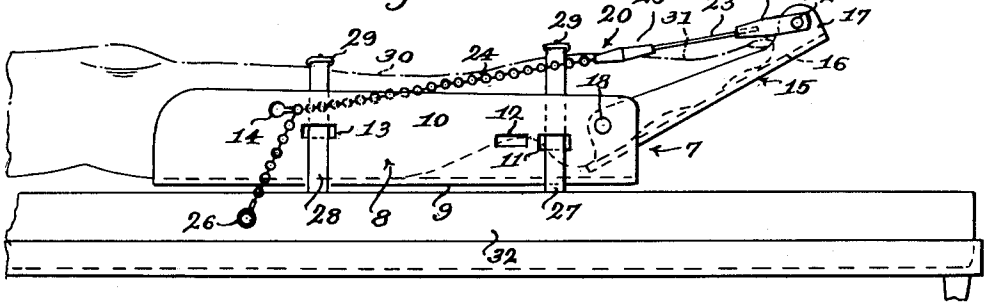
Jan. 5, 1954 H. L. COFFMAN 2,664,886

ORTHOPEDIC APPARATUS

Filed April 23, 1951

Fig 1



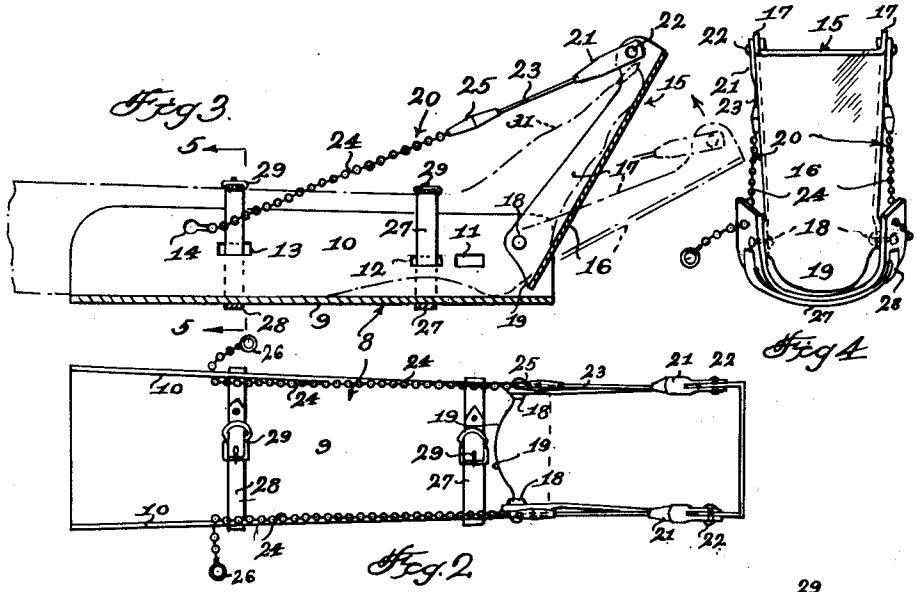


Fig 3

Fig 4

Fig 2

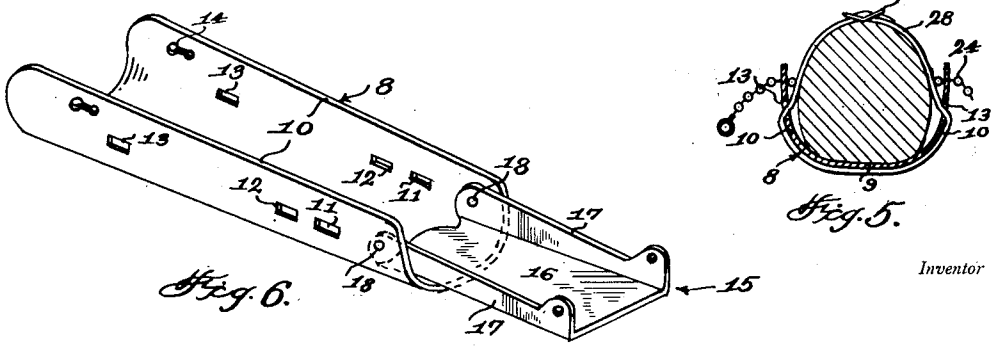


Fig 6.

Fig 5.

Inventor

HURSHEL L. COFFMAN

By John N. Randolph

Attorney

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ORTHOPEDIC APPARATUS

Hurshel L. Coffman, Clinton, Md.

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4 Claims. (Cl. 128—80)

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This invention relates to an orthopedic apparatus or device for use by bedridden patients afflicted with various forms of paralysis such as infantile paralysis and poliomyelitis wherein a stiffening or rigidity of the leg muscles occurs which causes the foot to be extended outwardly and downwardly relatively to the leg and wherein the patient lacks muscular control of the foot and leg sufficient to move the foot upwardly toward a position at substantially a right angle to the leg.

It is a primary object of the present invention to provide an apparatus of extremely simple construction which may be applied to the leg and against the foot for urging the foot back to a normal position and whereby varied tension may be maintained against the foot for urging it toward a normal position.

Another object of the invention is to provide an orthopedic apparatus wherein the foot is free for movement in a direction away from the portion of the apparatus in engagement therewith and in a direction toward a normal position and wherein the foot engaging portion of the apparatus will be yieldably drawn toward the foot to follow such movement of the foot back toward a normal position as muscular control of the leg and foot muscles are acquired by the patient, whereby the foot engaging portion will constantly urge the foot toward a correct position and assist in retaining the foot in any position attained in its movement toward a normal position.

Still a further object of the invention is to provide an apparatus capable of being readily adjusted to increase or decrease the yieldable pressure exerted against the foot and wherein no portion of the foot is enclosed or confined so that freedom of the foot and toe muscles is insured to enable the patient to exercise the foot and ankle.

Still a further object of the invention is to provide an apparatus wherein freedom of the foot for movement toward a normal position is further enhanced by the provision of means permitting the heel portion of the foot to swing in the opposite direction to the toe portion of the foot as the foot pivots on the ankle joint in moving from an extended abnormal position toward a normal, right-angular position relatively to the leg.

Various other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawing, illustrating a presently preferred embodiment thereof, and wherein:

Figure 1 is a side elevational view showing the apparatus in an applied position applied to the leg and foot of a patient;

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Figure 2 is a top plan view of the apparatus in its position of Figure 1;

Figure 3 is a longitudinal substantially central sectional view of the apparatus illustrated in an applied position;

Figure 4 is an end view of the invention looking from right to left of Figure 3;

Figure 5 is a cross sectional view of the apparatus taken substantially along a plane as indicated by the line 5—5 of Figure 3 and showing the leg in an applied position therein, and

Figure 6 is a perspective view of a portion of the apparatus shown in a fully extended position.

Referring more specifically to the drawing, the orthopedic apparatus in its entirety is designated generally 7 and includes an elongated leg engaging member 8 of substantially channel-shaped or U-shaped cross section including a substantially flat bottom portion 9 and corresponding upwardly curved sides 10 the upper portions of which are substantially flat. As best illustrated in Figures 2 and 4, the leg engaging member 8 tapers in width from end-to-end thereof and is provided near the narrower end with a pair of slots 11 and 12 formed in each side wall thereof and which are spaced a considerable distance from the upper edges of said side walls. The side walls 10 are also provided each with a single slot 13 near the opposite, wider end of the member 8 and which are likewise spaced a substantial distance from the upper edges of the walls 10. Each wall 10 is also provided with a keyhole-shaped slot 14, which slots are disposed above the slots 13 and between said slots 13 and the larger end of the member 8, the enlarged ends of the keyhole slots 14 being disposed nearer the wider end of the member 8.

The apparatus 7 also includes a foot engaging plate, designated generally 15 having a substantially flat bottom 16 and corresponding upstanding side walls 17. The foot engaging member 15 is narrower than the narrow end of the leg engaging member 8 and has one end thereof disposed in the narrow end of the member 8. Headed fastenings 18 extend through the adjacently disposed walls 17 and 10 of the members 15 and 8 for swingably mounting the foot plate 15 on the leg engaging member 8, said fastenings 18 engaging the walls 17 adjacent one end of the foot plate 15 and engaging the walls 10 adjacent the narrow end of the member 8 and between said end of the adjacent slots 11. As seen in Figures 1 and 2, the pivots 18 are disposed adjacent the upper edges of the walls 10 and above the level of the slots 11, 12 and 13. The foot plate portion

16 has an inner end forming a heel engaging portion 19 which is disposed inwardly of the axis of the pivots 18 on the opposite side thereof to the major portion of the foot plate bottom 16.

The members 8 and 15 are connected adjacent their remote ends by a pair of adjustable pulling units, each designated generally 20 and each of which is connected to complementary walls 10 and 17 of the members 8 and 15. Each pulling unit 20 includes a clevis 21 constituting one end thereof, one end of which clevis is pivotally connected by a pivot pin 22 to the outer end of one of the walls 17, remote to the pivots 18. A flexible elastic member 23 has one end secured in the opposite end of the clevis 21 and the other end of the elastic member 23 is connected to one end of a ball-type chain 24 by a coupling element 25. Each chain 24, which constitutes the opposite end of the pulling device 20 is connected to the wall 10, complementary to the wall 17 engaged by the clevis 21, by the chain 24 engaging the keyhole slot 14 of said wall 10, each chain 24 extending outwardly through a keyhole-shaped slot 14 and being provided at its terminal with a ring 26. The chains 24 are capable of sliding freely through the enlarged ends of the slots 14 but the balls of the chains 24 are incapable of sliding through the restricted ends of the slots 14 so that the chains 24 may thereby be adjustably connected to the leg engaging member 8 to vary the pull on the foot plate 15.

The orthopedic apparatus 7 also includes a pair of straps 27 and 28 each including an adjustable clasp 29 of any suitable type, herein illustrated as a conventional buckle. The straps 27 and 28 extend across the outer or under side of the bottom portion 9 and the strap 28 then extends inwardly through the slots 13 and over the upper portion of the leg 30 of a patient, which is disposed in the leg engaging member 8 and said strap 28 is secured over the upper portion or shin of the leg 30. As seen in Figure 1, the leg engaging member 8 engages the leg 30 below the knee. The strap 27, as illustrated in Figure 1, initially extends inwardly through the slots 11 and is then fastened snugly over the ankle. Figure 1 illustrates substantially the initial position of the foot 31 relatively to the leg 30 of a patient afflicted with paralysis and which frequently causes the foot to be extended outwardly or downwardly with respect to the leg due to stiffening or rigidifying of the muscles of the leg and foot and so that the patient is unable to move the foot upwardly or from right to left of Figure 1 to a normal position at substantially a right angle to the leg. The apparatus 7 is adapted for use in overcoming this muscular deficiency and in assisting a paralytic while still bedridden in returning the foot to a normal position and in restoring muscular control to the foot and leg muscles. The leg engaging member 8 is secured around the leg and ankle by the straps 28 and 27, as previously described and as illustrated in Figure 1 and the foot plate 15 is then swung upwardly from a fully extended position as illustrated in Figure 6 until the sole of the foot bears against the bottom 16 and with the heel of the foot disposed against the heel portion 19 of the bottom 16. The chains 24 are then drawn outwardly through the enlarged portions of the slots 14 until the stretchable elements 23 have been stretched sufficiently to apply as much pressure to the foot as the patient can reasonably stand, after which the chains are slipped into the restricted portions of the slots 14 so that a ball

of each chain will form a stop to prevent the chain from slipping inwardly through said slots. The parts will then be in their positions of Figure 1 with the pulling units 20 urging the foot plate 15 to swing upwardly relatively to the leg engaging member 8 in a counterclockwise direction and toward an upright position. The apparatus 7 does not burden the user as the leg engaging member 8 rests upon a bed or other support 32 on which the patient is lying and the foot of the patient is in no way confined by the foot plate 15 except against movement toward an extended position relatively to the leg so that the foot is free to be exercised as much as possible thus enabling the patient to attempt to raise the foot relatively to the leg, which muscular activity is encouraged by the resilient pressure of the pulling units 20 urging the foot plate 15 upwardly and in the same direction. The constant yielding pressure exerted against the foot by the foot plate 15 and pulling units 20 will gradually cause the foot to move toward a normal position, from its position of Figure 1 to and beyond its position of Figure 3 and as the foot is drawn upwardly or from right to left of Figures 1 and 3, the chains 24 are taken up by means of the slots 14 to take up any lost tension on the elastic elements 23 and so that a proper tension will be maintained by the foot plate 15 against the foot. As the foot plate approaches the position of Figure 3, the strap 27 is removed from the slots 11 and engaged with the slots 12 so as to engage the leg above the ankle. It will also be noted that as the foot moves toward a natural position under the action of the foot plate 15 and swings from its position of Figure 1 to and beyond its position of Figure 3, the heel swings downwardly and outwardly as the toe portion of the foot is drawn upwardly and inwardly and the ankle bone assumes a position substantially in longitudinal alignment with the axis of the pivots 18 and relatively to the leg engaging member 8 so that the heel is enabled to swing in one direction as the toe portion of the foot swings in the opposite direction.

It will thus be readily apparent that an orthopedic apparatus of extremely simple construction has been provided which is readily adapted for use by a bedridden paralytic for strengthening the foot and leg muscles to cause the foot to resume a normal position relatively to the leg before the patient has recovered sufficiently to stand or walk, thereby reducing considerably the difficulties involved in enabling a paralytic patient to leave the bed and resume a standing position and to overcome by exercise the weakened condition of the leg muscles caused by the paralysis and the long period of inactivity of the leg. The apparatus 7 may be formed of various suitable materials such as sheet metal including aluminum or may be formed of other materials including plastics.

Various modifications and changes are contemplated and may obviously be resorted to, without departing from the spirit or scope of the invention as hereinafter defined by the appended claims.

I claim as my invention:

1. An orthopendic apparatus comprising an elongated leg engaging member of channel-shaped cross section in which the lower portion of the leg is adapted to rest, means for detachably securing said leg engaging member to the leg to prevent sliding movement of the leg relatively thereto, a foot plate, means pivotally

connecting the foot plate adjacent to but spaced from one end thereof to the leg engaging member adjacent an end of the latter for swinging movement of the foot plate longitudinally of the leg engaging member, said foot plate being adapted to provide a support for the foot, and pulling means connected to the other outer end of the foot plate which is located remote to its pivot and being adjustably connected to the leg engaging member, near the end thereof disposed remote to the foot plate pivot, said pulling means urging the outer end of the foot plate to swing toward the last mentioned end of the leg engaging member to and beyond a position perpendicular to the longitudinal axis of the leg engaging member for exerting a pressure on the foot tending to swing the foot upwardly toward a position at substantially a right angle to the leg from an extended position of the foot.

2. An orthopedic apparatus as in claim 1, said foot plate having a bottom portion adapted to be engaged by the foot and side wall portions between which the foot is loosely disposed, said pivoting means comprising fastenings loosely engaging said side wall portions and the sides of the leg engaging member and forming the pivotal connection of the foot plate to the leg engaging member, said fastenings being disposed adjacent corresponding ends of said side wall portions of the foot plate and remote from the bottom portion, said foot plate bottom having a heel engaging portion disposed on the opposite side of the pivot of the foot plate to the major portion or outer end of said foot plate bottom

and which is swingable in the opposite direction to said outer end of the foot plate.

3. An orthopedic apparatus as in claim 1, said foot plate being pivoted to the leg engaging member about an axis disposed adjacent the upper edges of the sides of said leg engaging member and remote to its intermediate, bottom portion.

4. An orthopedic apparatus as in claim 1, said foot plate being substantially channel-shaped in cross section and including a bottom and substantially parallel sides, said sides being pivotally connected to the side portions of the leg engaging member and between which the foot is adapted to be loosely disposed, and the axis of the foot plate pivot being spaced from the plane of said bottom.

HURSHEL L. COFFMAN.

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