

United States Patent

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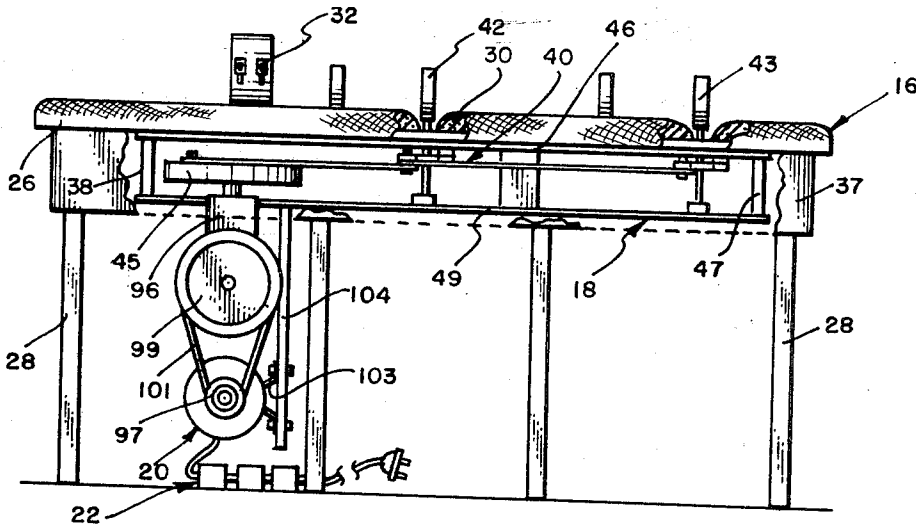
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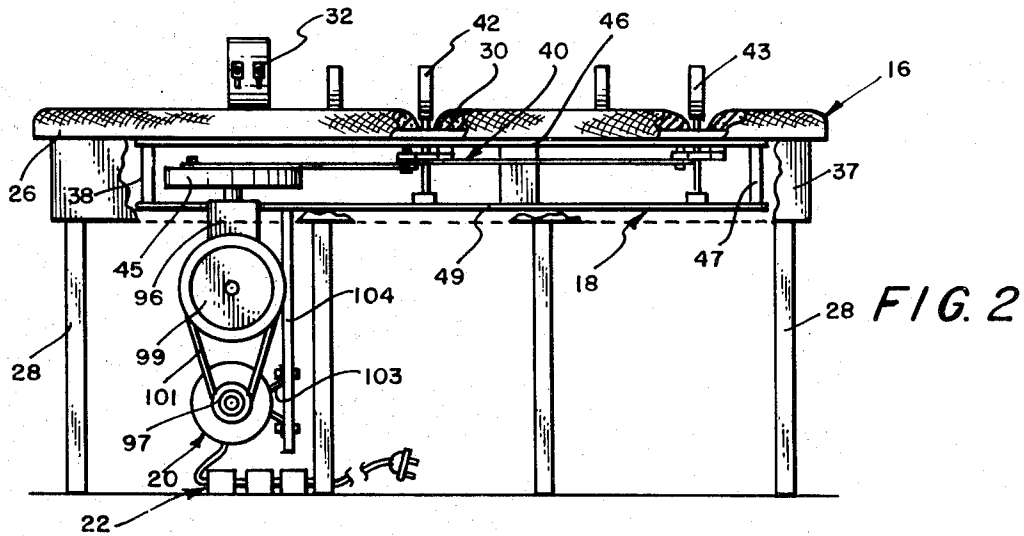
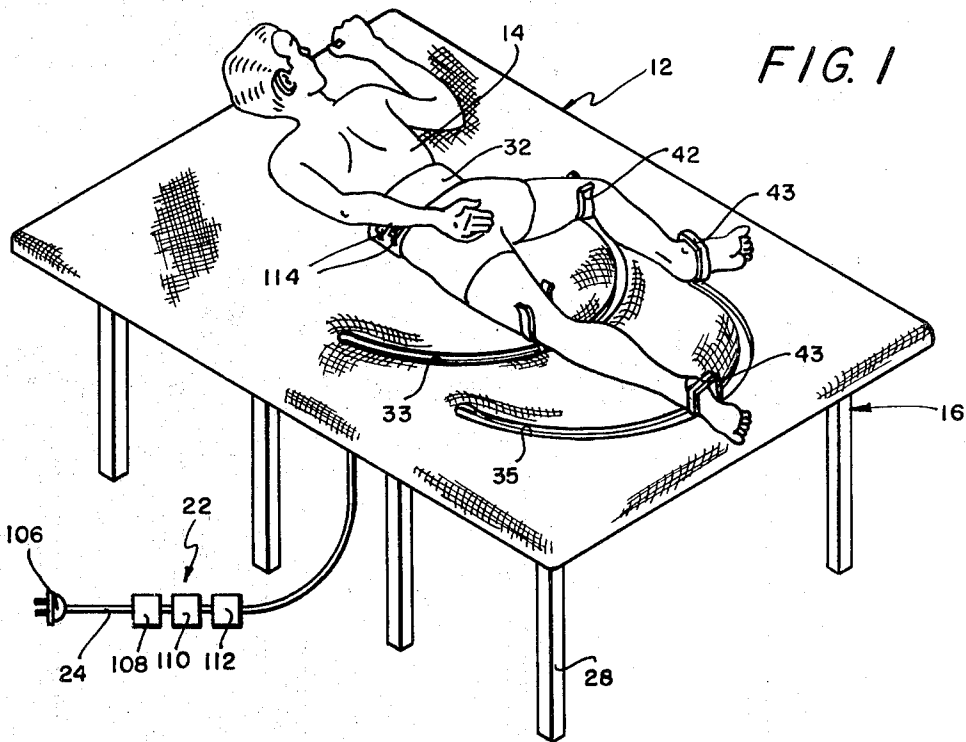
[54] **PATTERNING APPARATUS**
 6 Claims, 6 Drawing Figs.

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 35/29
 [51] Int. Cl..... A61h 1/02
 [50] Field of Search..... 128/25,
 24; 35/29

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ABSTRACT: A patterning apparatus for patients having some form of interruption of the function of the central nervous system and involving the passive movements of legs the patterning apparatus having a support table; a patterning structure mounted upon the support table; a power means connected to the patterning structure; and means for connecting portions of the patterning structure to the legs of a patient for moving of the same in a predetermined pattern for treatment purposes.





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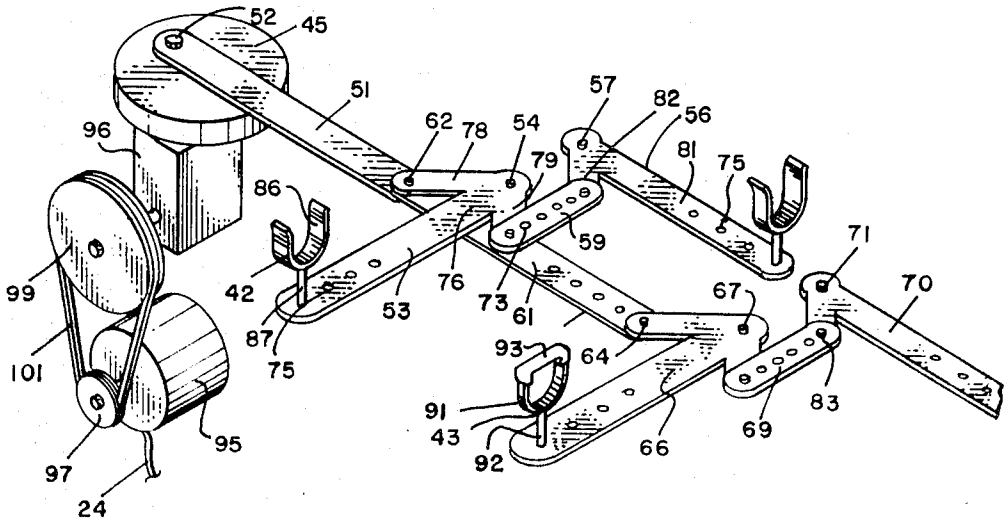


FIG. 3

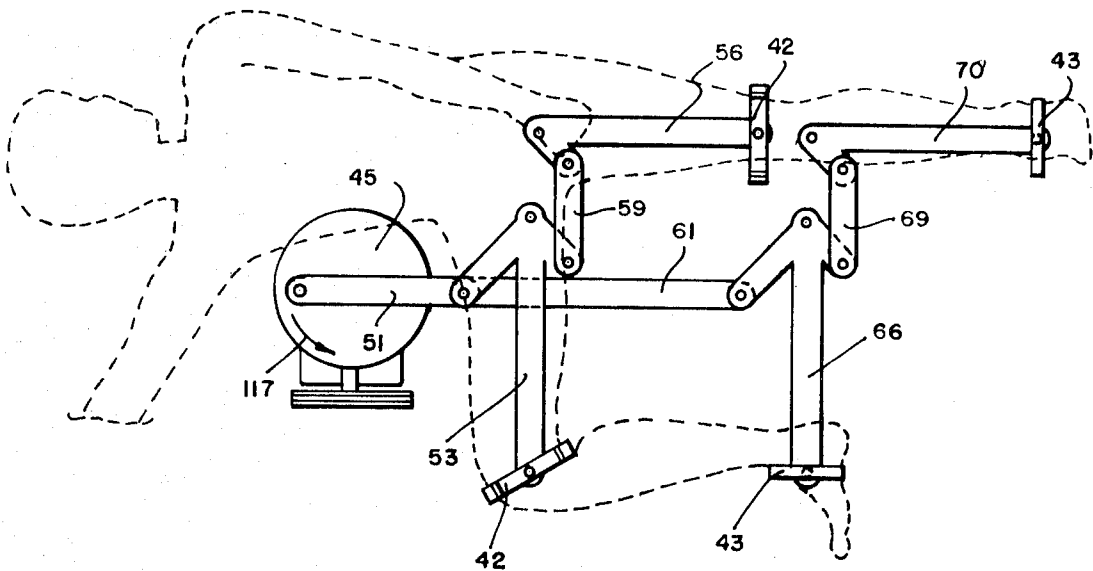


FIG. 4

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FIG. 5

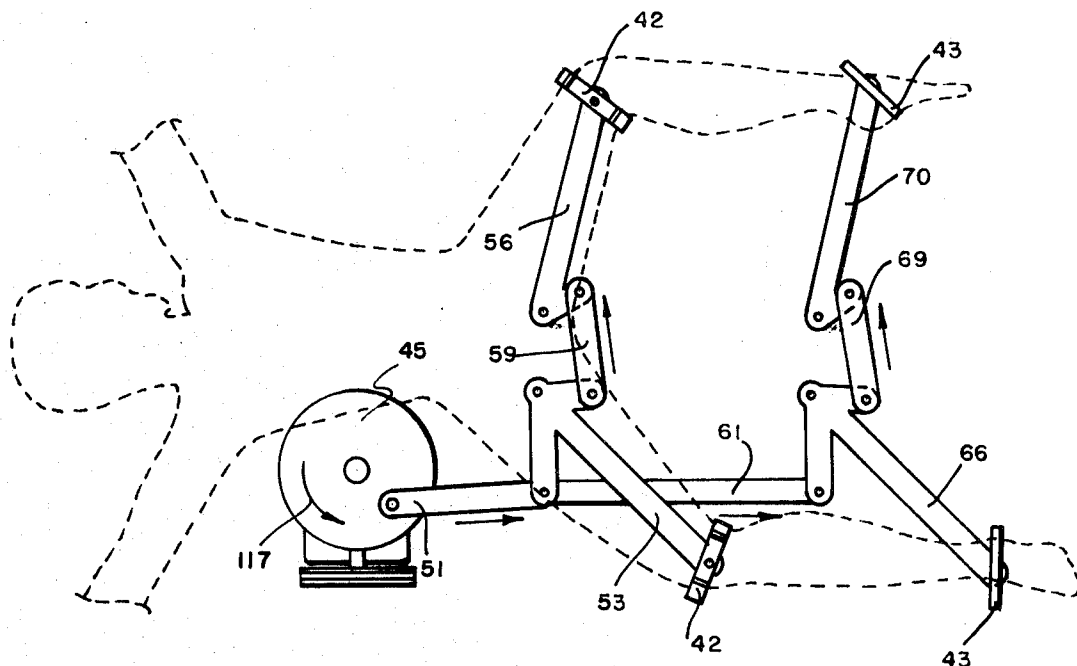
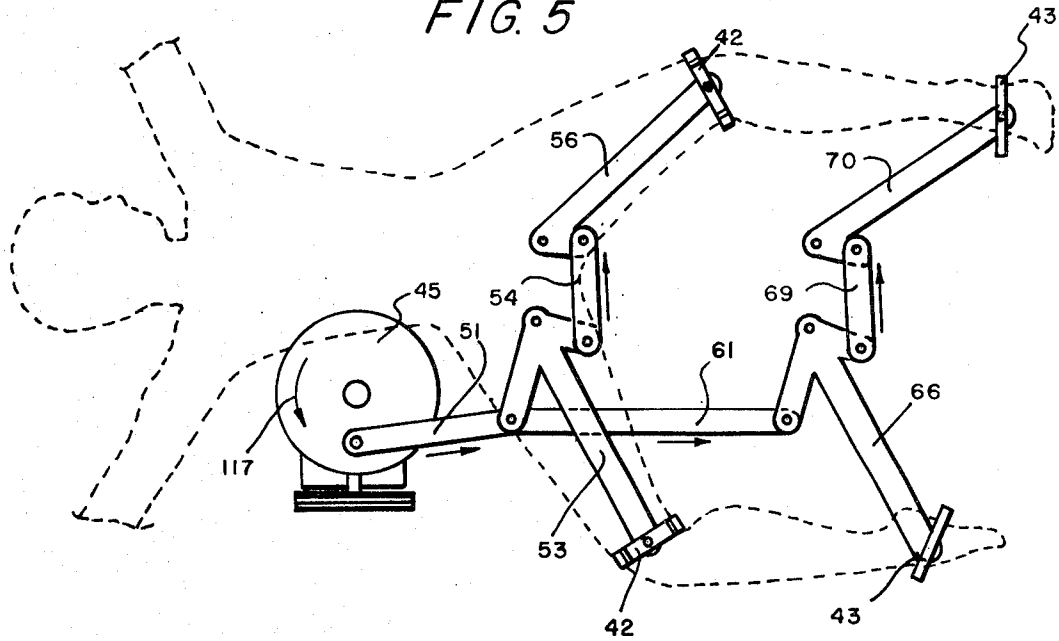


FIG. 6

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PATTERNING APPARATUS

It is known in the prior art that certain persons suffer from brain damage of one type or another and require a physical therapy for teaching the gestalts known as the cross pattern and the homolateral pattern. The treatment theory, in simplified form on the homolateral pattern, is that the passive movements of the limbs comprised of the legs and arms and in certain cases, the head in a creeping attitude with little or no motivation of the limbs by the patient, is a passive relaying of the neurological patterns of a development of mankind, resulting in walking which, for one reason or another, has been interrupted. The basic theory behind such passive actuation stimulation is that it stimulates one phase of the neurological patterns developing ultimate walking, and in due course, in some manner overcoming the earlier interruption. Children with brain damage seem to lack any instinct that compels and induces such movements unaided, so that the instinct must find a substitute in force manipulation. The accomplishment of the gestalt manual manipulation is impossible for one therapist unaided to perform, and the homolateral pattern requires the attendance of at least three or four and normally five therapists for each child. In many cases, due to the volunteer nature of the attendants, and their uncoordinated skills, the respective passive motions have been more or less out of synchronism with perhaps the wrong degrees of motion on the respective limbs, affecting the effectiveness of the treatment and frequently brush burns have been occasioned by the relative motion of a limb and a support. Additionally, the patterning work is exacting, tiring, and treatment of more than a few patients successively for a relatively short time interval for each patient is impossible, therefore the labor problem is fundamentally prohibitive.

Various physiotherapy apparatus are known to the prior art and have recently been developed in an attempt to achieve the motions needed for the cross pattern and the homolateral pattern forms of treatment. However, these prior art devices are complicated in structure and, therefore, expensive to manufacture thereby not readily available to all those that are in need of such machines. Additionally, the prior art devices are not operable to efficiently and effectively move a person's legs in the required creeping attitude motion required in the treatment process.

In one preferred embodiment of this invention, a patterning apparatus includes a support table; a patterning structure secured to the support structure; a power means operably connected to the patterning structure to provide the required patterning motion thereto; and a control means connected to the power means to regulate the operation of the patterning structure. The support table includes a table top mounted upon support legs and having a padded cover layer secured to the upper surface of the table top adapted to receive a patient thereon. The table top and padded cover layer are provided with arcuate slots therein adapted to receive a portion of the patterning structure therethrough for connection onto the thigh area next to the knee and also the foot area of each leg of the patient being worked upon. The patterning structure includes a support frame secured to the lower under surface of the table top; linkage means connected to the support frame having knee and foot saddles extended through the arcuate slots in the table top and cover layer; and a drive drum connected to the linkage means and driven by the power means. The linkage means includes a drive link connected at one end to the drive drum and the opposite end to a left knee link which is pivotally connected to the support frame; an intermediate drive link connected to the drive link and a left foot link which is also pivotal about a connection to the support frame; and a right knee and a right foot link, respectively, which are pivotally connected to the support frame and also connected as by connector links to the left knee link and the left foot link, respectively. Additionally, the upright knee and foot saddles are secured to the aforementioned linkages. The power means includes a drive motor connected through pulleys and belt member to a transmission or gear reduction

means which is connected to the drive drum. The control means is connected to an electrical conductor leading from the drive motor and includes a fuse or circuit overload device; an adjustable timer mechanism; and a motor speed control member to vary the rotational speed of the drive motor and the drive drum thereby regulating the speed of movement of the patterning structure.

An object of this invention is to provide a patterning apparatus overcoming the aforementioned disadvantages of the prior art structures.

One further object of this invention is to provide a patterning apparatus operable to coordinate a plurality of complex movements constituting the crawl or creep pattern in a patient to teach gestalts.

One other object of this invention is to provide a patterning apparatus operable to coordinate the hip, leg, knee and foot movements into a useful, meaningful gestalt that accomplishes coordinated movements.

Another object of this invention is to provide a patterning apparatus including a support table; a patterning structure mounted on the support table operable to engage a patient's body; and a power means connected to the patterning structure operable to move the lower half of a patient's body in a homolateral coordinated pattern.

Still, another object of this invention is to provide a patterning apparatus having linkage means connectable to a patient's knee and foot areas operable to move the same in a coordinated creeping pattern at a predetermined rate for the physical therapy treatment.

One further object of this invention is to provide a patterning apparatus which is simple to operate, economical to manufacture, adjustable in size to fit various human patients, and providing a simple mechanical linkage system for trouble-free operation.

Various other objects, advantages, and features of the invention will become apparent to those skilled in the art from the following discussion, taken in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective view of the patterning apparatus of this invention illustrated with a patient connected thereto;

FIG. 2 is a side elevational view of the patterning apparatus of this invention having portions broken away for clarity; and

FIG. 3 is a schematic diagram illustrating brain damage power and linkage means of the patterning apparatus of this invention; and

FIGS. 4, 5, and 6, inclusive, are schematic diagrams illustrating various operating positions of the patterning apparatus of this invention, illustrating the same as connected to a patient shown in dotted lines for clarity.

The following is a discussion and description of preferred and specific embodiments of the new patterning apparatus of this invention, such being made with reference to the drawings, whereupon the same reference numerals are used to indicate the same or similar parts and/or structure. It is to be understood that such discussion and description is not to unduly limit the scope of the invention.

Referring to the drawings in detail and in particular to FIG. 1, there is provided a physical therapy patterning apparatus, indicated generally at 12, having a human patient 14 mounted on the upper surface thereof. The patterning apparatus 12 includes a main support table assembly 16; a patterning structure 18 secured to the support table assembly 16; a power means 20 operably connected to the patterning structure 18 for the movement thereof; and a control means 22 operably mounted in an electrical conductor 24 which, in turn, supplies electrical energy to the power means 20.

The support table assembly 16 includes a main table top 26 secured to a plurality of spaced support legs 28; a padded cover layer 30 secured to the top surface of the table top 26; and a body torso strap member 32 secured to a central portion of the table top 26. The table top 26 is of a generally large rectangular shape so as to receive a rather large child thereon while permitting the longitudinal and lateral movement of his

limbs during the patterning process of this invention as will be explained. The table top 26 and the padded cover member 30 are provided with spaced arcuate slots 33 and 35 adapted to receive portions of the patterning structure 18 therethrough for connection to the patient 14 as will be explained. A downwardly extended border member 37 may be secured about the outer periphery of the table top 26 and anchored to the support legs 28 as desired in order to provide a shield covering the patterning structure 18 for an attractive appearance.

The patterning structure 18 includes a main support frame 38 anchored to the table top 26; a linkage means 40 having upright knee and foot saddles 42 and 43 for connection to the patient 14; and a drive drum 45 operably connected to the linkage means 40 and driven by the power means 20 as will be explained. The support frame 38 includes an upper support plate 46 anchored as by bolts or the like to the under surface of the table top 26 and, additionally, connected by through support posts 47 to a lower or base plate member 49. The support frame 38 provides a spaced relationship between the base plate member 49 and the support plate 46 in order to receive the linkage means 40 therebetween.

The linkage means 40 includes a drive link 51 having one end pivotally connected at 52 to the drive drum 45; a left knee first link 53 pivotally connected at 54 to the base plate member 49 and to the opposite end of the drive link 51; a right knee second link 56 pivotally connected at 57 to the base plate 49 and connected by a first connector link 59 to the left knee link 53; an intermediate drive link 61 pivotally connected at 62 to the drive link 51 and the left knee link 53 and having the opposite end pivotally connected at 64 to the left foot link 66; the left foot third link 66 being pivotally connected at 67 to the base plate 49 and additionally, connected by a second connector link 69 to a right foot fourth link 70; and the right foot link 70 being pivotally connected at 71 to the base plate 49. All of the aforementioned links are provided with a plurality of spaced holes 73 adjacent the pivotal connecting points so that the same may be readily adjustable to achieve variation in distance between the various knee and foot saddles 42 and 43 so that this invention can be used on various sized patients. It is seen that holes 75 are provided adjacent the outer ends of the links 53, 56, 66 and 70 so as to receive the respective knee saddles 42 and foot saddles 43 therein. Additionally, the drive link 51 is shown as pivotally connected at one point adjacent the outer periphery of the drive drum 45; however, it is obvious that the drive drum 45 could be provided with a plurality of connecting points to attach the drive link 51 thereto to achieve a variation in movement and rotational speed of the linkage means 40. It is noted that the various elements of the linkage means 40 are constructed of a flat sheet material preferably aluminum or the like so that the same may be easily mounted adjacent the under surface of the table top 26 in a compact, neat appearing manner.

More particularly, the left knee link 53 and left foot link 66 are substantially identical so only one need be described in detail. The left knee link 53 is provided with a main body portion 76 having leg portions 78 and 79 directed at an angle relative thereto. It is seen that the leg portion 78 is of a greater length than the other leg portion 79 and such is adjusted so that the main body portion 76 extends substantially perpendicular to the drive link 51 when in the maximum uplift position of the left knee and left foot as shown in FIG. 4. It is seen that the right knee link 56 and the right foot link 70 are substantially identical, each having a main body 81 and a connector link portion 82 which is pivotally connected at 83 to the respective connector links 59 and 69. In the position of FIG. 4, it is seen that the right knee link 56 and the right foot link 70 have the main bodies 81 axially aligned and extended substantially perpendicular to the intermediate links 59 and 69 and parallel to the drive links 51 and 61. This results in the patient's right leg being positioned in an extended condition which is required for the patterning of this invention. It is seen

an adjustment into one of the holes 75 on the intermediate links 59 and 69 will be operable to change the various angles of the aforementioned links to vary the position from the ideal condition shown in FIG. 4.

The knee saddles 42 are provided with a main U-shaped support section 86 having the closed portion connected by a shaft 87 to a respective one of the knee links 53 and 56. This U-shaped support section 86 is operable to receive a person's limb therein, preferably the portion immediately above the knee. The foot saddles 43 are also provided with a U-shaped main body 91 having its closed portion secured as by a post 92 to respective ones of the foot links 66 and 70. Additionally, the foot links 66 and 70 are provided with a resilient cover strap 93 adapted to hold a person's foot therein on movement through the various stages of the patterning apparatus 12.

The power means 20 includes a drive motor 95 connected to the electrical conductor 24 to receive power thereto; a transmission or a gear reduction box 96 operably connected to and supporting the drive drum 45; and a pair of pulleys 97 and 99 interconnected to a belt member 101 and to the respective drive motor 95 and the gear reduction box 96. The drive motor 95 is secured by a bracket member 103 to a downward support member 104 secured to the under surface of the base plate 49. It is obvious that the r.p.m. output of the drive motor 95 is reduced through the use of the pulleys 97 and 99 and the gear reduction box 96 to achieve the slow revolutions of the drive drum 45 to provide the proper and desired movements of the linkage means 40. The control means 22 includes the conductor 24 having a plug 106 on one end connectable to a conventional 110-volt electrical power supply. Mounted on the conductor 24 is a timer mechanism 108; a circuit overload device 110; and a variable motor speed control 112.

In the use and operation of the patterning apparatus 12 of this invention, the same is operable to achieve coordinated movements of the patient's legs in a simulated crawling or creeping relationship whereupon other therapists' are moving the patient's arms and head in a relationship known as the homolateral pattern. The patient 14 is placed face down upon the cover layer 30 of the support table assembly 16 whereupon the strap member 32 is securely fastened about the patient's waist through the use of snap members 114 as shown in FIG. 1. The patient's left and right feet are mounted within the foot saddles 43 on the foot links 66 and 70 with the thigh portions above the knee 12 mounted in the knee saddles 42. In this position, the entire weight of the patient 14 is supported upon the padded cover layer 40. The control means 22 is operated to supply electrical current to the drive motor 95 which operates through the gear reduction box 96 to rotate the drive drum 45.

Starting at the initial up-knee position and straight right leg position of FIG. 4, it is seen that the drive drum 45 is rotating in a counterclockwise rotation as indicated by the arrow 117. This operates through the drive link 51 to pivot the left knee link 53 and left foot link 66 counterclockwise as shown in FIG. 5. Additionally, the right knee link 56 and the right foot link 70 are rotated counterclockwise around their respective pivot points 57 and 71. This operates to move the left leg of the patient downwardly while concurrently lifting the right leg upwardly to achieve a creeping or crawling action. On reaching the furthest downward position of the drive link 51, which is approaching FIG. 6, it is obvious that the left knee link 53 and left foot link 66 will have their main bodies 76 substantially aligned so that the left leg achieves a straight position similar to the straight right leg position of FIG. 4. Additionally, the right knee link 56 and the right foot link 70 are extended substantially perpendicular to the drive link 51 and the intermediate drive link 61 so that the patient's right leg achieves a similar position to that of the left leg in FIG. 4. It is obvious that the various elements of the linkage means 40 may be adjustable to achieve desired positions for various sized patients to accomplish the desired crawling action.

The various pivot points 54, 57, 67 and 71 of the linkage means 40 may be adjustable connected to the base plate 49 of

the support frame 38 so as to compensate between small and large children to achieve the overall desired effect. It is seen that the patterning apparatus 12 achieves the desired hip and leg movement of the patient 14 while providing a turning motion to the person's foot to duplicate the homolateral pattern in physical therapy. This apparatus 12 eliminates the two members of a five member team normally needed to move the person's legs. Additionally, the smooth, controlled movement of the patient's legs is far more beneficial from a medical standpoint than the unprofessional normal movement thereof achieved through the use of volunteer team members.

The physical therapy patterning apparatus of this invention provides a new and novel structure being efficient and effective in operation and of low cost construction to achieve the desired movement needed in homolateral patterns for the treatment of persons with brain damage or other such problems. The patterning apparatus is economical to manufacture, simple to use, reliable in operation, variable in speed and size to accommodate any desired patient, and a proven benefit to persons requiring such treatment.

While the invention has been described in conjunction with preferred specific embodiments thereof, it will be understood that this description is intended to illustrate and not to limit the scope of the invention, which is defined by the following claims.

I claim:

1. A patterning apparatus operable to manipulate portions of a patient's body, comprising:
 - a. a support table assembly having a table top to support the patient thereon;
 - b. a patterning structure including a support frame secured to said support table; link means including first, second, third, and fourth link members pivotally connected to said support frame and first and second links interconnecting respective pairs of said first and third link members and said second and fourth link members; an intermediate drive link interconnecting said first and third link members; and support members secured to said linkage means adapted to be connected to portions of the patient's body;
 - c. powering means having gearing, a drive means, and a drive link interconnecting said first link and intermediate link to said drive means whereby said first, second, third, and fourth link members are pivotally movable about respective pivot points to provide a coordinated movement of left and right legs of the patient receiving physical therapy; and
 - d. control means operably connected to said powering

means to achieve a predetermined physical therapy movement to said support members.

2. A patterning apparatus as described in claim 1, wherein:
 - a. said first and third link members are adapted to be connected to the leg portions of the patient each including a main body portion with laterally extended first and second leg portions at one end and respective one of said support members secured to the other end; and
 - b. said first leg portion pivotally connected to said drive link and movable on rotation of said drive drum from a first position having said main body perpendicular to said drive link to a second position parallel with said drive link to move the patient's leg from the raised to the extended condition.
3. A patterning apparatus as described in claim 2 wherein:
 - a. said second and fourth link members connected to the other leg portion of the patient each including a main body having a laterally extended leg at one end connected to said second link and the opposite end connected to one of said support members; and
 - b. said main bodies of said second and fourth link members extended perpendicular to said first and third link members at the extremes of said first and second positions.
4. A patterning apparatus as described in claim 1, wherein:
 - a. said support members of U-shape and extended transversely of the longitudinal axis of said first, second, third, and fourth link members to maintain the patient's leg and foot areas in the proper position during all stages of the patterning operation.
5. A patterning apparatus as described in claim 1, wherein:
 - a. said support table assembly having said table top mounted upon support legs with a padded cover layer mounted upon said table top to receive and support the patient thereon;
 - b. said padded cover layer and said table top having arcuate slots therein to receive portions of said patterning structure therethrough; and
 - c. a belt member secured to said support table assembly to be placed about the patient to secure same in proper patterning position.
6. A patterning apparatus as described in claim 1, wherein:
 - a. said powering means including a drive motor, a gear reduction box connected to said drive means, and pulley members and a belt member to connect said drive motor to said gear reduction box whereupon said drive means is driven at a slow rotational speed to achieve the desired movement of said linkage means and said support members.

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