This invention relates to improvements in physiotherapeutic apparatus.

Known physio-therapeutic apparatus for stretching the human spinal column comprises a rigid support above the height of the human body, a pair of ropes passing over the guides and having a hand grip or stirrup at one end of each rope, the other end of each rope being connected to one or more harness devices adapted to be secured to the upper part of the patient, while the apparatus is symmetrically disposed about the longitudinal axis of the patient's spine whereby in use by the patient grasping the handgrips or placing the feet in the stirrups and pulling on the ropes tensile forces will be applied equally to each side of the spine.

In physio-therapeutic methods as hitherto practised the principle has been to stretch the spine, in some cases to the extent of hanging the patient freely by his neck and then releasing the patient. Normally the patient has his head in a harness with his feet on the ground and the harness is connected to ropes over pulleys and back to hand-grips whereby the patient, by pressing on the hand-grips, may lift himself stretch the ground, and it was considered that by this method the strain on the muscles of the spine was relieved so that the discs of the spine, where displaced, would, by being relieved of tension, move back of their own accord into their correct spinal position.

This in practice has been the mere stretching of the spine and is only applicable where the patient has full use of his muscles and hence the apparatus is only useful for toning-up a fit person.

With patients suffering from extremely weak muscles, as for example post-polio-myelitis cases or those with weakened intrathoracic pressures, as in asthma, it is necessary to effect rehabilitation of muscles which have ceased to function.

It is now realised that tension throughout the muscular system of the body interferes with the natural function of a particular part of the body, usually the spine, the breathing system, the abdomen muscles or, in some cases, the limbs, particularly the leg muscles. It is, therefore, necessary to bring about release of the tense muscles.

Known apparatus employed has been constructed to create an intermittent action on the muscles and this is achieved by the patient straining on the ropes, either through his hands or feet, so that springs are tensioned and carry at least a part of the weight of the patient's body, and then the patient releases his hold on the ropes which causes relaxing of the muscles so that, by the oscillation of the springs, the muscles are intermittently stretched and relaxed, which does have some beneficial effect.

It has now been found that in the aforesaid prior apparatus, when the patient relaxes his hold on the ropes this must involve muscular action of the arms or the legs so that complete relaxation of the body is not achieved.

The present invention provides an apparatus which employs a novel principle of maintaining the patient partially suspended on the apparatus while some of his weight is borne by his feet still being on the ground, or by sitting on a chair, and once the patient has produced the initial stretch of the spine and transferred some of the weight of his body through the neck or head harness to the springs and the springs, remaining in tension, oscillate longitudinally with very short-wave frequency changes in length and thereby subject the muscles of the body to short-wave oscillations of stretching and relaxing which ultimately releases the tension of the muscles so that they become completely relaxed.

The object of the present invention is to provide a physio-therapeutic apparatus for exercising the human body employing the aforesaid novel principle to release the muscles completely from tension.

According to the present invention a physio-therapeutic apparatus for exercising the human body comprises a guide device having means for securing it to an elevated support, a harness for connection to the upper part of the human body, a pair of resilient tension members each connected to the harness and to a rope passing over the guide device, means to engage the guide device to limit rope movement therethrough and disposed to engage the guide device when at least part of the weight of the harnessed portion of the patient's body is applied to the tension members, the tension members having sufficient strength within their elastic limit to support both the weight of the harnessed portion of the body and a longitudinal pull applied to the resilient members by action of the patient's muscles, a rigid member holding the resilient members apart to dispose them so as to apply equal longitudinal traction to either side of the body, and horizontally spaced catches on the support in the path of movement of the rigid member to be engaged by and to support the rigid member when the tension members are in tension under the load of the patient's body, whereby when the weight or part of the weight of the portion of the patient's body to be exercised and the tension in the tension members are in equilibrium, the muscles of the body portion can be wholly relaxed and the springs oscillate with short-wave impulses which are applied to the supported part of the patient's body.

The resilient members are preferably in the form of a plurality of tensioned springs capable of effecting the aforesaid oscillations when loaded by the patient's body for a period of several minutes and to oscillate when loaded to predetermined loads, for example 30 lbs. or 50 lbs. The resilient member may comprise two or more springs of equal value so that with a spring operating on a load of 15 lbs., two springs would be required to provide a 30 lb. load spring forming the resilient member.

The support is in the form of a frame provided with a mounting engageable for example over the top of a door to be clamped thereto by the frame when the door is shut and having spaced vertical members with a series of horizontally aligned vertical rows of holes into which the catches can be removably mounted.

The catches preferably comprise hooks open on the upper side and curved on their outer faces so that, when the patient uses the apparatus and effects the initial pull on the ropes the rigid member connecting the top ends of the two resilient members will ride over the hooks and, on release of the rope tension by the patient, will drop into the hooks, the hooks being so positioned that the patient will be subjected to the aforesaid spring oscillations.

In its initial use by a new patient the hooks are placed in one of the pairs of lowermost holes in the frame member so that the patient is not subjected to undue strain, but as the patient improves by use of the apparatus the hooks may be raised to higher sets of holes to provide greater traction effect and hence greater oscillation of the spine.

In order that the invention may be more clearly understood, some embodiments of the apparatus in accordance therewith will now be described by way of example with reference to the accompanying drawings, in which:

FIGURE 1 is a front perspective view of the apparatus secured to the top of a closed door with the patient sit...
ting on a stool in a relaxed position before starting the treatment.

FIGURE 2 is a view similar to FIGURE 1 showing the patient after applying the tension to the ropes and before disposing the apparatus in the short wave frequency oscillation position, and

FIGURE 3 shows the apparatus of FIGURES 1 and 2 after the patient has relaxed the hold on the ropes and is being subjected to the short-wave oscillation, the patient of FIGURE 3 is employing a head harness as well as a shoulder harness as shown in FIGURES 1 and 2.

In the drawings the same numerals have been used to designate the same parts.

Referring to FIGURES 1 and 2 the apparatus has a guide device in the form of pulleys 4, 5, rotatably mounted in pulley blocks 4a, 5a respectively fixed to a supporting frame 12 having a cross bar 28 of hook shape for slipping over the top of a door D which, when closed in its frame F, will secure the support in an elevated position above the position to be occupied by the patient when using the apparatus.

Rope 34, 35 are pressed one round each pulley 4, 5 respectively and have hand-grips 6, 7 at their free ends, the other ends of the ropes being fixed to resilient members 9, 10 which are spaced apart by a rigid member 16.

The rigid member is shown in the form of a bar of a length approximating to the width or slightly greater than the normal width human head so that the upper ends of the springs are disposed vertically above and symmetrically of the spine of the patient when using the apparatus. The lower free ends of the resilient members 9, 10 are connected by hooks 17, 18 to a harness, in FIGURES 1 and 2 shown as a padded member extending outwardly and rearwardly under the patient's armpits and across the patient's back where they are joined; if desired a single padded sling can be employed for the purpose.

In the alternative construction shown in FIGURE 3 the harness is in the form of a padded loop 20 hooked to the shoulder harness as shown in FIGURES 1 and 2; the springs of the head harness are loadable to 30 lbs. weight and of the shoulder harness to 50 lbs. weight. Thus the cervical as well as the dorsal and lumbar muscles are treated and the treatment is balanced about the spinal column.

The resilient members 9, 10 are each formed in the preferred construction, of a plurality of springs 9a, 9b, 10a, 10b, etc., two springs being shown in the drawings. A greater number of springs in each resilient member may be used if desired.

The springs are of predetermined strength so as to yield within their elastic limit at a predetermined loading for example 30 lbs. or 50 lbs. on each side of the patient; where a number of springs are employed then each spring of the resilient member is of the same strength so that, for a 30 lb. loading resilient member, each spring will yield within its elastic limit at 15 lbs. load.

It will be understood that the resilient members, although preferably of helical spring form, may be of other resilient material, such as rubber, if desired and the pulleys 4, 5 may be replaced by hooks or rollers.

In the use of the patient sits on the stool disposed immediately beneath the described supporting frame 12 in the manner illustrated in FIGURES 1 and 2 or in FIGURE 3 and then grasps the handles 6, 7. When comfortable, the patient then commences a steady downward pull on the ropes so that the upper part of his body is lifted and the spine stretched while the patient's weight remains still partially carried by the stool. The springs commence long wave pulsations, as well as short wave impulses. The catches 34, having been placed in the apparatus 27 of the frame 12 to suit the patient's state of treatment, obstruct the upward pull of the rigid member 16 as the patient's legs continue and since the catches are upwardly curved and smooth, the rigid member 16 slides over them into the position shown in FIGURE 2. The patient is then partially suspended and a part of the body weight is carried by the springs which, by being loaded beyond their yield point, continue to oscillate longitudinally but with short wave frequency of oscillation.

The patient then relaxes the pull on the ropes until the ends can be taken from the handles 6, 7 when the rigid member 16 will move downwardly and engage in the catches 34. The springs will then continue to oscillate longitudinally with short-wave frequencies that impulses of tension and relaxation follow each other in rapid succession on the spine and the other muscles of the body, the patient not having to exert any muscular action in releasing the ropes from tension.

It will be appreciated that on the first pull of the ropes the patient will receive long oscillations from the springs which ultimately give place, in the position shown in FIGURE 3, to the short-wave oscillations which are conveyed to the muscles, thereby encouraging them to release any tension therein and to start functioning normally again. The action of the apparatus being self-acting by the patient to decide when sufficient movement has been effected so that the possibility of overstraining the muscles, setting up inflammation therein or damaging the body is reduced to a minimum.

While the above described apparatus has been shown and described with reference to hand-holds on the ropes, it will be understood that the ropes may be lengthened and provided with stirrup members into which the patient's feet may be inserted so that the downward pull on the ropes can be effected by using the patient's leg muscles rather than the arm muscles, and this has been found beneficial when the patient's condition is such for example, that arm muscles are not functioning properly and not sufficiently for the patient to apply the necessary pull to the ropes. With the stirrup harness, and if desired with the hand-grips, a sliding loop may be provided so that, when pressure is applied to the stirrups or hand-grips, the loop tightens round the feet or hands respectively to assist in the grip thereon.

The ropes may be provided with means 33 by which their lengths may be varied to suit the height of the particular patient and the ropes have means in the form of enlargements 35 thereon, such as knots, which cannot pass over the pulleys and thereby limit the rope movement over the pulleys and thereby prevent the ropes running through the pulleys and causing any danger to the patient.

The apparatus can very easily be varied for other purposes, for example the harness, instead of being over the patient's shoulder or under the chin, may be hooked beneath the patient's thighs, or one or them, just above the knee and, by using the stirrup construction, the push of the patient's foot on the stirrup or the pull by the hand on the stirrup rope can be made to balance the force applied by the spring on the thigh so that the patient's leg is in a balanced condition and weightless as far as the patient is concerned. The patient may then use the muscles and exercise them to assist in rehabilitating them to complete health.

Alternatively a second pair of resilient members may be employed connected to the rigid bar, as in the previously described apparatus, one pair connected to the stirrup ropes and each of the first pair of springs connected one to each end of the thigh harness and then, without any effort of the leg muscles by the patient, the lengths of the ropes may be varied by pulling on them by the hands so that the springs carry the complete weight of the patient's legs and, even where the leg muscles are completely dormant, the patient can try to move the leg. The very slightest function of the muscles
will be visible to the patient because there will be no movement of the leg due to its weight and this will have a psychological effect upon the patient which is of primary importance in restoring inactive muscles of poliomyelitis patients.

I claim:

1. A physio-therapeutic apparatus for exercising the body of a human patient, comprising a support adapted to be secured in an elevated position, a guide device mounted on said support, a harness for connection to an upper part of a human body, a pair of ropes passing over the guide device, a pair of resilient tension members connected to the harness and to the pair of ropes, said ropes at their free ends being provided with means for exerting a pull by a portion of a patient's body other than the said upper part to be connected to the harness, a rigid member holding the resilient members apart to dispose them so as to apply equal longitudinal traction to either side of a patient's body, and horizontally spaced support means on said support to receive and hold the rigid member when the tension members are in tension under load of the upper part of a patient's body, said support means including a portion disposed in a manner to guide said rigid member over the support means.

2. A physio-therapeutic apparatus according to claim 1 wherein the resilient members are in the form of a plurality of tensioned springs capable of effecting the aforementioned oscillations when loaded by the patient's body for a period of several minutes and to oscillate when loaded to predetermined loads.

3. A physio-therapeutic apparatus according to claim 1 wherein said support comprises a frame, a mounting on said frame engageable over the top of a door to be clamped thereon by the door frame when the door is shut, said support frame having spaced vertical members with a series of horizontally aligned holes arranged in vertical rows into which said horizontally spaced support means are removably mounted.

4. A physio-therapeutic apparatus for exercising the body of a human patient, comprising a support, a guide device mounted on said support, means for securing said support in an elevated position, a harness for connection to an upper part of a human body, a pair of ropes passing over the guide device, a pair of resilient tension members connected to the harness and to the pair of ropes, said ropes at their free ends being provided with means for exerting a pull by a portion of a patient's body other than the said upper part to be connected to the harness, the tension members having sufficient strength within their elastic limit to support both the weight of the harnessed part of the body and a longitudinal pull applied to the resilient members by action of a patient's muscles in pulling on said means at the free ends of the ropes, a rigid member holding the resilient members apart to dispose them so as to apply equal longitudinal traction to either side of a patient's body, and horizontally spaced hooks mounted on said support in the path of the rigid member and which are open on their upper sides and curved on their outer faces and are shaped and disposed so as to permit the rigid member to ride over them during a pull on the ropes and to drop into and be supported by them when said pull is relaxed and the tension members are in tension under load of a patient's body, whereby at least part of the weight of the portion of the patient's body to be exercised and the tension members are in equilibrium, the muscles of the body including those utilized to exert said pull on the ropes can be wholly relaxed and the tension members oscillate with short-wave impulses which are applied to the supported upper part of a patient's body.

5. A physio-therapeutic apparatus according to claim 1 wherein additional means is provided above said rigid member to engage the guide device to limit rope movement therethrough.

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