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S. H. WHITELOW
THERAPEUTIC DEVICE FOR USE IN MANIPULATIVE
TREATMENT OF JOINTS OF THE HUMAN BODY

2,832,334

2 Sheets-Sheet 1

FIG. 1

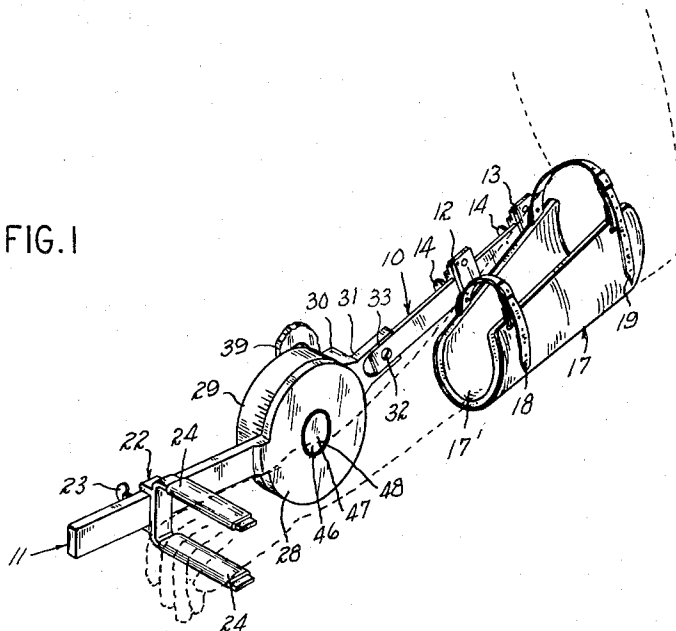
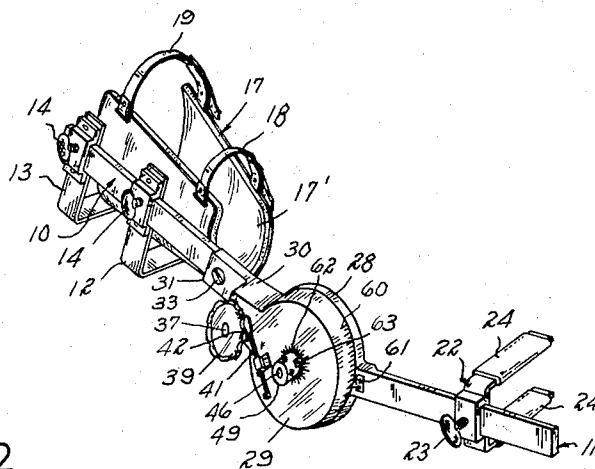


FIG. 2



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2 Sheets-Sheet 2

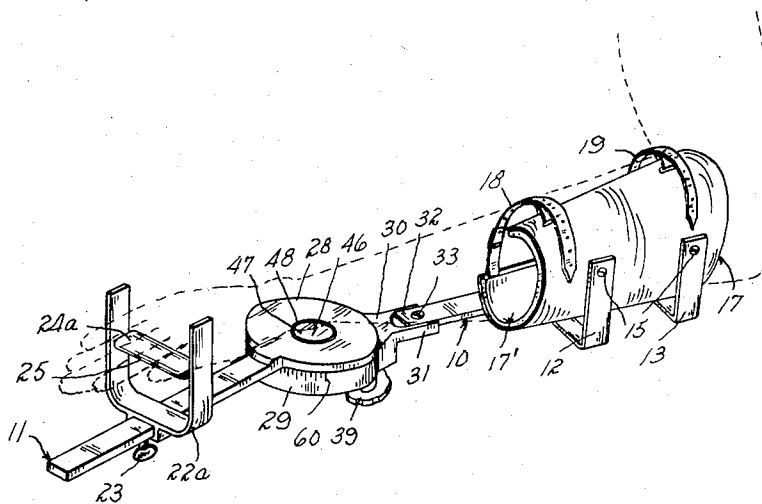


FIG. 3

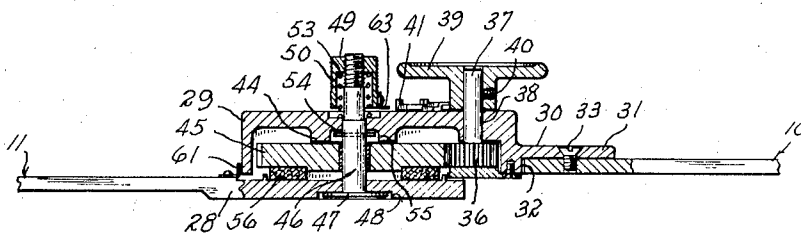


FIG. 4

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1

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THERAPEUTIC DEVICE FOR USE IN MANIPULATIVE TREATMENT OF JOINTS OF THE HUMAN BODY

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9 Claims. (Cl. 128—25)

The present invention relates to therapeutic devices and, more particularly, to a novel therapeutic device for use in the manipulative treatment of joints of the human body.

Frequently human joints are adversely affected by illness or accident resulting in stiffness and lack of mobility of the joint. In many cases, such malfunctioning or disability of the joint can be alleviated by proper manipulative treatment, but relatively little use of such treatment has been made because it is difficult to self-administer and usually has to be done frequently and over long periods of time to be effective. Even with the assistance of skilled personnel, such treatments are frequently painful and too irregular for maximum benefit.

It is an aim of this invention to provide an inexpensive light-weight portable therapeutic device which is suitable for use on any of the major joints of the body such as the wrist, shoulder, elbow, knee or ankle and which may be operated by the patient himself to impart motion to the joint and also to exercise the adductor and abductor or flexor and extensor muscles of the affected joint through the application of external force.

It is another aim of this invention to provide a therapeutic device of the type described which may be used by a patient to move the joint and exercise the muscles associated therewith by the use of these muscles to operate the exerciser against a preselected resistive force.

It is still another aim of this invention to provide a device of the type described which will produce the desired movements of the joint in a fully controlled manner and with visible indication of the operation so as to provide maximum therapeutic benefits, which is of simple and economical construction and comfortable to use, and which is particularly adaptable for home use with a minimum of instruction and training.

Other objects will be in part obvious, and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application of which will be indicated in the appended claims.

In the drawings:

Fig. 1 is a perspective view of an embodiment of a joint manipulating device constructed in accordance with the invention as applied to a wrist.

Fig. 2 is a perspective view of the device of Fig. 1, taken from the opposite side.

Fig. 3 is a perspective view of the device of Fig. 1 as applied to a wrist but turned 90° from the position shown in Fig. 1; and

Fig. 4 is a fragmentary longitudinal cross-sectional view of the device.

The drawings and the following description describe the invention as used in connection with a wrist joint. However, it is of course to be understood and will be readily apparent that the invention is equally applicable to any of the major joints of the body, and that the specific use of the invention described herein is for example only.

2

With reference to the drawings, a therapeutic device constructed in accordance with the invention is comprised of a pair of oppositely extending lever arms 10 and 11. The lever arm 10 has slidably mounted thereon a pair of L-shaped brackets 12 and 13. The brackets may be secured in any adjusted position longitudinally of the lever arm 10 by means of the thumb screws 14. In the specific embodiment shown, a sling 17 adapted to cradle a forearm, as shown in dotted lines in Figs. 1 and 3, is suitably attached to the brackets 12 and 13 by means such as the screws 15. The sling is preferably padded as indicated at 17' and is provided with straps 18 and 19 to secure the forearm in the sling.

As shown in Figs. 1 and 2, the lever arm 11 is provided with a U-shaped bracket 22 slidably mounted thereon. The bracket 22 may be secured in any adjusted position longitudinally of the lever arm 11 by the thumb screw 23, and is provided with hand grips 24 on each of its legs for a purpose to be hereinafter described. In Fig. 3 a modified bracket 22a is mounted on the lever arm 11 in the same manner as the bracket 22, and is provided with a cross-piece 25 having a hand grip 24a mounted thereon. The reason for the variation in structure between the brackets 22 and 22a will be fully apparent from the description of operation of the device hereinafter appearing.

With particular reference to Fig. 4, the lever arm 11, in the embodiment shown, is connected to and is preferably integral with a circular plate member 28 disposed coaxially of a cup shaped casing or housing 29 having a radially extending portion 30. The radially extending portion 30 of the casing has an end portion 31 of reduced thickness having a recess 32 in which the lever arm 10 is received and retained by means such as the screw 33. A pinion 36 is disposed within the casing 29 and is fixed to a shaft 37 extending through and journaled in the casing as at 38. An operating handle 39 is secured to the shaft 37 externally of the casing 29 as by means of the setscrew 40. When it is desired to lock the handle 39 and hence the shaft 37 and pinion 36 against rotational movement, this is accomplished conveniently by the slide latch 41 which can be slid into engagement with the notch 42.

A gear 45 engaged with the pinion 36 is disposed within the casing 29 and is rotatably mounted on a shaft 46 which is journaled in a boss 44 internally of the casing 29. One end of the shaft 46 extends through the plate member 28 and is provided at said one end with a radially extending flange 47 received in a recess 48 in the plate member 28. The other end of the shaft 46 extends outwardly of the casing 29 and is threadably engaged with an adjusting cap nut 49. The cap nut 49 is provided with an axially extending recess 50 in which is received a spiral spring 53 surrounding the shaft 46, the spring 53 being engaged at the other end with the casing 29. A pin 54 extends diametrically through the shaft 46 and is received within a slot 55 extending diametrically of the boss 44 to prevent rotation of the shaft relative to the casing during adjustment and permitting movement of the shaft axially of the casing.

The boss 44 of casing 29 engages upon the upper side of the gear 45 while a friction member 56 is disposed between gear 45 and the plate member 28. The purpose of the friction member 56 is to provide a yieldable connection between the gear 45 and plate member 28 whose force can be varied by adjusting the cap nut 49. Since there is only a metal to metal contact of small area between boss 44 and gear 45, little frictional force is exerted between these two members.

In the use of the device as shown in Fig. 1, the lever arm

10 is attached to the forearm through the use of the adjustable sling 17 in such position that the shaft 46 is coaxial with the pivot point of the wrist. The bracket 22 is then adjusted to receive the hand as shown. In order to condition the device for the application of an external force, the cap nut 49 preferably is turned down sufficiently to prevent slippage of the gear 45 relative to the plate member although, if desired, the force of spring 53 may be adjusted by backing off the cap nut 49 to permit slippage and thus limit the maximum force which can be applied to the joint. After the device is in place, the handle or knob 39 is turned by the patient to apply force to the hand through the gearing 36, 45 and friction member 56 to the lever arm 11. As will be apparent, the bracket 22 by engagement with the hand will pivot the wrist relative to the forearm in a plane normal to the general plane of the hand. Movement of the wrist can, of course, be accomplished in either direction from the median position of the wrist wherein the hand is aligned with the forearm. In order to indicate the amount of flexion of the wrist for use in determining improvement in the condition of the joint, indicia are provided on the casing as at 60 and a pointer 61 mounted on the lever arm 11 as is most clearly seen in Fig. 2.

If it is desired to have the patient manipulate the joint by the use of the wrist muscles themselves, the slide latch 41 is moved to the locking position as shown in Fig. 2 to prevent rotation of the pinion 36. Henceforth, any movement of the lever arm 11 relative to the lever arm 10 will be opposed by the resistance offered by the friction member 56 disposed between the gear 45 and plate member 28. As described above this resistive force of the friction member may be varied by adjustment of the adjusting cap 49 to increase or decrease the force imposed on the friction member by the gear 45 and plate member 28. To provide an indication of the resistive force opposing relative movement of the lever arms 10 and 11, and thus provide a comparative indication of the improvement in the strength of the muscles, indicia are provided on the casing 29 as at 62 and a pointer 63 mounted on the cap 49. In the use of the device as last described, the patient grasps one of the hand grips 24 and moves his hand in a direction to exercise the flexor and extensor muscles of the wrist.

In Fig. 3 the device is illustrated as being used to pivot the wrist in the general plane of the hand. As can be seen in Fig. 3, to enable the patient to engage the lever arm 11 in a manner appropriate for this type of manipulation, a modified bracket 22a having a crosspiece, or finger grip 25 extending between the leg of the bracket is mounted on the lever arm 11. By positioning the finger grip 25 far enough out on lever arm 11, the patient's fingers can encircle the finger grip and exert movement of the joint. The manner of using the device is identical with the manner described above in connection with Fig. 1 in that the lever arm 11 may be pivoted relative to the lever arm 10 either by rotation of the operating handle 39 or through the use of the muscles of the affected joint themselves.

It should be apparent that the device is suitable for use on such joints as the shoulder or knee by the provision of appropriate means on the lever arms 10 and 11 to secure the lever arms relative to the limbs on either side of the joint. Thus, it can be seen that there has been provided a joint manipulator of simple, economical construction particularly adapted to home use by a patient and which requires a minimum of skill or training to operate. The exerciser is versatile in that it may be adapted for use on all major joints of the body and is obviously rugged and capable of extended usage.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter con-

tained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim:

1. A therapeutic device for use in the manipulative treatment of joints of the human body comprising a first member having means for attachment to the body on one side of a joint, a lever arm pivotally connected to the first member and having means for engagement with the body on the other side of the joint, a manually operable handle movably mounted on the first member, and driving means between the handle and the lever arm including a yieldable clutch.

2. A therapeutic device for use in the manipulative treatment of joints of the human body comprising a first member having means for attachment to the body on one side of a joint, a lever arm pivotally connected to the first member and having means for engagement with the body on the other side of the joint, manually operable means mounted on the first member for pivoting the lever arm relative to the first member, a friction clutch between the manually operable means and the lever arm, and means for latching the manually operable means to prevent movement thereof.

3. A therapeutic device for use in the manipulative treatment of joints of the human body comprising a first member having means for attachment to the body on one side of a joint, a lever arm pivotally connected to the first member and having means for engagement with the body on the other side of the joint, manually operable means mounted on the first member for pivoting the lever arm relative to the first member, a friction clutch between the manually operable means and the lever arm, means for varying the effective force of the friction clutch, and means for latching the manually operable means to prevent movement thereof.

4. A therapeutic device for use in the manipulative treatment of joints of the human body, comprising a first lever arm for attachment to the body on one side of a joint, a second lever arm for attachment to the body on the other side of said joint, a pivotal connection for said lever arms, comprising gearing operatively connecting said lever arms, a friction clutch associated with said gearing, means for locking said gears against relative rotation, whereby pivotal movement of one lever arm is opposed by said friction clutch, and a manually operated handle for rotating said gears whereby one lever arm is caused to pivot about said pivotal connection.

5. The combination of claim 4, further including means for varying the torque transmitted by said friction clutch.

6. The combination of claim 4, further including indicia carried by said pivotal connection for indicating the angular displacement of said lever arms.

7. The combination of claim 4, further including attachments for said lever arms for attachment to the limbs of the patient and means for variably positioning said attachments on said lever arms.

8. The combination of claim 7, wherein one of said attachments is provided with a hand grip to be gripped by the fingers of the patient.

9. The combination of claim 4, further including attachments variably positionable longitudinally on said lever arms, for attachment to the limbs of the patient, one of said attachments being also positionable in different angular positions on said lever arms.

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