

[54] APPARATUS FOR CERVICAL TRACTION

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[58] Field of Search 128/75, 84

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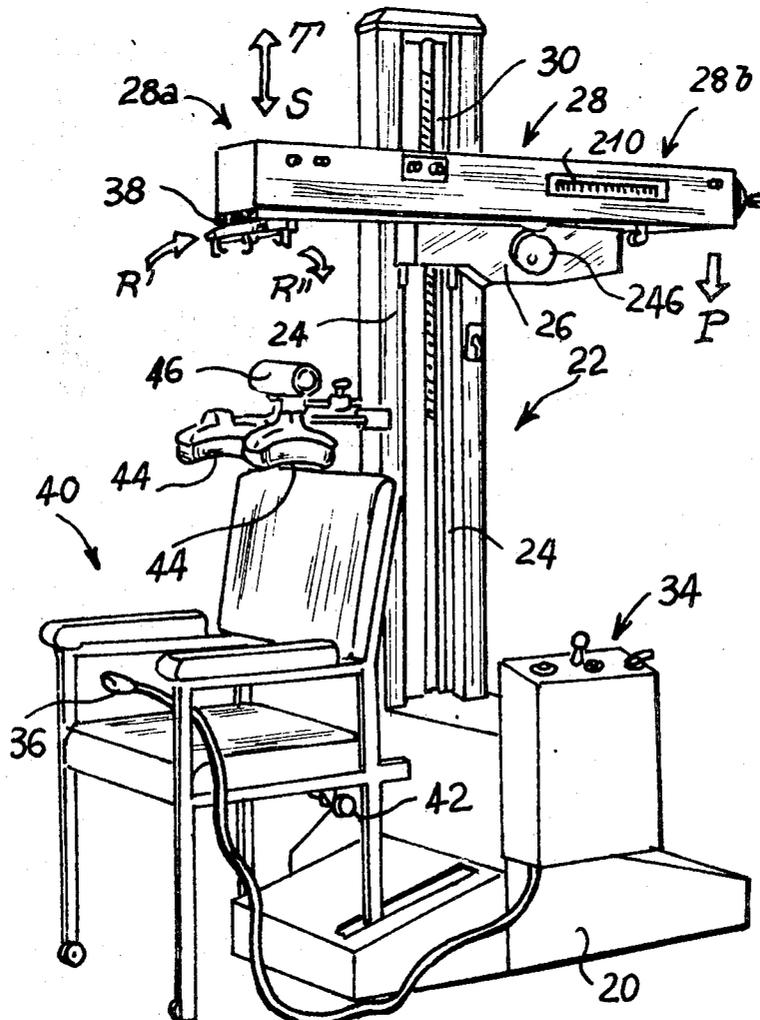
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[57] ABSTRACT

The specification describes an apparatus comprising a positionable seat group fitted with adjustable shoulder and cervical supports for accommodating and securing a patient below a motorized cervical traction and torsion applying assembly and mechanism. The assembly comprises a stationary structure on which a traction and torsion group is supported at adjustable level. Such group is provided with an adjustably counterweighted oscillatable arm having one end portion above said seat, and comprise a member supported for rotation about a vertical axis and having hooking bar for connecting an adjustable cervical hauler therebelow. The mechanism comprises means for controllably oscillating said arm for continuous or intermittent traction, and for selectively and alternatively rotating clock- and counter clockwise said bar, selectively exerting static and/or dynamic treatments to the patient's cervical spine and neighbouring body parts.

9 Claims, 10 Drawing Figures



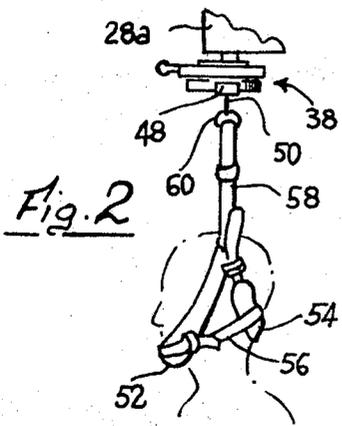


Fig. 2

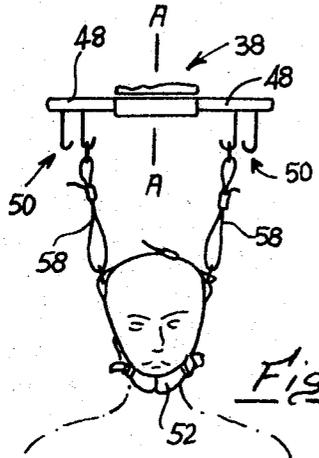


Fig. 3

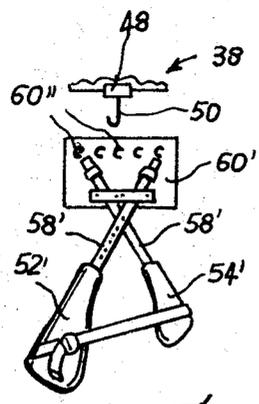


Fig. 5

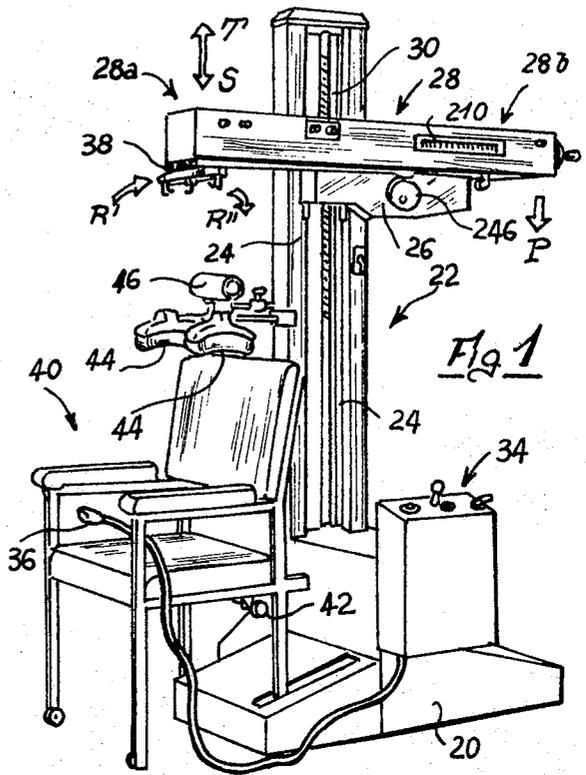


Fig. 1

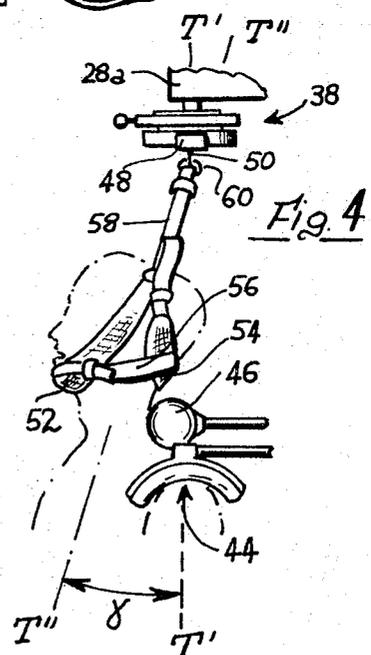


Fig. 4

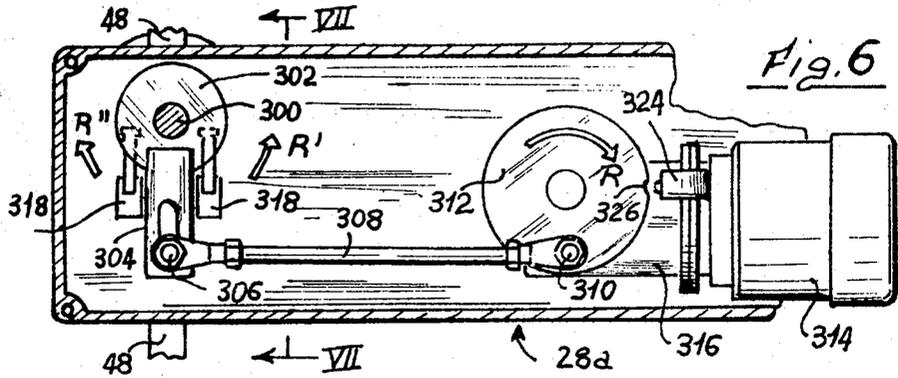


Fig. 6

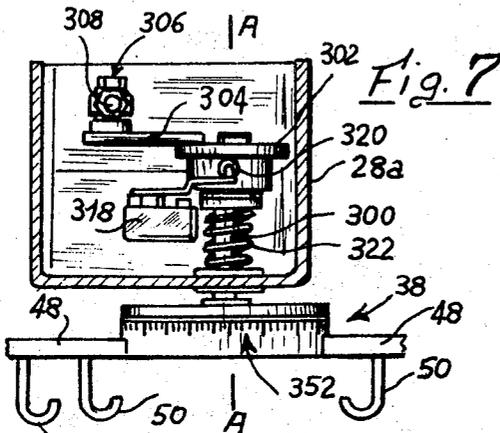


Fig. 7

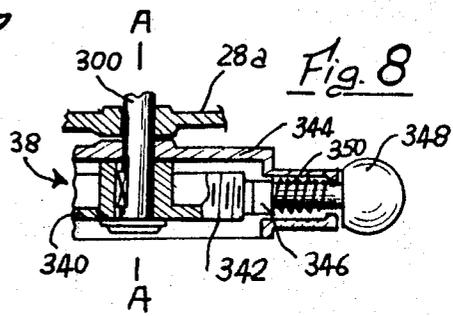


Fig. 8

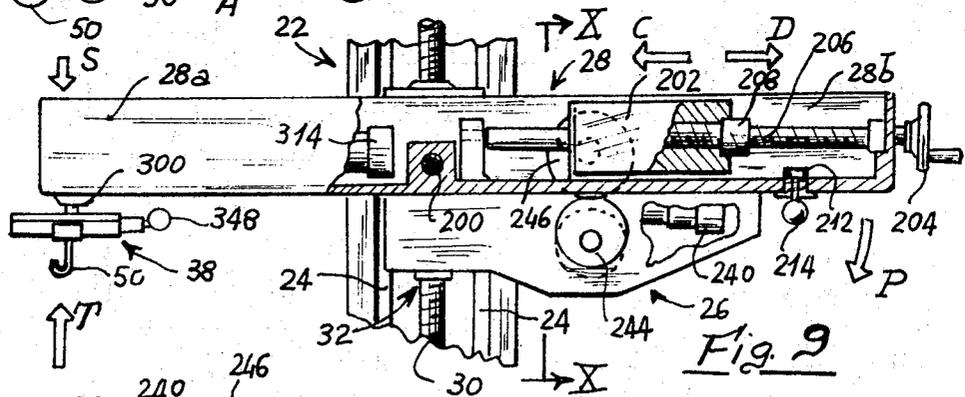


Fig. 9

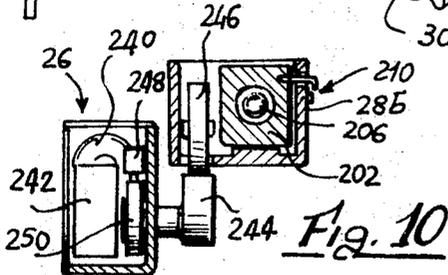


Fig. 10

APPARATUS FOR CERVICAL TRACTION

BACKGROUND OF THE INVENTION

This invention generally appertains to the art of treatments of the cervical region, including applying constant or variable forces and actions to a patient to provide for a plurality of diseases, spinal misalignments, vertebral rotations, fixations, compressions, adhesions and so on, as well as for relieving muscle spasm and hypertonia, reducing inflammation and swelling, improving cases of hyperlordosis, hyphosis and cervical scoliosis and so on. Such art is well known to physicians and practitioners and a pretty wide literature is available thereabout, and, therefore further comments are superfluous. It is however well known that such treatments are most generally manually exerted by skilled physicians and masseurs who must very carefully apply fatiguing muscular efforts with the most proper amplitude, direction and force, for best adaptation either to the specific treatment to be applied and to the patient's nature, fitness and tolerance.

It is evident that such treatments involve an extremely wide range of actions, to be selectively adapted to a corresponding extremely wide range of cases and of patients, individually requiring a specific condition of treatment, including the specific force, sequence, orientation and duration of the actions.

THE INVENTION

It is therefore an object of this invention to provide a new and advantageous apparatus adapted for mechanically exerting actions selectively adjusted for specific treatment of a patient's cervical region. More particularly, it is an object of the invention to provide a new and advantageous apparatus comprising, in combination, means for accommodating a patient in a selectively adjustable positional relationship with an action exerting mechanism, selectively adjustable cervical hauler means for physically tractively connecting the patient's cervical region to said mechanism, and a mechanism having an essentially vertically reciprocable member adjustably connectable to said cervical hauler means, connecting means for adjustably connecting said hauler means to said member, adjustable force applying means for upwardly urging said member and the said cervical hauler means connected thereto, means for adjusting said force, means for intermittently applying said force, means for rotatably connecting said connecting means to said member for rotation about an essentially vertical axis, means for rotationally reciprocating said connecting means about said axis, motor and actuator means for applying said vertical reciprocation to said member and said rotational reciprocation to said connecting means, and control means for selectively actuating said motor and actuator means.

Preferably, the said vertically reciprocable member comprises a two-armed structure oscillatably supported about a horizontal axis and a counter-weight selectively positionable at different distance from said horizontal axis for applying said force, and operator controlled means for selectively adjusting said distance.

Further preferably, the said mechanisms comprise motor and cam means arranged and controlledly operatable for intermittently upwardly urging the counter-weighted arm of said structure for having said upwardly directed force intermittently applied to said connecting means.

Still further, the said patient's accommodation means preferably comprise a seat group including an arm-chair, means for securing the patient accommodated on said arm-chair against upwardly applied forces, means for adjustably supporting the cervical region of the accommodated patient, and means for adjustably positioning said arm-chair and the accommodated patient below said connecting means.

According to another preferred feature of the invention, the said vertically reciprocable structure is supported upon a vertically adjustable mounting structure for vertical adjustment of the level of said connecting means above the accommodated patient for adjusting the apparatus to the patient's body size.

These and other important objects and advantages of the invention will be more fully understood from a consideration of the following detailed description of a preferred embodiment of same invention, taken in conjunction with the accompanying drawings, forming an essential component of this disclosure.

THE DRAWINGS

FIG. 1 is a somewhat diagrammatical perspective view of the apparatus;

FIGS. 2 and 3 are a side view and respectively a front view of the connecting and the hauler means (diagrammatically illustrated) when connected to a patient for applying an essentially vertically upward force to the cervical region of said patient;

FIG. 4 is a side view of said connecting and hauler means when adjusted for applying an obliquely directed force to the said cervical region;

FIG. 5 is a side view illustrating certain details of a modified embodiment of the cervical hauler means, adapted for a wider range of adjustment and therefore of specific treatments;

FIG. 6 is a view from above of a preferred embodiment of the sub-assembly of the mechanism designed for rotational reciprocation of the said connecting means;

FIG. 7 is a cross-sectional view of same sub-assembly, taken in plane indicated at VII—VII in FIG. 6;

FIG. 8 is a sectional view illustrating a detail of means provided for adjusting the mean direction of the said rotational reciprocations;

FIG. 9 is partly a side view and partly a sectional view of the sub-assembly comprising the oscillatable structure and of the various counter-weighting, motor, actuator and vertically adjusting means associated therewith;

FIG. 10 is a sectional view taken in the plane indicated at X—X in FIG. 9, illustrating certain details of said motor and actuator means.

DETAIL DESCRIPTION OF THE PREFERRED EMBODIMENT

The general character and scope of the invention will be now made apparent from a preliminary consideration of FIGS. 1 to 5 inclusive. The apparatus comprises a sturdy pedestal or basement generally indicated at 20, having the lower end portion of an also sturdy vertical column 22 fixedly secured thereto or integrally formed therewith. Said column 22 is provided with vertical parallel guide means 24 along with a mount sub-assembly 26 (more detailedly described below) is slidably supported for vertical or level adjustment thereof. Such mount oscillatably supports a two-

armed brace 28, termed traction and torsion arm, about a horizontal axis, perpendicular to the length of said arm, and defined by the pivot shaft indicated at 200 in FIG. 9. The mean position of said arm 28 is nearly horizontal. The said arm 28 comprises arm portions 28a and 28b at opposite sides of said horizontal pivotal axis.

As more detailedly exemplified in FIG. 9, the vertical or level adjustment of said mount 26 and therefore of said arm 28 is provided by rotationally driving a vertical screw-threaded rod 30 arranged into said column 22 and screwly engaged with a nut screw 32 secured to said mount 26. Suitable motor and transmission means (not shown) in said pedestal 20 are drivingly connected to said screw-threaded rod 30 and conventionally connected switch and control means, arranged on a control panel 34, are provided for operator controlled actuation of said motor means, in either directions, and therefore providing level adjustment of said mount and traction and torsion arm.

It is evident that the various control means, suitably grouped on said panel 34, comprise several means, such as a starter switch, a level adjusting selector switch, a treatment selector switch having traction, torsion and neutral positions and so on. The various circuits are conventionally connected according to known art and a detailed description thereof is therefore unnecessary. Such circuits are however activatable only acting on a proper master control key of which the operator is responsible. Further, a patient safety switch, indicated at 36, is preferably provided, such switch being connected for disactivating any force applying means as the patient discontinues a pressure on said switch, for example.

The free end portion of part 28a of the arm 28 has a connecting means, generally indicated at 38, dependently secured thereto, above an arm-chair 40 for patient accommodation. Such arm-chair is the essential component of the seat group, and it may be adjustably positioned, upon releasing a seat positioning locking knob 42, by forward or rearward moving in direction parallel to the length of arm 28. In consideration of the fact that the body weight alone is not generally considered sufficient as a counter-weight to the traction force, generally applied in the direction indicated at T, the said seat group is provided with suitably shaped and stuffed shoulder block 44 adjustably positioned for downwardly counteracting the said traction force, as shown in FIG. 4, for example. The group comprises further a positionally adjustable cervical stuffed support 46, for proper alignment and supporting of the patient's cervical region, also as shown in FIG. 4, for example.

The connecting means consists of a device connected to the said fore end of arm portion 28a for rotation about a generally vertical axis A—A (FIGS. 3 and 7), the said axis being vertical when the arm 28 is horizontal. Such device comprises two diametrically aligned braces 48 having hooks secured thereto at different distances from said axis A—A, for adjustable connection of the cervical hauler. Such hauler is detailedly illustrated in FIG. 4 and, in a modified embodiment thereof, in FIG. 5. In the embodiment of FIG. 4 (diagrammatically illustrated in FIGS. 2 and 3 also), such hauler comprises a mandibular pad 52, an occipital pad 34, inter-hauler adjustable straps 56 and also adjustable vertical straps 58 having means 60 for removable connection thereof to said hooks 50. Retaining

straps across the top of the patient head are also provided, as shown in FIG. 3.

According to the modified embodiment of FIG. 5, the mandibular and the occipital pads 52' and 54', respectively, are secured to individual intercrossing straps 58', which are at their turn secured to preferably leather made plate supports 60' each having a plurality of holes 60'' running along the top edge thereof, each one of such holes being adapted for individually and selectively engaging one hook 50. According to the holes being engaged, the pull of the traction can be concentrated on the mandible, or on the center of the neck, or at the occiput, as required for any specific treatment.

Further, by properly positioning the seat means beneath the connecting means, the direction of the pull can be selectively modified according to the specific treatment. For example, the relative position diagrammatically illustrated in FIG. 2 will lead to vertically apply the traction to the patient. In the arrangement of FIG. 4, where the arm-chair is assumed to have been forwardly positioned, and assuming that the device 38 is being upwardly pulling in direction T'-T', and angle "gamma" can be adjustably provided between such direction and the direction T''-T'' at which the pull is actually applied to the straps 58 of the hauler.

The preferred structural details of the various sub-assemblies and associated mechanisms will be now described with reference to FIGS. 6 to 10 inclusive, wherein FIGS. 6, 7 and 8 are concerned with the motor and actuator means designed for rotationally reciprocating the connecting means 38 and therefore imparting a torsional treatment, diagrammatically indicated by arrows R' and R'' in FIGS. 1 and 6, while FIGS. 9 and 10 illustrate the means for imparting an either continuous or intermittent tractive upward pull, that is a traction T to same means 38, the intermittent traction being applied by discontinuing the application of the force, by lowering in direction S (FIGS. 1 and 9) the part 28a of the traction and torsion arm 28.

As shown in FIGS. 6 and 7, the said essentially vertical axis A—A is embodied by a short shaft 300 rotatably supported across the bottom wall portion of the fore part 28a of the arm 28, and having said device 38 secured at its lower end portion, below said wall. A disk 302 is secured to the upper end portion of shaft 300, inside said arm portion 28a, and a crank arm 304 is radially secured to said disk. A crank pin 306 is secured to said arm, and preferably the position of said pin 306 is adjustable so that its distance from said axis A—A can be adjusted so that the angular amplitude of rotational reciprocation of device 38 can be correspondingly adjusted. Such crank pin 306 and therefore the disk 302, shaft 300 and device 38 are reciprocated by a connecting rod 308 having its opposed end portion connected to a driving crank pin 310 secured to a drive crank disk 312 which can be, upon operator controlled activation, continuously rotated in direction R by a motor 314 and a gearing enclosed into a casing 316. The arm length of the driving crank pin 310 is related to that of driven crank pin 306 so that the continuous rotation of the former causes a rotational reciprocation of the latter.

The said shaft 300, disk 302 and device 38 are upwardly biased by a relatively weak spring 322, and a switch 318 has a switch actuator arm 320 urging from below on the down-turned face of said disk. Said switch

is connected within the apparatus circuitry so that such apparatus cannot be actuated until a substantial downwardly directed pull is exerted on said device 38. This pull is provided when the patient has been properly accommodated, the hauler has been secured thereto and connected to the hooks 50 of said device 38, and the mount 26 and arm 28 have been properly levelled relatively to the patient for having the hauler downwardly pulling said device. This arrangement provides for ensuring that the apparatus can be operated only upon proper accommodation and preparation of the patient for the treatment, the various adjustment of the cervical hauler and the levelling of traction and torsion arm inclusive.

The above described mechanism, therefore, provides for imparting a rotational reciprocation to the device 38, of given amplitude, about a given mean position, corresponding to that of the crank means as shown in FIG. 6. Now, specific treatments can require that to the patient's cervical region an asymmetrical torsion is to be applied, that is that the device 38 is to be rotated in one direction for an amplitude greater than in the other direction, relatively to the symmetry plane of the arm 28 and of the seat group. The apparatus therefore provides for selective adjustment of the mean direction of the rotational reciprocation.

These means can be provided as shown in FIG. 8. The shaft 300 has a small flywheel 340 secured thereto. A part 342 of the outer edge of said flywheel is suitably toothed and can be engaged, at any selectively selected position of a plurality of positions defined by the teeth of said toothed part 342, by a snug 346 connected to a knob 348 and biased by a spring 350 into engagement with said toothed part 342. Said snug 346 is radially slidable within a bell-shaped member 344 which embodies the member to which the said arms 48 are actually secured. By pulling on said knob 348 said snug can be transiently disengaged from the toothed part 342 for selective modification of the relative angular position of the cranking and reciprocating device and the means to which the hauler is actually connected for treatment.

It is desirable that when the torsion treatment is discontinued the device will stop and remain at rest in its mean position. Suitable means are therefore preferably provided therefor. Such means can include a switch 324 (FIG. 6) having an actuator button which opens the switch when engaging a notch 326 of the driving crank disk 312, when the reciprocation mechanism attains its mean position. Such switch 324 is conventionally connected in the circuits (not shown) for delaying the actual discontinuing of the drive, upon operator or timed operation, until such mean position has been attained. A scale 352 (FIG. 7) provides an angular measure of the actual adjustment.

As stated above, the traction and torsion arm 28 is supported for oscillation about the axis of the essentially horizontal and transversal pivot shaft 200. A suitably heavy counter-weighting mass 202 is slidably arranged in the rear part 28b of the arm 28 and provided the upward pull (traction) T with a force given by the said mass by its spacing from the pivotal axis at 200. This spacing can be varied (thus varying the force) by displacing in either directions C and D the mass 202 along said arm part 28b, by means (for example) of manual action on a handled flywheel 204 secured to a screw-threaded rod 206 screwly engaging a screw-nut

208 secured to same mass 202. The actual position of said mass within the arm part 28b can be visualized for example by means of an index and scale system 210 of the outer face of said arm part 28b.

It is evident that as far as the mass 202 is displaced in direction D, as relevant the torque in direction P and thus the tractive force in direction T will be. Now, the apparatus is desirably designed and produced to meet the most wide range of traction forces adapted from the most delicate to the most substantial treatments applied to muscularly built patients. On the other part, the most relevant forces might harmful for the average patient and must be responsibly applied. A safety device, consisting of a stop member 212 (FIG. 9) connected to a knob 214 can be provided for limiting the displacement in direction D, except upon voluntary and responsible action on said knob.

As a consequence of the fact that the traction T is applied by a force provided by the weight and the position of mass 202, no force greater than that resulting by the adjustments can be applied to the patient. Specific treatments can require either a continuous or an intermittent application of the cervical traction. The continuous treatment is done by leaving the arm 28 free to bilocate, within the necessary amplitude. The intermittent treatment is preferably provided by a mechanism including a motor 240, a transmission 242 and a cam 244 supported by the mount member 26, and a cam follower idle roller 246 secured to the said arm portion 28b above said cam 244. Each revolution of cam 244 provides an upwardly directed force greater than that provided by counter-weighting mass 202 and causes a counter-clockwise oscillation of the traction arm 28, thus intermittently discontinuing the traction in direction T by transiently lowering the part 28a of the arm and therefore the device 38, in direction indicated at S. The rotational speed of motor 240 can be adjusted, if desired, for adjusting the rate of intermittency.

It is further evident that the continuous traction, when applied, must be not contrasted by the described mechanism. Therefore, this mechanism also can be provided with means, similar to that above described with reference with parts 324 and 326 in FIG. 6, and including a cam 250 and a switch 248 (FIG. 10) for ensuring that, when the action of this mechanism is discontinued, the cam 244 will reach and remain at its lowermost position, indicated by a phantom contour in FIG. 9, leaving the traction arm 28 free to bilocate at the necessary extent for applying the continuous traction to the cervical region of the patient.

I claim:

1. An apparatus adapted for selectively applying both tractive and torsional forces to the cervical region of a patient, the said apparatus comprising in combination, an arm-like member pivotally mounted intermediate its ends about a first horizontal pivot axis, a halter for supporting a patient's head at the cervical region, a connecting device mounted at one end of the said arm-like member that is oscillatable above the patient's head on a second pivot axis normal to the said first horizontal pivot axis, the said connecting device including hooks from which the said halter is suspended, a first mechanism for continuously or intermittently oscillating the said connecting device about the second pivot axis so as to apply torsional forces to the patient's cervical region, and a second mechanism for continuously or intermittently oscillating the arm-like member about the

first horizontal pivot axis so as to apply tractive forces to the patient's cervical region.

2. An apparatus as described in claim 1, which includes a movable counterweight mounted in that portion of the arm-like member opposite the connecting device and means for adjusting the said counterweight at a position between the first horizontal pivot axis and the end of the arm-like member so as to control the tractive forces applied to the patient.

3. An apparatus as defined in claim 1 in which the said second mechanism comprises a motor and actuating means between the said motor and the said arm-like member for oscillating the arm-like member about its pivot axis.

4. An apparatus as defined in claim 1 in which the second mechanism for continuously or intermittently oscillating the said arm-like member includes a motor, a cam driven by the said motor and cooperative with that portion of the said arm-like member which is located on that side of the first horizontal pivot axis which is opposite to the side on which the connecting device is located, so that the oscillation of the arm-like member with each revolution of the said cam supplies essentially vertical tractive forces to the patient's cervical region.

5. An apparatus as defined in claim 1 in which the said first mechanism includes a motor mounted on the said arm-like member and a crank means driven by the said motor and connected to the said connecting device for oscillating the same about the said second pivot axis.

6. An apparatus as defined in claim 5 and further including means between the said crank means and the said connecting device for adjusting the angle of oscillation of the said connecting device.

7. An apparatus as defined in claim 1 and including first and second motor means for operating said first and second mechanisms, in which the said connecting device is mounted on a shaft extending along the said second pivot axis and including biasing means between the said shaft and the said arm-like member for biasing the said shaft in an upward direction, and switch means connected to the said shaft and in circuit with the said first and second motor means for actuating the same only when, during operation of the said apparatus, a downwardly directed force is applied to the said shaft which is greater than the force applied upwardly by the said bias means to the said shaft.

8. An apparatus as defined in claim 1 which includes an adjustable seat located below the connecting device, which seat is adjustable relative to the plane in which the arm-like member oscillates, so that the tractive forces are applied to the patient's cervical region in a preselected direction.

9. An apparatus as defined in claim 1 in which the halter includes a mandibular pad, an occipital pad, an adjustable intermediate strap connecting the said mandibular and occipital pads, and essentially vertical lateral adjustable straps, each having a lower portion secured to a side portion of one of the said pads and an upper portion attached to means for detachably and selectively connecting the said pads to said connecting device, so that the forces transmitted from the connecting device, so that the said pads and the patient's cervical region can be directed in a plurality of different directions for selectively concentrating the tractive forces in a plurality of locations between the mandible and the occiput of the patient.

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