United States Patent [19]

Sichau

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[54] **TRAINING ASSIST BRACE**

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[73] Assignee: **Ballert Orthopedic Corp.,** Chicago, Ill.

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[52] **U.S. Cl.** ..... **128/80 E,** 128/80 F

[51] **Int. Cl.** **A61f 3/00**

[58] **Field of Search** 128/80, 83, 84, 85, 88, 128/87

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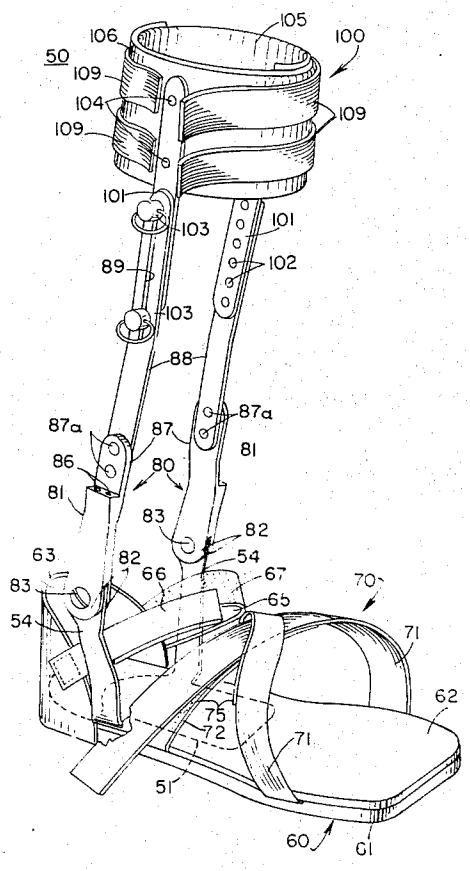
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Assistant Examiner—J. Yasko
Attorney, Agent, or Firm—Prangley, Dithmar, Vogel, Sandler & Stotland

[57] **ABSTRACT**

A fully adjustable orthopedic training assist brace comprises a relatively rigid foot member having a heel portion and a stirrup connected thereto, an adjustable Velcro closure ankle strap and two crossing adjustable Velcro closure instep straps for securing the foot member to various size feet, and a pair of adjustable length lower leg members pivotally coupled to the stirrup at the ankle and having adjustable Velcro closure calf bands for attachment to the calf. Also provided is a thigh brace including a modified calf member having outwardly flared knee portions extending above the calf bands, a pair of adjustable length thigh members coupled to the knee portion for limited pivotal movement with respect thereto, and having adjustable Velcro closure thigh bands for attachment to the thigh, and a latch sleeve surrounding the joint between the thigh and calf members to lock them against pivotal movement.

5 Claims, 10 Drawing Figures



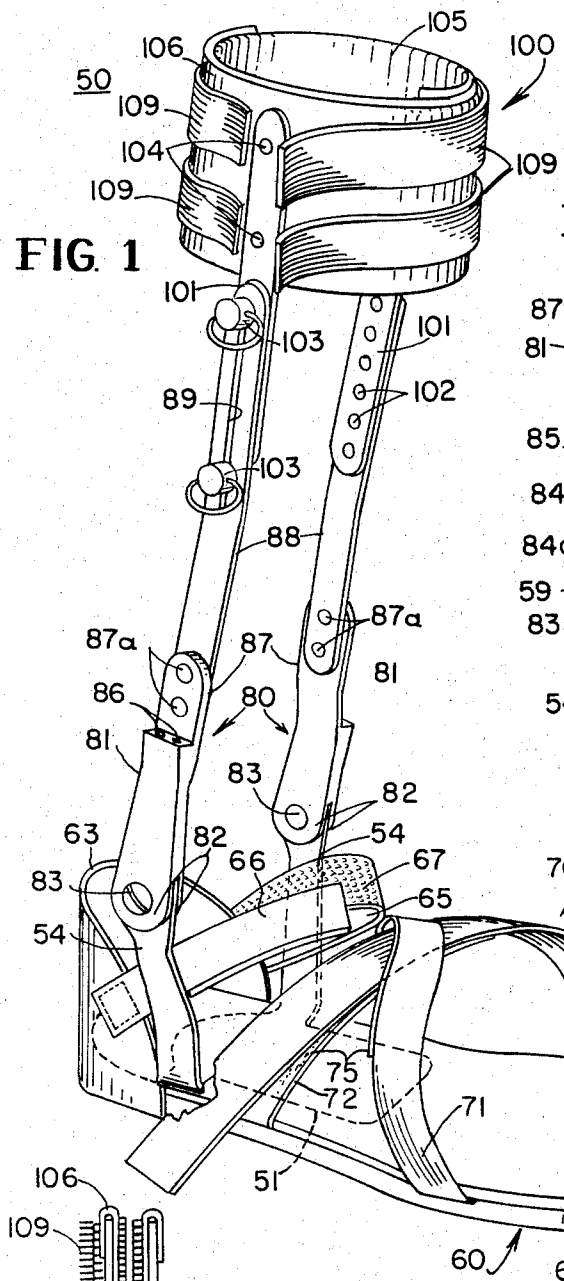


FIG. 1

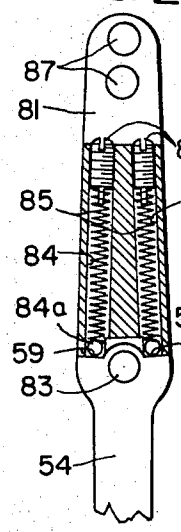


FIG. 2

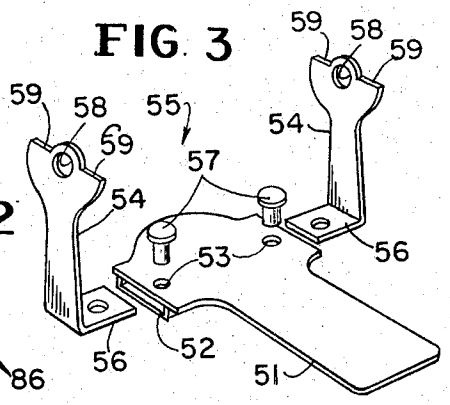


FIG. 3

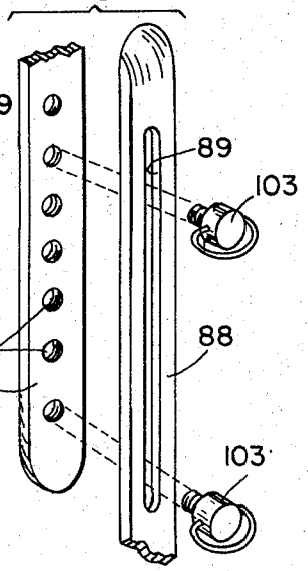


FIG 4

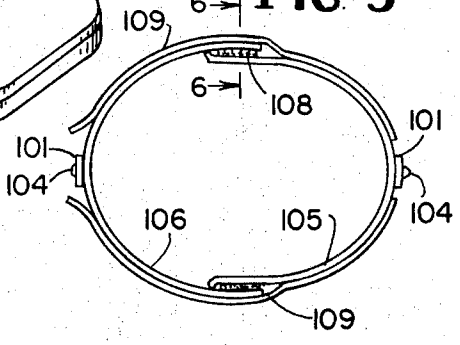


FIG. 5

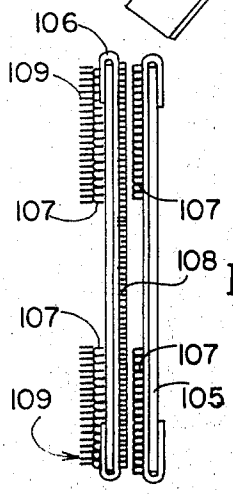


FIG. 6

FIG. 7

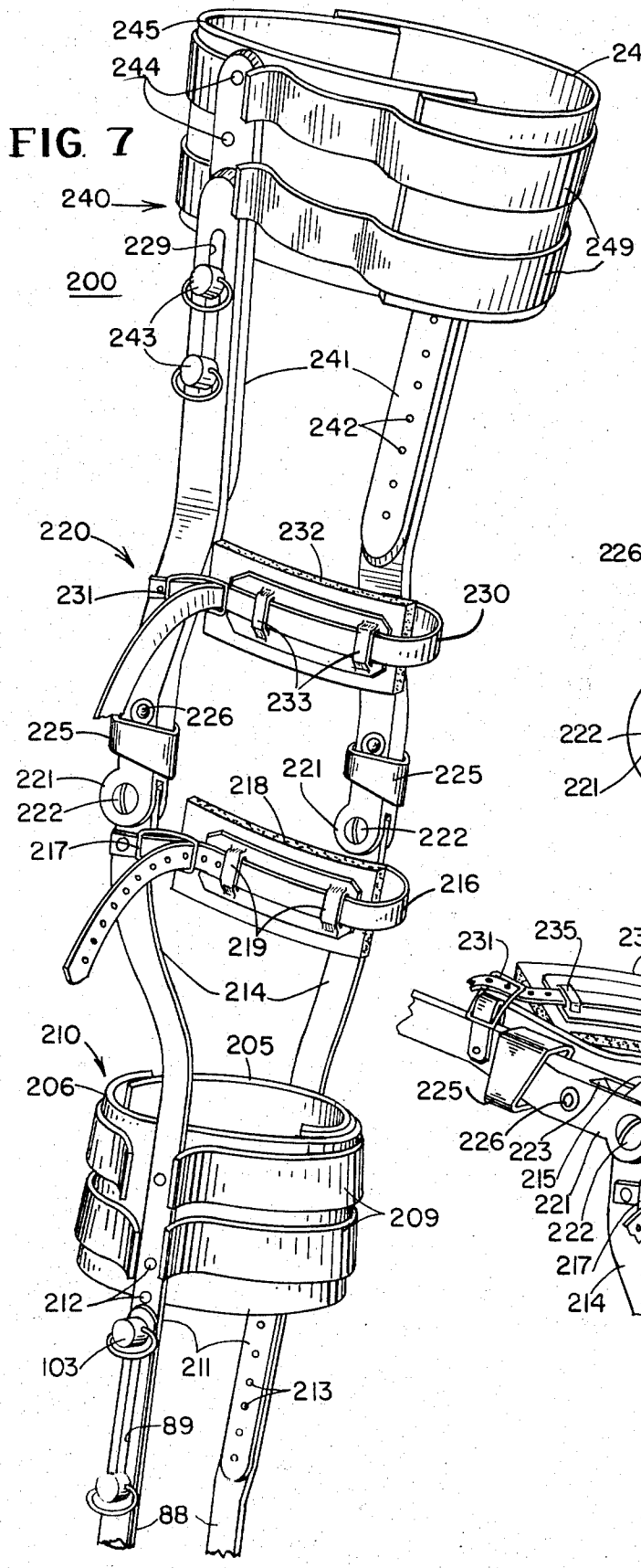


FIG. 9

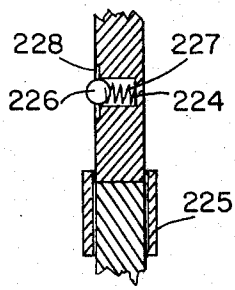


FIG. 8

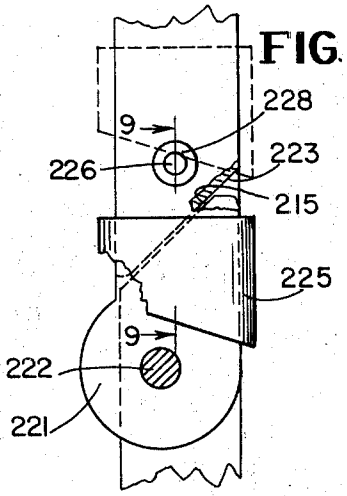
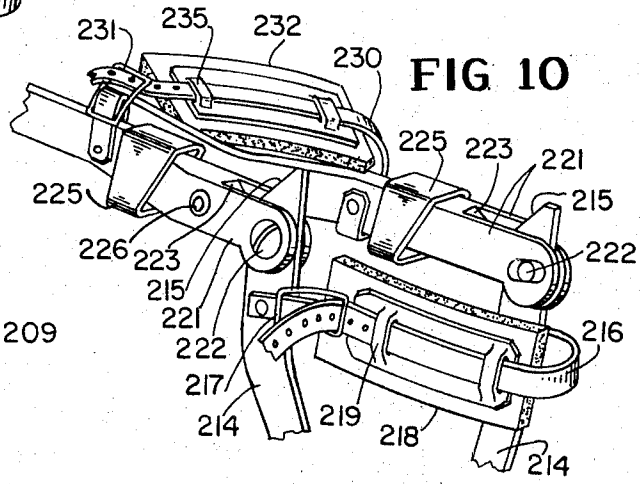


FIG. 10



TRAINING ASSIST BRACE

In certain diseases, such as poliomyelitis cases, or after certain operations, the legs of the patient frequently become temporarily weakened or paralyzed, and in the treatment of such cases the weakened leg or foot must be supported in a suitable brace which will allow the patient to duplicate the natural movements of the foot and leg during walking, whereby the physical therapist will be able to assist the patient in recovering the greatest degree of mobility of the leg and foot, and also allows the therapist to train the patient to use the brace. It also is desirable that the foot be permitted as much freedom of movement as possible, particularly in the case known as "drop-foot", to allow exercise of the paralyzed or weakened muscles. Such action is of great benefit as it aids in restoring the muscles, it promotes proper circulation of the blood in the temporarily or permanently paralyzed limb and helps to prevent atrophy of the limb.

A primary object of the invention is to provide a training assist brace which finds greatest utility in the use of physical therapy rooms, hospitals and the like, wherein the physical therapist determines that some form of training assist brace is required for use by the patient, and wherein the therapist may see a great number of patients from day to day, the therapist being able to use the instant training assist brace on such great number of patients by making the necessary adjustments in the brace, and thereby eliminate the need for a large number of specialty braces heretofore normally required by the therapist. The present brace also allows the therapist to determine the degree of improvement in the patient and to make a determination as to the nature of the permanent brace to be worn by the patient if such permanent brace is necessary.

Normally the physical therapist at the hospital is required to maintain a substantial stock of various-sized braces because of the different sizes of the numerous patients' legs and feet which the therapist treats. The present invention provides a training assist brace for use by the therapist which is designed to be capable of being readily applied or removed from a patient's leg so that the training assist brace will fit the patient with maximum comport and is light in weight in order not to unnecessarily fatigue the patient, yet the training assist brace will be usable on numerous patients, with varying size legs and feet.

A further object is to provide a training assist brace which may easily be fitted with an upper leg portion to provide additional leg support above the knee if the therapist deems such support to be required, and wherein the brace and upper leg portion may be adopted to legs of different individuals with the assurance that the knee joint will always be accurately positioned with respect to the patient's knee, thereby to allow proper movement of the leg.

The present invention relates to an orthopedic training assist brace which includes a foot portion adjustable to fit various patients, whether or not the patient is wearing a shoe, and also includes leg portions adjustable longitudinally and circumferentially to accommodate the patient's leg.

It is a general object of the present invention to provide a training assist brace which includes a sandal-type foot member having a plurality of adjustable Velcro fasteners and upper and lower leg members including adjustable Velcro calf and thigh fastening bands.

It is an important object of the present invention to provide an orthopedic training assist brace adjustable readily to fit various patients who have different sizes of feet and legs, the brace comprising a relatively rigid foot member including a heel portion, the heel portion engaging the heel of the foot of the patient and limiting rearward movement thereof with respect to the foot member, adjustable foot attachment means connected to the foot member for extending over the foot forwardly of the ankle to secure the foot to the foot member, a stirrup connected to the foot member and projecting upwardly therefrom adjacent to a side edge thereof, a lower leg member connected to the stirrup for pivotal movement with respect thereto adjacent to the ankle, a calf member adjustably coupled to the lower leg member adjacent to the upper end thereof and generally parallel thereto for varying the combined length of the calf and lower leg members, and adjustable calf attachment means connected to the calf member adjacent to the upper end thereof and extending in use about the calf of the patient for securing the calf member thereto.

In connection with the foregoing object, still another object of this invention is to provide an orthopedic training assist brace of the type set forth, wherein the calf member has a first abutment surface thereon, and further including a lower thigh member having a second abutment surface thereon and being connected to the calf member for pivotal movement with respect thereto adjacent to the knee, the first and second abutment surfaces being engageable with each other when the calf member and the lower thigh member are disposed generally in vertical alignment with each other in a straight-leg configuration for preventing pivotal movement of the thigh member forwardly with respect to the calf member, latch mechanism movable between a latching condition for holding the calf member and the lower thigh member in the straight-leg configuration thereof and a releasing condition accommodating pivotal movement of the calf member and the lower thigh member with respect to each other, an upper thigh member adjustably coupled to the lower thigh member adjacent to the upper end thereof and generally parallel thereto for varying the combined length of the upper and lower thigh members, and adjustable thigh attachment means connected to the upper thigh member adjacent to the upper end thereof and extending in use about the thigh of the patient for securing the upper thigh member thereto.

Further features of the invention pertain to the particular arrangement of the parts of the training assist brace whereby the above-outlined and additional operating features thereof are attained.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying drawing, in which:

FIG. 1 is a front perspective view of a training assist brace constructed in accordance with and embodying the features of the present invention, showing a first embodiment of the calf member;

FIG. 2 is an enlarged fragmentary view in vertical section of a portion of the calf member of FIG. 1, showing the pivot adjusting means;

FIG. 3 is an exploded view of the stirrup of the training assist brace of FIG. 1;

FIG. 4 is an enlarged exploded view of the vertical adjustment means of the training assist brace of FIG. 1;

FIG. 5 is a top-plan view of the calf and fastening means of the training assist brace of FIG. 1;

FIG. 6 is an enlarged view in vertical section taken along the line 6—6 in FIG. 5, and showing the fastening means on the calf band;

FIG. 7 is a front perspective view of a second embodiment of calf member with attached thigh member constructed in accordance with and embodying the features of the present invention, with the parts shown in a straightleg configuration;

FIG. 8 is an enlarged fragmentary side elevational view in partial section of the knee-joint latch mechanism of the training assist brace of FIG. 7;

FIG. 9 is a view in vertical section taken along the line 9—9 of FIG. 8, showing further details of the knee-joint latch mechanism; and

FIG. 10 is a fragmentary front perspective view of the training assist brace of FIG. 7, shown in the bent-knee configuration thereof.

Referring now more particularly to FIGS. 1 through 6 of the drawings, there is shown a training assist brace, generally designated by the numeral 50, which includes a foot pad 60 and a double-action lower leg brace 80, adapted to have adjustably connected thereto either a calf member 100 or an upper leg assembly 200 (FIG. 7). Secured to the foot pad 60 and forming a rigid spine therefor is a generally conventional caliper stirrup 55 having a foot plate 51 provided adjacent to one end thereof with a pair of transversely extending slots 52 respectively extending inwardly from the opposite sides of the foot plate 51. The conventional stirrup is modified so that the foot plate 51 has a pair of openings or holes 53 extending therethrough and communicating with the slots 52.

A pair of upstanding calipers 54 are also provided, constructed substantially as mirror images of each other, each of the calipers 54 including a relatively short mounting flange 56 integral therewith and extending therefrom substantially normal thereto at one end thereof and shaped and dimensioned to be received in a corresponding one of the slots 52 in the foot plate 51. When the mounting flanges 56 are respectively inserted in the slots 52, they may be secured to the foot plate 51 by rivets or other suitable fasteners 57 which are received through the holes 53 and through complementary holes in the attachment flanges 56. Each of the calipers 54 has a part circular upper end provided with a circular opening 58 extending therethrough and having a pair of substantially radially extending abutment surfaces 59 for a purpose to be described more fully below.

The foot pad 60 includes a relatively rigid outer sole 61 which may be constructed of leather or rubber or other suitable material, and an insole 62 fixedly secured to the outer sole 61 and substantially congruent therewith. Preferably, the foot plate 51 of the stirrup 55 is sandwiched between the outer sole 61 and the insole 62 for securely fastening the stirrup 55 to the foot pad 60, with the calipers 54 respectively extending upwardly from the opposite sides of the foot pad 60 adjacent to the rear end thereof to points adjacent to the opposite sides of a patient's ankle. Wrapped around the rear end of the foot pad 60 and secured thereto and extending vertically upwardly therefrom is a heel member 63 for receiving the heel of the foot and limiting rearward movement of the foot with respect to the foot pad 60.

Respectively secured to the heel member 63 of the opposite edges thereof and projecting upwardly and forwardly therefrom are two ankle staps 65 and 66, respectively provided with mating patches 67 of synthetic materials which adhere when pressed together, such as those sold under the trademark "Velcro", for fastening the ankle straps 65 and 66 together, thereby to secure the foot to the foot pad 60 and limit forward and upward movement of the foot with respect to the foot pad 60. More particularly, the Velcro material includes a first patch providing a plurality of monofilament hooks and a second fabric pad which engages the hooks. Each of the ankle straps 65 and 66 is of sufficient length to accommodate a wide range of adjustments in the length of the fastened-together straps, thereby to accommodate a wide range of foot sizes.

Also secured to the foot pad 60 are two pairs of instep straps, generally designated by the numeral 70, each of the pairs of straps 70 including a front strap 71 and a rear strap 72, each having one end thereof fixedly secured between the outer sole 61 and the insole 62. Preferably, the pairs of straps 70 are arranged in a criss-cross relationship, with the front straps 71 being respectively secured to the opposite sides of the foot member 62 adjacent to the front end thereof and with the rear strap 72 being respecitvely secured to the opposite sides of the foot pad 60 just forwardly of the calipers 54, as is illustrated in FIG. 1. Each pair of straps 71 and 72 is provided with mating Velcro patches 73 thereon for securing the strap ends together above the instep of the foot. Each of the straps 71 and 72 is of sufficient length to provide a wide range of adjustment to accommodate a wide range of foot sizes, whether or not the patient is wearing a shoe. Thus, it will be appreciated that the patient can readily step onto the foot member 60 with or without a shoe, thereby facilitating use of the device 50 as a physical therapy-training assist until the patient is ready for a permanent brace.

Respectively secured to the calipers 54 of the stirrup 55 and to extend upwardly therefrom along the inner and outer sides of the patient's leg are a pair of double-action lower leg brace members, generally designated by the numeral 80, which are constructed substantially as mirror images of each other, whereby only one of the brace members 80 will be described in detail. Each of the brace members 80 includes a control bar 81 having a clevis 82 at the lower end thereof for receiving therein the upper end of the corresponding caliper 54 for pivotal coupling thereto by means of a pivot pin or screw 83 adjacent to the ankle. The control bar 81 is provided with a pair of longitudinally extending bores 84 therethrough, the lower ends of the bores 84 opening between the legs of the clevis 82 and respectively overlying the bearing surfaces 59 on the associated caliper 54. Received in each of the bores 84 is a bearing 84*a* which rests upon the associated one of the stirrup caliper bearing surfaces 59, as best seen in FIG. 2. Also received in each of the bores 84 is a coil compression spring 85 having the lower end thereof seated on the bearing 84*a* and having the upper end thereof bearing against a set screw 86 which is threadedly received in the upper end of the bore 84. The upper end of the con-

trol bar **81** is provided with a laterally offset attachment portion **87** extending upwardly therefrom and adapted to be connected by means of rivets or other suitable fasteners **87***a* to the lower end of an elongated extension bar **88.** The extension bar **88** preferably has a slightly outwardly flared upper end having centrally disposed therein an elongated slot **89** extending longitudinally of the bar **88.**

The lower leg braces **80** may be connected alternatively to the calf member **100** or to the full upper leg assembly **200,** as desired, depending upon the type of leg assist brace required, but the calf member **100** will be described first. The calf member **100** includes a pair of elongated bars **101** constructed as mirror images of each other, each of the bars **101** having a plurality of longitudinally spaced-apart holes **102** therein, each having a diameter substantially equal to the width of the slots **89** in the lower leg brace bars **88.** In use, the calf member bars **101** are respectively disposed along the inner surfaces of the bars **88** in overlapping relationship therewith, with the holes **102** disposed in alignment with the slots **89** for receiving therethrough a pair of wire loop type set screws **103** for securing the bars **88** and **101** together. It will be understood that the amount of overlap of the bars **88** and **101** may be varied to adjust the length of the training assist brace **50** to accommodate different length legs. The wire loop type set screws make this adjustment relatively easy to accomplish without additional tools.

Secured to the inner and outer ones of the bars **101** adjacent to the upper end thereof by rivets or other suitable fasteners **104** are an inner calf band **105** and an outer calf band **106,** each being of part-cylindrical shape and constructed of a flexible material such as leather. Each of the calf bands **105** and **106** is provided along the outer surface thereof with a pair of circumferentially extending and vertically spaced-apart Velcro patches **107,** the outer calf band **106** also being provided on the inner surface thereof with a Velcro patch **108** adapted to mate with the Velcro patches **107.**

In use, the free ends of the inner calf band **105** are received within the free ends of the outer calf bands **106** in overlapping relationship therewith, with the mating Velcro patches **107** and **108** being engageable for fastening the calf bands **105** and **106** together about the calf of a patient. Also provided are four Velcro strips **109,** respectively adapted to mate with the Velcro patches **107** on the outer surfaces of the calf bands **105** and **106** at the front and rear sides of the calf bands when they are wrapped around the calf of the patient providing more secure closure.

In use, the patient places his foot onto the insole **62** of the foot pad **60** and against the heel member **63** and securely fastens the ankle straps **66** and **67** and the criss-crossing instep straps **71** and **72,** firmly to secure the foot to the foot pad **60** and to prevent movement of the foot with respect to the foot pad **60.** It will be noted that the calipers **54** are adapted to extend upwardly on the inner and outer sides of the ankle, the length of the calipers **54** being such that the pivotal connection between the calipers **54** and the lower leg brace control rods **81** will be positioned substantially at the patient's ankle to accommodate either dorsiflexion or plantarflexion movements of the foot, depending on the type of movement the therapist deems necessary. While two of the compression springs **85** have been illustrated in FIG. **2,** in normal use only one of the springs **85** will be used, the spring **85** being placed in either the front or rear one of the bores **84,** respectively to limit either plantarflexion or dorsiflexion. By appropriate adjustment of the set screws **86,** the compression of the spring **85** may be varied to adjust the force which opposes and counterbalances the flexion to be limited.

When the overlap of the bars **88** and **101** has been adjusted to the appropriate length of the patient's leg and the set screws **103** have been firmly fastened in place, the calf bands **105** and **106** are respectively wrapped around the inner and outer sides of the calf and are secured together by the Velcro patches **107** and **108** and the Velcro strips **109** in the manner indicated in the drawings, the circumferential lengths of the calf bands **105** and **106** being such as to permit a wide range of overlap, thereby to accommodate a wide range of patient calf sizes.

Referring now also to FIGS. **7** through **10** of the drawings, there is illustrated an upper leg assembly, generally designated by the numeral **200** which may alternatively be attached to the lower leg brace **80,** the assembly **200** including a calf brace, generally designated by the numeral **210,** a lower thigh brace generally designated by the numeral **220** and an upper thigh brace generally designated by the numeral **240.** The calf brace **210** includes a pair of extension bars **211** constructed as mirror images of each other, each of the bars **211** being provided with an outwardly flared upper end **214** and having a plurality of longitudinally aligned spaced-apart openings **213** therein adjacent to the lower end thereof. The bars **211** are respectively adapted to be disposed along the inner surfaces of the bars **88** in overlapping relationship therewith and adjustably secured thereto by the wire loop type set screws **103** in the same manner as was described above with respect to the calf member **100.** Respectively secured to the inner and outer ones of the bars **211** by suitable fasteners such as rivets **212** are inner and outer calf bands **205** and **206,** respectively identical in structure and function to the calf bands **105** and **106** described above, being additionally provided with Velcro straps **209,** identical in structure and function to straps **109** described above.

Each of the calf brace bars **211** is provided at the upper end thereof with an inclined bearing surface **215,** the bars **211** also having secured thereto adjacent to the upper end thereof a knee strap **216,** preferably provided with a buckle **217** and a cushioning pad **218,** the pad **218** being provided with loops **219** through which the strap **216** is received. In use, the strap **216** extends around the front of the patient's leg immediately below the knee to limit forward movement of the patient's knee with respect to the bars **211.**

A pair of lower thigh brace members **220** are provided, constructed substantially as mirror images of each other, whereby only one of these braces **220** will be described in detail. Each of the lower thigh braces **220** is substantially in the form of an elongated bar having an outwardly flared lower end terminating at the bottom end thereof in a clevis having part-circular shaped legs adapted to receive therebetween the upper end of the corresponding one of the calf brace bars **211** and pivotally secured thereto by a pivot pin or screw **222.** Preferably, the part-circular legs of clevis **221** have a diameter slightly greater than the portion of the

lower thigh brace **220** immediately thereabove, for a purpose to be described more fully below.

Formed on the lower thigh brace **220** between the clevis arms is an inclined bearing surface **223** shaped complementary to the bearing surface **215** on the calf brace **210.** Disposed in surrounding relationship with the lower thigh brace **220** immediately above the clevis end **221** is a latch sleeve **225** having dimensions sufficient to accommodate sliding movement thereof with respect to the lower thigh brace **222,** but insufficient to permit the latch sleeve **225** to pass over the clevis end **221,** the sleeve **225** extending longitudinally of the thigh brace **220** a distance substantially equal to the vertical distance between the upper and lower edges of the inclined bearing surface **223.** Centrally disposed in the outer surface of the lower thigh brace **220** adjacent to the upper end of the inclined bearing surface **223** is a cylindrical opening or recess **224** receiving therein a coil compression spring **227** and a ball bearing **226,** the lip of the opening **224** being peened as at **228** to retain the bearing **226** therein. Normally, the compression spring **227** urges the bearing **226** outwardly so that it projects outwardly beyond the outer surface of the lower thigh brace **220** a distance slightly greater than the clearance between the thigh brace **220** and the sleeve **225,** as best seen in FIG. **9.**

When the calf brace bars **211** and the lower thigh braces **220** are disposed substantially in vertical alignment in the straight-leg configuration illustrated in FIGS. **7** through **9,** the inclined bearing surfaces **215** and **223** are disposed parallel to each other and cooperate to prevent further pivotal movement of the thigh brace **220** in a clockwise direction with respect to the calf brace **210,** as viewed in FIG. **8.** When the sleeve **225** is disposed against the enlarged clevis end **221,** as viewed in FIG. **8,** it surrounds the region of overlap between the inclined bearing surfaces **215** and **223** for locking the thigh braces and the calf brace members in the straight-leg configuration thereof and preventing pivotal movement thereof with respect to each other. When it is desired to bend the knee to pivot the thigh brace **220** rearwardly with respect to the calf brace **210,** the sleeve **225** is moved upwardly along the thigh brace **220,** depressing the bearing **226** against the urging of the compression spring **227,** until the sleeve **225** is disposed in a releasing position completely above the bearing **226,** as shown in broken line in FIG. **8.** The sleeve **225** is retained in its releasing position by the bearing **226,** whereby there is freely accommodated a rearward pivotal movement of the thigh brace **220** with respect to the calf brace **210** to a bent-knee position illustrated in FIG. **10.** The adjustability of the lower brace portions via the set screws **103** permits placement of the pivot pin at the patient's knee joint, regardless of the length of the patient's calf.

Preferably, each of the lower thigh braces **220** has a middle inwardly bent portion immediately above the bearing **226** and an outwardly flared upward portion having centrally disposed therein an elongated slot **229** extending longitudinally of the thigh brace **220.** Also secured to the middle portion of the thigh braces **220** is a knee strap **230,** preferably provided with a buckle **231** and a cushioning pad **232,** the pad **232** having loops **233** therein for accommodating therethrough the strap **230.** In use, the strap **230** is fastened about the front portion of the patient's thigh immediately above the knee for cooperation with the strap **216** securely to position the patient's knee with respect to the upper leg assembly **200,** the straps **216** and **230** each having a length sufficient to accommodate a wide range of different leg sizes.

The upper thigh brace **240** includes a pair of elongated bars **241** constructed as mirror images of each other, each of the bars **241** having a plurality of longitudinally spaced-apart holes **242** therein, each having a diameter substantially equal to the width of the slots **229.** In use, the bars **241** are respectively disposed along the inner surfaces of the lower thigh braces **220** in overlapping relationship therewith, with the holes **242** in alignment with the slots **229** for receiving therethrough the wire loop set screws **243,** adjustably to secure the upper thigh brace **240** to the lower thigh braces **220.**

Respectively fixedly secured to the bars **241** adjacent to the upper ends thereof as by rivets or other suitable fasteners **244** are an inner thigh band **245** and an outer thigh band **246,** each being substantially part-cylindrical in shape and constructed of a flexible material such as leather or the like. Preferably, the thigh bands **245** and **246** are similar in construction and function to the calf bands **205** and **206,** each of the thigh bands **245** and **246** being provided with outer Velcro patches thereon and the outer thigh band **246** having an inner Velcro patch thereon. Also provided are four Velcro strips **249** functioning in the same manner as the Velcro strip **109** described above. The thigh bands **245** and **246** are of sufficient length to accommodate a wide range of patient leg sizes and still provide overlapping of the Velcro patches to fasten the upper thigh brace **240** to the patient's thigh.

In use, the calf bands **205** and **206** and the thigh bands **245** and **246** are securely fastened about the calf and thigh of the patient in the same manner as was described above with respect to the calf bands **105** and **106,** and the straps **216** and **230** are then secured across the front of the patient's leg immediately above and below the knee, it being readily appreciated that a wide variety of size adjustments are permitted to accommodate an accurate fit to the patient's leg.

In a preferred constructional example of the training assist brace **50** of the present invention, the outer sole **61** of the foot pad **60** may be of any suitable shoe sole material and may preferably be of the rubber crepe type. The insole **52** may be of any suitable material such as leather, whereby the foot pad **60** is adapted for use with or without the patient's shoe on, adding greater versatility to the brace. The straps **65, 66, 71, 72, 109, 209, 216, 230** and **249** may be formed of any suitable material such as leather or fabric, while the stirrup **55** and the bars **81, 88, 101, 211, 220** and **241** are all formed of metal, preferably duraluminum. The rivets or pins **57** are disposed below the rear portion of the upper surfaces **62** of the foot pad **60,** and by lifting that portion and removing the rivets or pins **57** it is easy to change the foot pad **60.**

From the foregoing, it can be seen that there has been provided a novel orthopedic training assist brace usable whether or not the patient has his shoe on and characterized by maximum adjustability to accommodate a wide variety of patient foot, leg and shoe sizes.

More particularly, there has been provided an orthopedic training assist brace of the character described which includes a sandal-type foot member having

ankle and instep adjustable Velcro straps for accommodating a wide variety of patient foot sizes, whether or not the patient is wearing his shoe, and also provides full vertical adjustability whereby the device has utility as a training assistance device in physical therapy.

In addition, there has been provided an orthopedic training assist brace of the character described, which includes leg portions which are longitudinally and circumferentially adjustable, the circumferential adjustments including calf and thigh bands having Velcro fastening means thereon.

Finally, there has been provided an orthopedic training assist brace which includes a lower leg portion adaptable to be used with either a calf brace or with a full upper leg assembly which includes a calf brace and thigh braces pivotally coupled together in a knee joint. In this connection, there is also provided a novel knee joint latch for locking the knee joint in a straight-leg position.

While there have been described what are at present to be considered the preferred embodiments of the invention, it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. An orthopedic training assist brace adjustable readily to fit numerous sizes of feet and legs, said brace comprising a relatively rigid foot member including a flat sole pad for readily receiving thereon the foot of the wearer with or without an associated shoe and a heel portion engaging the heel of the foot and limiting rearward movement thereof with respect to said foot member, adjustable ankle straps connected to said heel portion and two pairs of instep attachment straps connected to said foot member for extending over the foot forwardly of the ankle in a criss-cross pattern to secure the foot to said foot member, a stirrup connected to said foot member and projecting upwardly therefrom adjacent to a side edge thereof, a lower leg member connected to said stirrup for pivotal movement with respect thereto adjacent to the ankle, said lower leg member being provided at the upper end thereof with an elongated slot therethrough, adjustable bias means on said lower leg member to provide dorsoflexion and plantarflexion assistance to the foot of the wearer, a calf member having a plurality of longitudinally aligned spaced-apart holes therethrough, said calf member being disposed in use in overlapping relationship with said lower leg member with slected ones of said holes disposed in alignment with said slot, and fastening means receivable through said aligned holes and slot for adjustably coupling said lower leg member to said calf member to vary the combined length of said calf and lower leg members, and adjustable calf attachment means connected to said calf member adjacent to the upper end thereof and extending in use about the calf for securing said calf member thereto.

2. The orthopedic training assist brace set forth in claim 1, and including a pair of said lower leg members respectively disposed along the opposite sides of the leg of the wearer, and a pair of said calf members respectively connected to said leg members, said adjustable calf attachment means comprising a pair of calf bands respectively connected to said calf members and cooperating to surround the calf of the wearer with the free ends of one of said calf bands respectively disposed in overlapping relationship with the free ends of the other of said calf bands, and fastening means for securing together the overlapping ends of said calf bands.

3. An orthopedic training assist brace adjustable readily to fit numerous sizes of feet and legs, said brace comprising a relatively rigid foot member for accommodating a foot thereon and including a heel portion, said heel portion engaging the heel of the foot and limiting rearward movement thereof with respect to said foot member, adjustable foot attachment straps connected to said foot member for extending over the foot forwardly of the ankle to secure the foot to said foot member, a stirrup connected to said foot member and projecting upwardly therefrom adjacent to a side edge thereof, a lower leg member connected to said stirrup for pivotal movement with respect thereto adjacent to the ankle, a calf member having a first abutment surface thereon inclined with respect to the longitudinal axis thereof and being adjustably coupled to said lower leg member adjacent the upper end thereof and generally parallel thereto for varying the combined length of said calf and lower leg members, adjustable calf attachment means connected to said calf member and extending in use about the calf for securing said calf member thereto, a lower thigh member having a second abutment surface thereon inclined with respect to the longitudinal axis thereof and being connected to said calf member for pivotal movement with respect thereto adjacent to the knee, said first and second abutment surfaces being engageable with each other when said calf member and said lower thigh member are disposed substantially parallel to each other in a straight-leg configuration for preventing pivotal movement of said lower thigh member forwardly with respect to said calf member, a sleeve disposed in surrounding relationship with said lower thigh member for sliding movement longitudinally thereof between a latching condition and a relating condition, said sleeve in the latching condition thereof being engageable with the upper end of said calf member along the side edge thereof for preventing pivotal movement of said lower thigh member rearwardly with respect to said calf member thereby to lock said calf member and said lower thigh member in the straight-leg configuration thereof, said sleeve in the releasing condition thereof being out of engagement with said calf member for accommodating pivotal movement of said calf member and said lower thigh member with respect to each other, said lower thigh member having a widened stop portion at the bottom thereof dimensioned to prevent the passage of said sleeve thereover, and a depressable stop member projecting from said lower thigh member adjacent to the lower end of said second abutment surface for yieldably resisting the passage of said sleeve thereover, said sleeve in the latching condition thereof being disposed between said stop member and said widened stop portion and yieldably held in place thereby, said sleeve in the releasing condition thereof being disposed above said stop member and yieldably held out of said latching condition thereby, and two knee straps respectively disposed on said lower thigh member and said calf member immediately above and below the knee for strapping across the front of the leg securely to position the knee with respect to said calf member and said lower thigh member, an upper thigh member adjustably coupled to said lower thigh member adjacent to the upper end thereof and generally parallel thereto for

varying the combined length of said upper and lower thigh members, and adjustable thigh attachment means connected to said upper thigh member adjacent to the upper end thereof and extending in use about the thigh for securing said upper thigh member thereto.

4. The orthopedic training assist brace set forth in claim **3**, and including a pair of said upper thigh members respectively disposed along the upper sides of the thigh, said thigh attachment means comprising a pair of calf bands respectively connected to said upper thigh members and cooperating to surround the thigh with the free ends of one of said thigh bands respectively disposed in overlapping relationship with the free ends of the other of said thigh bands, and fastening means for securing together the overlapping ends of said thigh bands.

5. An orthopedic training assist brace adjustable readily to fit numerous sizes of feet and legs, said brace comprising a relatively rigid foot member for accommodating a foot thereon, adjustable foot attachment means connected to said foot member for securing the foot thereto, a stirrup connected to said foot member and projecting upwardly therefrom adjacent to a side edge thereof, elongated lower leg structure connected to said stirrup for pivotal movement with respect thereto adjacent to the ankle, said lower leg structure having a first abutment surface thereon inclined with respect to the longitudinal axis thereof, elongated upper leg structure connected to said lower leg structure for pivotal movement with respect thereto adjacent to the knee, said upper leg structure having a second abutment surface thereon inclined with respect to the longitudinal axis thereof and engageable with said first abutment surface when said upper and lower leg structures are disposed generally in vertical alignment with each other in a straight-leg configuration for preventing pivotal movement of said lower leg structure forwardly with respect to said upper leg structure, a sleeve carried by said upper leg structure for sliding movement longitudinally thereof between a latching condition and a releasing condition, said sleeve in the latching condition thereof being engageable with the upper end of said lower leg structure for preventing pivotal movement thereof with respect to said upper leg structure thereby to lock said upper and lower leg structures in the straight-leg configuration thereof, said sleeve in the releasing condition thereof being out of engagement with said lower leg structure for accommodating pivotal movement of said upper leg structure and said lower leg structure with respect to each other, said upper leg structure having a widened stop portion at the bottom thereof diminished to prevent the passage of said sleeve thereover, and a depressable stop member projecting from said upper leg structure adjacent to the lower end of said second abutment surface for yieldably resisting the passage of said sleeve thereover, said sleeve in the latching condition thereof being disposed between said stop member and said widened stop portion and yieldably held in place thereby, said sleeve in the releasing condition thereof being disposed above said stop member and yieldably held out of said latching condition thereby, and attachment means connected to said upper and lower leg structures for attachment thereof to the leg.

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