A therapy device and methods thereof for increasing the flexibility and range of motion to the wrist, fingers, and thumb of a person is disclosed. The therapy device is directed to the stretching of the wrist, fingers, and thumb to improve range of motion, especially in such conditions as post-stroke spasticity.
THERAPY DEVICE TO INCREASE FLEXIBILITY AND RANGE OF MOTION TO THE WRIST, FINGERS, AND THUMB


FIELD OF THE INVENTION

[0002] The technology disclosed herein relates generally to the field of rehabilitation and more particularly to a therapy device for increasing the flexibility and range of motion to the wrist, fingers, and thumb of a person.

BACKGROUND OF THE INVENTION

[0003] Patients who suffer from paralysis of one or more limbs, e.g., as caused by a stroke, central nervous dysfunction, or other neurological disorder, are unable to effectively use the affected limb. The paralyzed limb is generally either in a condition of flaccidity or spasticity.

[0004] Left untreated this can cause other difficulties to the patient such as limitation of joint movement, deformity of the limb, and atrophy.

[0005] Related art that addresses these and other problems includes the following patents.

[0006] U.S. Pat. No. 1,879,401, issued to Bennett on Aug. 8, 1972, discloses a device for exercising paralyzed limbs.

[0007] U.S. Pat. No. 4,316,454, issued to Perka on Feb. 23, 1982, discloses a therapeutic positioning device for a paralyzed limb having either a flaccid or spastic condition. The therapeutic device consists of a support board removably accommodating a positioning rod which maintains the paralyzed limb in a therapeutically desirable position. The support board is provided with several locating holes each accepting the positioning rod. The locating holes are placed on the support board such that the rod can be located at varying positions to achieve the optimal therapeutic effect for a variety of limb sizes and conditions.

[0008] U.S. Pat. No. 4,674,110, issued to Eaton et al. on Jun. 16, 1987, discloses a hand and finger X-ray positioning device comprising a radiolucent support board containing one or more attachment means and one or more positioning means which are removably affixed to said attachment means and which permit the stable positioning of one or more fingers in a desired position for the purpose of obtaining X-rays of the hand and fingers without exposing a surgeon or technician to harmful radiation. In a preferred embodiment, the attachment means are a series of holes located at the distal end of a sterilizable rectangular support board into which fit the positioning means or pegs.

[0009] U.S. Pat. No. 5,374,226, issued to Graham on Dec. 20, 1994, discloses an apparatus for stretching the span of a hand includes a base member and a pair of spaced pegs; one peg for engaging the first metacarpal and one peg for engaging the fifth metacarpal of the hand. The pegs are mounted for relative adjustment in the base member. More particularly, the peg for engaging the first metacarpal is received in a straight guide way or slot extending through the base member. The second peg for engaging the fifth metacarpal is received in an arcuate guide track or slot extending through the base member in an arc about the first peg. Graduations are provided to identify relative positions along the guide way and guide track. A method for stretching the span of a hand includes engaging the hand between the first and second metacarpals with a first peg and between the fourth and fifth metacarpals at a spaced stretching distance with a second peg. Next is repeatedly pressing the hand against the pegs to provide stretching. The apparatus may include and the method may be performed in a warm water bath to make the bones, tendons and muscles of the hand more supple during treatment.

[0010] While these patents and other previous methods have attempted to solve the problems that they addressed, none have utilized or disclosed a portable, adjustable, adaptable therapy device to increase flexibility and range of motion to the wrist, fingers and thumb, as does embodiments of the technology disclosed herein.

[0011] Therefore, a need exists for a therapy device to increase flexibility and range of motion to the wrist, fingers, and thumb with these attributes and functionalities. The therapy device according to embodiments of the technology described herein substantially departs from the conventional concepts and designs of the prior art. It can be appreciated that there exists a continuing need for a new and improved therapy which can be used commercially. In this regard, the technology described herein substantially fulfills these objectives.

[0012] The foregoing patent and other information reflect the state of the art of which the inventor is aware and are tendered with a view toward discharging the inventor’s acknowledged duty of candor in disclosing information that may be pertinent to the patentability of the technology disclosed herein. It is respectfully stipulated, however, that the foregoing patent and other information do not teach or render obvious, singly or when considered in combination, the inventor’s claimed invention.

BRIEF SUMMARY OF THE INVENTION

[0013] In general, the technology disclosed herein features a therapy device to stretch the wrist, fingers, and thumb and improve range of motion, especially in such conditions as post-stroke spasticity. An aspect of the technology disclosed herein is to provide a method and apparatus for increasing the flexibility and range of motion to the wrist, fingers, and thumb for patients suffering from paralysis in their hand and arm and from loss of tone in their muscles. Left untreated, this spastic condition causes other problems for the patient, such as limitation of joint movement, atrophy, and deformity of the limb.

[0014] The technology described herein is directed to an adjustable and affordable device to help normalize the tone in a spastic condition for a patient’s wrist, fingers, and thumb. In one aspect it is a therapeutic positioning device that provides adjustable positioning to accommodate the size of a person’s hand and arm and to provide desired stretching force to the wrist, fingers, or thumb.

[0015] The wrist, fingers, and thumb can be positioned by mechanical means which extend the fingers and thumb and stretch the joints in the fingers, thumb, and wrist. The hand, arm, fingers, and wrist are placed on the therapy device providing a 3-point leveraged position, thus eliminating the need to have straps be the mechanism to position joints properly. The straps on the therapy device are to attach the therapy device comfortably to the arm in order to prevent the therapy device from coming off the arm when the user is mobile.
Unlike most other splints or other devices, the hand and arm are in a natural position with the thumb up and not forced into a horizontal position.

The therapy device is portable to allow an individual mobility while using the therapy device. The simple adjustability feature of the therapy device allows the individual to increase the amount of stretch when appropriate.

Advantages of the technology described herein include:

- Simplicity of operation, with no complicated adjustments or special tools required
- Portability, allowing the user to be mobile while using the device
- Lightweight, thus not adding to potential shoulder subluxation
- Adjustability, to vary the amount of stretch

Another advantage of the technology disclosed herein is that it is efficient to use.

Another advantage of the technology disclosed herein is that it is easy to use.

Another advantage of the technology disclosed herein is that it may be made from readily available materials.

Another advantage of the technology disclosed herein is that it may be economically produced.

Other objects, advantages and capabilities of the technology disclosed herein are apparent from the following description taken in conjunction with the accompanying drawings showing the preferred embodiment of the invention.

**BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS**

The technology disclosed herein, together with further advantages thereof, may best be understood by reference to the following description of the simplest form of the invention, taken in conjunction with the accompanying drawings in which:

**FIG. 1** is a perspective view of an adjustable, lightweight, portable therapy device, illustrating, in particular, major elements, according to an embodiment of the technology described herein;

**FIG. 2** is a plan view of an arm and wrist platform element, illustrating, in particular an arrangement of peg holes, according to an embodiment of the technology described herein;

**FIG. 3** is a perspective view of an arm and wrist platform, illustrating, in particular, the initial four pegs inserted, according to an embodiment of the technology described herein;

**FIG. 4** is a perspective view of an arm and wrist platform, illustrating, in particular, an arm and wrist positioned on the platform before insertion of the last peg, according to an embodiment of the technology described herein;

**FIG. 5** is a perspective view of an arm and wrist platform, illustrating, in particular, the last peg inserted, according to an embodiment of the technology described herein;

**FIG. 6** is a perspective view of an arm and wrist platform, illustrating, in particular, a first loop strap element initially attached to a hook fastener attached to the platform, according to an embodiment of the technology described herein;

**FIG. 7** is a perspective view of an arm and wrist platform, illustrating, in particular, the first loop strap element being wrapped around the arm, according to an embodiment of the technology described herein.

**FIG. 8** is a perspective view of an arm and wrist platform, illustrating, in particular, the first loop strap element installed, according to an embodiment of the technology described herein;

**FIG. 9** is a perspective view of an arm and wrist platform, illustrating, in particular, a second loop strap element being attached in a similar manner as the first loop strap element, according to an embodiment of the technology described herein;

**FIG. 10** is a perspective view of a therapy device, illustrating, in particular, a user's arm, hand, wrist and fingers ready to use the therapy device, according to an embodiment of the technology described herein.

**DETAILED DESCRIPTION OF THE INVENTION**

The technology disclosed herein will now be described in detail with reference to at least one preferred embodiment thereof as illustrated in the accompanying drawings. In the following description, numerous specific details are set forth in order to provide a thorough understanding of the technology disclosed herein. It will be apparent, however, to one skilled in the art, that the technology disclosed herein may be practiced without some or all of these specific details. In other instances, well known operations have not been described in detail so not to unnecessarily obscure the technology disclosed herein.

Referring to the drawings, FIGS. 1-10, where like reference numerals designate corresponding parts throughout the several figures, reference is made first to FIG. 1 that illustrates a typical therapy device 010 of the technology disclosed herein.

In an exemplary embodiment a therapy device 010 comprises a platform 100 having a plurality of holes 200 disposed upon the platform 100, and a plurality of pegs 300 configured for interchangeable placement within any of the plurality of holes 200 and extending upwardly from the platform 100, where the plurality of pegs 300 are configured to be gripped by a hand and fingers of a user.

The therapy device 010 is further comprised of a first loop strap 400 disposed upon the platform 100 and configured to wrap around an arm of the user to secure the arm to the platform 100. The therapy device 010 is further composed of a second loop strap 500 disposed upon the platform 100 and configured to wrap around the arm to secure the arm to the platform 100, where the first loop strap 400 is configured to wrap around the upper forearm and the second loop strap 500 is configured to wrap around the lower forearm.

The therapy device 010 is further comprised of a first fastener 600 disposed on the first loop strap 400 to fasten the first loop strap 400 and to secure the upper forearm to the platform 100. The therapy device 010 is further comprised of a second fastener 700 disposed on the second loop strap 500 to fasten the second loop strap 500 and to secure the lower forearm to the platform 100. In some embodiments of the technology described herein the first fastener 600 and the second fastener 700 are hook-and-loop fasteners.

In some embodiments of the technology described herein the platform 100 is ambidextrously configured and dual-sided, comprising a first platform side configured for use with a left arm, wrist, hand and fingers and a second platform side configured for use with a right arm, wrist, hand and fingers. A label 800 is disposed upon the first platform side and upon the second platform side to designate which side is to be used. This designation can be the letters “L” or “R”, the words “Left” or “Right”, symbols, graphics or the like.
In some embodiments of the technology described herein the plurality of holes 200 disposed upon the platform 100 is varied to accommodate varied arm and hand sizes.

In some embodiments of the technology described herein the plurality of holes 200 disposed upon the platform 100 includes a first number of holes in which to place a first number of the plurality of pegs for arm alignment and a second number of holes in which to place a second number of the plurality of pegs for gripping by the hand and fingers.

In some embodiments of the technology described herein the therapy device 010 is configured to extend the fingers, grip the hand, and to exercise the joints, tendons, ligaments, muscles in the fingers, hand and wrist.

To use an embodiment of the technology described herein, a user chooses the appropriate (“right” or “left”) labeled side of the platform 100 that matches which wrist is to be stretched (right or left) by observing the label 100. The user places the platform 100 so that the desired side faces upward.

The user then inserts four pegs into the holes at the two ends of the platform as shown in FIG. 3. An example of peg hole positions is illustrated in FIG. 2. At the bottom end of the platform, the user inserts a peg into inner hole A for small to medium size forearms or the outer hole B for large forearms. At the top end, the user inserts a peg into the inner peg C for small to medium size hands or hole D for large hands. The user inserts a peg into a hole in group E, with hole F1 being the easiest position. The user inserts a peg into a hole in group F with hole F1 being the easiest position.

Once a hand, fingers, thumb, and arm are placed around the four pegs as shown in FIG. 4, the user grasps the last peg with his other hand and inserts the last peg into the outermost middle hole of group G on platform 100 as shown in FIG. 5.

FIG. 6 shows the first loop strap 400 attached to a locked fastener at the end of the first loop strap 400 with the hook strip.

FIG. 7 shows the first loop strap 400 brought across the arm and around the platform 100. The first loop strap 400 is pulled snugly and then attaches itself with the end that has the hook strap as shown in FIG. 8.

The user duplicates this strapping process with the second loop strap 500 as shown in FIG. 9.

The user is ready to use the therapy device as shown in FIG. 10.

Each strap may be shortened on the end without the hook strip to reduce strap length if desired.

To increase the stretching of the wrist, the user inserts the middle peg into other holes in the group G as appropriate. To modify the stretch of the thumb, the user inserts a peg into other holes in group E as appropriate. To modify the stretch of the fingers, the user inserts a peg into other holes in group F as appropriate.

The technology described herein includes a method for increasing flexibility and range of motion to the wrist, fingers, and thumb. The method comprises:

**Utilizing a therapy device comprising:**
- a platform configured to receive an arm, wrist, hand, and fingers;
- a plurality of holes disposed upon the platform; and
- a plurality of pegs configured for interchangeable placement within any of the plurality of holes and extending upwardly from the arm, wrist, and hand platform, the plurality of pegs configured to be gripped by the hand and fingers;
- positioning therapeutically the arm, wrist, hand, and fingers in the platform; and
- extending the fingers, gripping the hand, and exercising the joints, tendons, ligaments, muscles in the fingers, hand, and wrist, thereby increasing flexibility and range of motion to the wrist, fingers, and thumb.

The method further comprises:

- utilizing the therapy device wherein the plurality of holes disposed upon the platform is varied to accommodate varied arm and hand sizes, and wherein the plurality of holes disposed upon the platform includes a first number of holes in which to place a first number of the plurality of pegs for arm alignment and;
- positioning therapeutically the arm, wrist, hand, and fingers in the platform between a peg at the inner upper forearm and a peg at the outer lower forearm.

The method further comprises:

- utilizing the therapy device wherein the plurality of holes disposed upon the platform includes a second number of holes to in which to place a second number of the plurality of pegs for gripping by the hand and fingers; and
- positioning therapeutically the arm, wrist, hand, and fingers in the platform for grip of the second number of the plurality of pegs by the hand and fingers.

The method further comprises:

- utilizing the therapy device wherein second number of the plurality of pegs forms a three-point leveraged position, the three-point leveraged position created by a placement of three of the plurality of pegs into three of the plurality of holes on the platform, three pegs arranged in a three-point triangular arrangement for grip by the hand and fingers; and
- positioning therapeutically the arm, wrist, hand, and fingers in the platform for grip of the three-point leveraged position by the hand and fingers.

The method further comprises:

- utilizing the therapy device wherein the platform is ambidextrously configured and dual-sided, comprising a first platform side configured for use with a left arm, wrist, hand and fingers and a second platform side configured for use with a right arm, wrist, hand and fingers;
- positioning interchangeably, therapeutically the left arm, wrist, hand, and fingers in the platform on the first platform side for therapy of the left arm, wrist, hand and fingers; and
- positioning interchangeably, therapeutically the right arm, wrist, hand, and fingers in the platform on the second platform side for therapy of the right arm, wrist, hand and fingers.

The method further comprises:

- utilizing the therapy device with the therapy device further comprising:
  - a first loop strap disposed upon the platform and configured to wrap around the arm to secure the arm to the platform; and
  - positioning therapeutically the arm, wrist, hand, and fingers in the platform; and
[0081] wrapping the first loop strap around the arm to secure the arm to the platform of the therapy device.

[0082] The method further comprises:

[0083] utilizing the therapy device with the therapy device further comprising:

[0084] a second loop strap disposed upon the platform and configured to wrap around the arm to secure the arm to the platform, where the first loop strap is configured to wrap around the upper forearm and the second loop strap is configured to wrap around the lower forearm;

[0085] wrapping the first loop strap around the arm to secure the upper forearm to the platform of the therapy device; and

[0086] wrapping the second loop strap around the arm to secure the lower forearm to the platform of the therapy device.

[0087] The method further comprises:

[0088] utilizing the therapy device with the therapy device further comprising:

[0089] a first fastener, disposed on first loop strap, to fasten the first loop strap to secure the upper forearm to the platform; and

[0090] fastening the first loop strap with the first fastener.

[0091] The method further comprises:

[0092] utilizing the therapy device with the therapy device further comprising:

[0093] a second fastener, disposed on the second loop strap, to fasten the second loop strap and to secure the lower forearm to the platform; and

[0094] fastening the second loop strap with the second fastener.

[0095] The method further comprises:

[0096] utilizing the therapy device wherein the first fastener and the second fastener are hook-and-loop fasteners.

[0097] There are many alternative ways that the technology described herein can be modified for stretching the wrist:

[0098] Separate right and left platforms can be provided.

[0099] Different platform shapes can be used.

[0100] Different materials for the platform, pins, and straps can be used.

[0101] Instead of pins or pegs, rods, bars, or shaped forms can be used to position the wrist, fingers, and thumb. Such positioning parts could be removable or be an integral and non-removable part of the complete device.

[0102] Positioning parts can be designed to place the wrist, fingers, and thumb and under tension using devices, e.g., springs, or certain materials to provide varying degrees of resistance instead of the fixed position parts which provide static resistance.

[0103] If separate right and left platforms are provided, straps can be permanently attached.

[0104] Instead of multiple holes in the top, middle, and/or bottom of the platform and utilization of independent pins or pegs, adjustable mechanisms, slots, or other techniques can be utilized to vary the angle of the wrist, fingers, and thumb and adjust the device for arm and hand sizes.

[0105] A different mix of holes in quantity and/or location can be utilized.

[0106] Pegs can be made of varying diameters to modify angles and to stretch out fingers and thumb.

[0107] An attachment can be used to position the thumb and fingers on their pegs.

[0108] Other types of strap fastening techniques can be used, such as buckles, clamps, and friction devices.

[0109] In place of straps, cuffs can be used to attach platform 100 to a user's arm.

[0110] Instead of the middle peg having multiple positions to alter the wrist angle, the top and/or bottom pegs have multiple positions with the purpose of varying the wrist angle.

[0111] The foregoing description and drawings comprise illustrative embodiments of the technology disclosed herein. Having thus described exemplary embodiments of the technology disclosed herein, it should be noted by those skilled in the art that the within disclosures are exemplary only, and that various other alternatives, adaptations and modifications may be made within the scope of the technology disclosed herein. Merely listing or numbering the steps of a method in a certain order does not constitute any limitation on the order of the steps of that method. Many modifications and other embodiments of the invention will come to mind to one skilled in the art to which this invention pertains having the benefit of the teachings presented in the foregoing description and the associated drawings. Although specific terms may be employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation. Accordingly, the technology disclosed herein is not limited to the specific embodiments illustrated herein, but is limited only by the following claims.

What is claimed is:

1. An adjustable, lightweight, portable therapy device to increase flexibility and range of motion to the wrist, fingers, and thumb, the therapy device comprising:
   - a platform configured to receive an arm, wrist, fingers, and thumb;
   - a plurality of holes disposed upon the platform; and
   - a plurality of pegs configured for interchangeable placement within any of the plurality of holes and extending upwardly from the arm, wrist, and hand platform, the plurality of pegs configured to be gripped by the hand and fingers;

2. The therapy device of claim 1, further comprising:
   - a first fastener, disposed on first loop strap, to fasten the first loop strap and to secure the upper forearm to the platform; and
   - a second fastener, disposed on the second loop strap, to fasten the second loop strap and to secure the lower forearm to the platform.

3. The therapy device of claim 2, further comprising:
   - a second loop strap disposed upon the platform and configured to wrap around the arm to secure the arm to the platform.

4. The therapy device of claim 3, further comprising:
   - a first fastener, disposed on first loop strap, to fasten the first loop strap and to secure the upper forearm to the platform;
   - a second fastener, disposed on the second loop strap, to fasten the second loop strap and to secure the lower forearm to the platform.

5. The therapy device of claim 4, wherein the first fastener and the second fastener are hook-and-loop fasteners.

6. The therapy device of claim 1, wherein the platform is ambidextrously configured and dual-sided, comprising a first platform side configured for use with a left arm, wrist, hand, and fingers and a second platform side configured for use with a right arm, wrist, hand, and fingers.
7. The therapy device of claim 1, wherein the plurality of holes disposed upon the platform is varied to accommodate varied arm and hand sizes.

8. The therapy device of claim 7, wherein the plurality of holes disposed upon the platform includes a first number of holes in which to place a first number of the plurality of pegs for arm alignment and a second number of holes to which to place a second number of the plurality of pegs for gripping by the hand and fingers.

9. The therapy device of claim 1, wherein the therapy device is configured to extend the fingers, grip the hand, and to exercise the joints, tendons, ligaments, muscles in the fingers, hand, and wrist.

10. The therapy device of claim 1, further comprising: a three-point leveraged position, the three-point leveraged position created by a placement of three of the plurality of pegs into three of the plurality of holes on the platform, three pegs arranged in a three-point triangular arrangement for grip by the hand and fingers;

11. A method for increasing flexibility and range of motion to the wrist, fingers, and thumb, the method comprising: utilizing a therapy device comprising: a platform configured to receive an arm, wrist, hand, and fingers;

a plurality of holes disposed upon the platform; and a plurality of pegs configured for interchangeable placement within any of the plurality of holes and extending upwards from the arm, wrist, and hand platform, the plurality of pegs configured to be gripped by the hand and fingers;

positioning therapeutically the arm, wrist, hand, and fingers in the platform; and

extending the fingers, gripping the hand, and exercising the joints, tendons, ligaments, muscles in the fingers, hand, and wrist, thereby increasing flexibility and range of motion to the wrist, fingers, and thumb.

12. The method of claim 11, further comprising: utilizing the therapy device wherein the plurality of holes disposed upon the platform is varied to accommodate varied arm and hand sizes, and wherein the plurality of holes disposed upon the platform includes a first number of holes in which to place a first number of the plurality of pegs for arm alignment; and

positioning therapeutically the arm, wrist, hand, and fingers in the platform between a peg at the inner upper forearm and a peg at the outer lower forearm.

13. The method of claim 12, further comprising: utilizing the therapy device wherein the plurality of holes disposed upon the platform includes a second number of holes to in which to place a second number of the plurality of pegs for gripping by the hand and fingers; and positioning therapeutically the arm, wrist, hand, and fingers in the platform for grip of the second number of the plurality of pegs by the hand and fingers.

14. The method of claim 13, further comprising: utilizing the therapy device wherein second number of the plurality of pegs forms a three-point leveraged position, the three-point leveraged position created by a placement of three of the plurality of pegs into three of the plurality of holes on the platform, three pegs arranged in a three-point triangular arrangement for grip by the hand and fingers; and

positioning therapeutically the arm, wrist, hand, and fingers in the platform for grip of the three-point leveraged position by the hand and fingers.

15. The method of claim 11, further comprising: utilizing the therapy device wherein the platform is ambidextrously configured and dual-sided, comprising a first platform side configured for use with a left arm, wrist, hand and fingers and a second platform side configured for use with a right arm, wrist, hand and fingers;

positioning interchangeably, therapeutically the left arm, wrist, hand, and fingers in the platform on the first platform side for therapy of the left arm, wrist, hand and fingers; and

positioning interchangeably, therapeutically the right arm, wrist, hand, and fingers in the platform on the second platform side for therapy of the right arm, wrist, hand and fingers.

16. The method of claim 11, further comprising: utilizing the therapy device with the therapy device further comprising: a first loop strap disposed upon the platform and configured to wrap around the arm to secure the arm to the platform;

positioning therapeutically the arm, wrist, hand, and fingers in the platform; and

wrapping the first loop strap around the arm to secure the arm to the platform device.

17. The method of claim 16, further comprising: utilizing the therapy device with the therapy device further comprising:

a second loop strap disposed upon the platform and configured to wrap around the arm to secure the arm to the platform, wherein the first loop strap is configured to wrap around the upper forearm and the second loop strap is configured to wrap around the lower forearm;

wrapping the first loop strap around the arm to secure the upper forearm to the platform of the therapy device; and

wrapping the second loop strap around the arm to secure the lower forearm to the platform of the therapy device.

18. The method of claim 11, further comprising:

utilizing the therapy device with the therapy device further comprising:

a first fastener, disposed on first loop strap, to fasten the first loop strap and to secure the upper forearm to the platform; and

fastening the first loop strap with the first fastener.

19. The method of claim 11, further comprising: utilizing the therapy device with the therapy device further comprising:

a second fastener, disposed on the second loop strap, to fasten the second loop strap and to secure the lower forearm to the platform; and

fastening the second loop strap with the second fastener.

20. The method of claim 18, further comprising: utilizing the therapy device wherein the first fastener and the second fastener are hook-and-loop fasteners.