—7 of Fig. 4,

Fig. 8 is a fragmentary view similar to Fig. 6 but showing the actuating cam and associated parts at the opposite end of the traction producing stroke,

Fig. 9 is a perspective view showing the device employed for imparting cervical traction to a recumbent patient, and,

Figs. 10 and 11 are perspective views showing various applications of the device for imparting pelvic traction to a recumbent patient.

Referring first to Figs. 1, 9, 10 and 11, the illustrated embodiment of the invention comprises a casing 1 mountable on a supporting means spaced from the patient; said casing enclosing a motor and devices actuated thereby which impart oscillations to a lever arm 2 projecting outwardly through a slot 3 in the casing. A spring scale 4 has one end thereof attached to the arm 2 and the other end thereof connected by a flexible member 5 with a halter means 6 engaging the head of the patient (Figs. 1 and 9) or with a belt 7 surrounding the trochanter area of the patient (Figs. 10 and 11). Suitable means for adjusting the length of the flexible member 5 is also provided such as the hollow chuck 8 through which the flexible member extends; said chuck having a series of gripping jaws carried by a sleeve member 9 reciprocable in the outer member 10 of the chuck. The scale 4 serves two purposes in that first, it registers the maximum pull being exerted on the patient and second, it provides the necessary yielding action in the applied traction or pull.

Referring next principally to Figs. 2 through 8, the casing 1 comprises a first member formed of sheet metal and comprising the front 11, the top 12, preferably provided with a carrying handle 12', the bottom 13, and the ends 14 and 15 and is of generally rectangular configuration except that the front portion is convexly curved as about a horizontal axis and that the bottom is of less width than the top. The rear of the casing is closed by a cover 16 having forwardly projecting flanges which closely fit within the inner faces of the top, bottom and end portions of the front member 11 and which is suitably removably secured therein by screws 17 extending through holes in the end portions 14 and 15 and which threadedly engage the cover flanges. Disposed within the casing and secured to the inner face of the cover 16 by screws 18 is the frame member 19 of a gear case 20; said gear case having one side thereof closed by a removable cover 21 secured thereto by screws 22. The side wall 23 of the frame member 19 is disposed opposite the cover 21 and carries a bearing boss 24 projecting laterally from both sides of the side wall adjacent the upper front portion of the case and said bearing boss has a horizontal bore 25 extending therethrough affording a bearing for a rock shaft 26 mounted therein. Externally of the gear case the shaft 26 carries a radially extending arm 27 projecting generally toward the rear of the casing 1. Within the casing, the shaft 26 carries a second arm 28 projecting substantially in the same direction as the arm 27 and the engagement of the sides of the arms 27 and 28 with the ends of the boss 24 serve to restrain the shaft against endwise movement. The arm 28 at its distal end carries a roller 29 rotatable on an axis parallel with the axis of the shaft 26; said roller engaging the surface of a cam 30 fixed to a shaft 31 journaled in a bearing boss 32 in the side wall 19 of the gear case and also being disposed with its axis parallel to the axis of the shaft 26. The shaft 31 also carries a worm gear 33 fixed thereto at the side of the cam 30 remote from the wall 19 and this worm gear meshes with a worm 34 carried by a shaft 35 journaled in bearings at the top and bottom of

the gear case and adjacent the lower end thereof carries a worm gear 36 which meshes with a worm 37 carried by the shaft 38 of a motor 39 mounted on the exterior of the gear case side wall 19 with the shaft thereof projecting into the interior of the gear case. Means such as the screw 38', may be provided for adjustably restraining endwise movement of the shaft 35. Preferably, the motor is a double wound motor for two speeds; the control and selection of speeds being achieved by a manual switch 40 mounted in a flexible conductor by which the motor may be connected to any convenient outlet; the switch being movable to high speed, low speed or off positions selectively. All of the gearing is separately enclosed within the casing so that it may be suitably lubricated at assembly and be maintained in properly lubricated condition for long periods of time. It is further to be noted that since the speed reduction means consists exclusively of worm gearing, the device is quiet in operation and thus will not annoy a patient being treated by the device.

The lever arm 2 is pivotally mounted on the back member 16 of the casing 1 by means of a shaft 41 fixed to one end of the lever arm and projecting from both sides thereof with said ends journaled in a bearing block 42 fixed to the inner face of the back member 16 and in the wall 19 of the gear case 20; said shaft being disposed parallel to the shaft 26 and the lever arm 2 being disposed for movement in a plane parallel to the path of movement of the arm 27. A tension spring 43 serves to urge the lever arm 2 toward the adjacent edge of the arm 27. Slidably mounted on the lever arm 2 and securable in adjusted positions thereon by a thumb screw 44 is a sleeve member 45 having at the end thereof adjacent the shaft 41 a fulcrum element 46 engageable with the edge of the arm 27 and held in such engagement by the spring 43. The force of the spring 43 thus serves additionally to maintain the roller 29 in contact with the cam 30 and thus, as the cam rotates from the high point to the low point thereof, to cause the lever arm 2 to oscillate in the opposite direction.

The cam 30 has the major portion of its periphery generated about an axis laterally offset from the axis of the shaft 31 and diametrically opposite the axis of the shaft 31 has about one third of its periphery generated about the axis of the shaft 31. Thus the rotation of the cam will impart oscillations to the shaft 26 through the arm 28 and at the portion of the cam generated about the axis of the shaft will impart a prolonged dwell at the high point of the cam. Referring now particularly to Fig. 5, it will be noted that the lever arm 2 is pivoted at the rear of the casing and the arm 27 is pivoted at the front of the casing. The fulcrum element 46 is positioned between these pivotal mountings and thus when moved on the arm 2 toward the rear of the casing, it engages the arm 27 at a point of greater lineal movement and at the same time it is closer to the pivot point of the lever arm 2 with consequent increase in the extent of movement of the lever arm 2. Conversely when moved to a point adjacent the axis of the shaft 26 with little movement of the arm 27, the movement of the lever arm is greatly reduced. By this novel arrangement, a wide range of oscillation of the lever arm 2 is effected within small space and by means which can be readily adjusted while the device is in operation with the proportion of dwell time to reciprocating time being maintained at all adjustments.

The mounting means for the device comprises a bracket member 47 which may be formed from sheet metal having one end 47' bent at right angles to the plane of the body of the bracket member and provided with pins 48, 48 receivable in holes 49, 49 extending through the bottom portion 13 of the casing and through the adjacent flange of the back member 16. At its opposite end the bracket is bent to form a right angled hook portion 50 suitable to engage over the top edge of a door or the like (Fig. 1) or over the edge of a supporting table (Figs. 9, 10 and 11); said hook portion being reinforced by a pair of heavy metal straps 51, 51 threaded at one end to receive thumb screws 52, 52 which cause plates 52', 52' to clampingly engage the door or table edge and which straps at their other ends project laterally beyond the plane of the bracket and carry thumb screws 53, 53 which freely enter holes 54, 54 in the top portion 12 of the casing and in the flange of the back portion 16 adjacent thereto. By this means, the supporting bracket may first be mounted on the required support and the device then mounted on the bracket by first engaging it with the pins 48, 48 and then screwing the thumbscrews 53, 53 into the holes 54, 54. Alternatively, the device may of course be permanently installed in a desired location on a wall or table by first removing the back cover 16 of the casing and securing it in the desired location and then mounting the casing on the thus located and secured cover. Generally, however, the device will be subject to occasional use only and for such use the removable bracket above described makes the installation easy to accomplish. Still further, it will be realized that the hook portion of the bracket may be dispensed with and bracket permanently installed on a wall or table for mounting or removal of the device.

In use the device and patient are positioned for the treatment to be given and the device attached to the patient accordingly with the lever arm 2 of the device at its lowest position and adjusted for a short stroke. The machine is started and the necessary adjustments made in the length of the stroke and the length of the flexible member 5 until the desired condition is reached. It is to be noted that since the patient is relatively immovable, the effect of increasing the stroke of the lever arm is to stretch the yielding spring of the scale 4 with resultant indication of the extent of traction being applied. The device is readily installed and dismounted and can be compactly stored. Additionally, it is readily transported by the handle means provided.

Where constant spinal traction is employed, as little as, say, 10 pounds of force can be borne by a patient for only a short time without severe discomfort. Forces of this order are insufficient for therapeutic effectiveness in achieving increase in the vertebral interspaces.

With the present invention traction forces of up to 100 pounds may be applied since the maximum force exists for only a few seconds at a time and the short repeated applications of greater force are within the level of tolerance of the patient. The amount of tractive force applied and the length and frequency of treatment are, of course matters which must be left to discretion of the physician and depend on the condition being treated, the ability of the patient to withstand the treatment and related factors.

Spinal traction is useful in the treatment of many conditions in which the increase of vertebral interspace and the widening of the nerve root canals are beneficial. Illustrative of such conditions are the so-called "whiplash" injuries resulting largely from sudden stopping of automobiles, as in collisions, shoulder and arm pain, neck or lower back sprain, narrowing of vertebral foramina, cervical and lumbar disc injuries, osteoarthritis of the cervical or lumbar spine, sublaxations, injuries to or inflammatory conditions of the lower back, spondylolisthesis, acute scoliosis, and certain types of sciatica.

Thus, there has been devised an effective device in which the desired objectives are realized in practice and while a presently preferred embodiment of the invention has been disclosed by way of example in the foregoing specification, it is not to be inferred therefrom that the invention is limited to the exact form so disclosed and it will be understood that the invention includes as well all such changes and modifications in the parts and in the construction, combination and arrangement of parts as shall come within the purview of the appended claims.

I claim:

1. In an organized apparatus for traction therapy, a frame structure mountable in fixed relation with respect to a patient to be treated, traction creating devices mounted on said frame structure including a member movable back and forth in a fixed path and having means affording connection to one end of a longitudinally yieldable member having its other end attachable to the portion of the body of a patient to be subjected to traction, power means including devices connected to said member effective to impart said back and forth movement thereto with resultant application of successive traction efforts to the patient with said efforts being reduced to at least substantially zero value between successive applications, and manually adjustable means operable to vary the extent of movement of said member to infinite extents.

2. An intermittent traction apparatus as claimed in claim 1 in which said member is mounted for oscillation and in which said power means and manually adjustable means includes a rotatable cam, oscillatable means including a cam follower engaging said cam, and interengaging means affording driving interengagement between said oscillatable means and said member; said interengaging means being carried by and being manually adjustable longitudinally of said member with resultant variation of the distance of said interengaging means from the axis of oscillation of said oscillatable means and said member and consequent variation of the extent of oscillation imparted to said member by said oscillatable means.

3. In an organized apparatus for imparting intermittent traction to a patient, a frame structure mountable in fixed relation to a patient to be treated, a lever having one end thereof pivotally mounted on said frame structure and having the other end thereof disposed exteriorly of said frame structure, a longitudinally yieldable means having one end thereof attached to said exteriorly disposed end of said lever with the other end thereof attachable to the portion of the body of a patient to be subjected to traction, and power means carried by said frame structure and engaging said lever intermediate the ends thereof effective to impart successive oscillatory movement in one direction to said lever with resultant application of successive traction efforts to the patient connected thereto by said longitudinally yieldable means, and other means imparting oscillatory movement in the opposite direction to said lever including said yieldable means.

4. In an organized apparatus for subjecting a patient to intermittently administered traction efforts and mountable in fixed relation to the patient, the combination of a frame, a lever arm having one end thereof pivotally mounted on said frame and the other end thereof disposed exteriorly of said frame, a motor and devices actuated thereby mounted on said frame including means engaging said lever intermediate the ends thereof effective to move said lever in one direction on said pivotal mounting, spring means connected to said lever effective to move said lever in the opposite direction on said pivotal mounting to the extent permitted by said lever engaging means, and longitudinally yieldable means having one end thereof connected to said exteriorly disposed end of said lever and the other end thereof attachable to the portion of the body of the patient to be subjected to traction.

5. An intermittent traction apparatus as claimed in claim 4 in which said motor actuated devices includes a rotatable cam and cam follower means interposed between said cam and said lever and in which said cam at the portion thereof imparting movement of said lever imparting maximum traction includes a follower engaged surface having fixed radial relation with respect to the axis of rotation of said cam with resultant creation of a prolonged dwell in the movement of said lever at the point of maximum tractive effort.

6. An intermittent traction apparatus as claimed in claim 5 in which said lever carries a fulcrum element adjustable longitudinally of said lever and engaging said follower devices with resultant capacity for varying the extent of movement of said lever about the pivotal mounting therefor.

7. An intermittent traction apparatus as claimed in claim 5 in which said cam follower devices includes an arm mounted for oscillation in the same plane as the plane of oscillation of said lever and disposed at the side thereof toward which said lever is moved by said spring means and with said arm disposed with the free end thereof extending generally toward the pivotal mounting for said lever, and in which said lever carries a fulcrum element adjustable longitudinally of said lever and maintained in engagement with said arm by said spring means.

8. In an organized apparatus for traction therapy treatment, a frame structure carrying a casing, a lever pivotally mounted on said frame structure and having a free end projecting through an opening in said casing, longitudinally yieldable means adapted to connect said free end of said lever with the portion of the body of a patient to be subjected to traction, and means within said casing effective to impart oscillation to said lever comprising an enclosed gear case within said casing and containing speed reduction gearing, a motor mounted on said gear case and having its shaft projecting into said gear case and carrying a driving gear, a driven shaft mounted in said gear case and connected to said gearing, a cam mounted on said driven shaft exteriorly of said gear case, and cam follower means engaging both said cam and said lever and effective to translate movements received from rotation of said cam into oscillations of said lever.

9. A traction therapy apparatus as claimed in claim 8 including spring means yieldably maintaining said lever in engagement with said cam follower means with resultant maintenance of said cam follower means in engagement with said cam.

10. In a traction therapy apparatus, a frame structure supporting an oscillating lever, resilient means for connecting said lever with the portion of the body of a patient to be subjected to traction, and means for securing said frame in fixed relation to the portion of the body of a patient to be subjected to traction comprising a base plate having mounting means at one edge adapted to be hooked over the edge of a door or the edge of a table, clamp means adapted to secure said base plate to the element over which it is hooked, a laterally extending portion at the opposite edge of said base plate having locating pins engageable with mating holes in said frame structure, and thumb screw means adjacent to said one edge of said base plate and disposed opposite to said locating pins operable to engage other holes in said frame structure with resultant detachable mounting of said frame structure on said base plate.

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