STIRRUP FOR ORTHOPEDIC BRACES
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11 Claims. (Cl. 128—80)

The present invention relates to orthopedic brace construction, and more particularly to a stirrup portion for an orthopedic brace having a leg portion and a portion adapted to be secured to a shoe.

In the making of orthopedic braces for leg and foot support, it is customary to secure a stirrup portion, as the part forming the bottom of the brace is known, to a wearer's shoe. Since the muscular foot action of most wearers of this general type of brace is not normal, the shoe on the brace frequently tends to wear down excessively at some particular point, such as at the toe or one side of the sole. Such uneven wear indicates need for correction, but adjustment is usually possible only by bending the metal members from which the brace is made, by cutting and rewelding these members, or by the use of special shoes.

The ankle of the foot with respect to the lower leg at the ankle joint also frequently affects one's ability to use the brace satisfactorily. For example, in a brace having a fixed ankle joint, or one in which the ankle joint is movable, but having a spring-held "normal" position, a difference of even one degree in that position may materially affect the wearer's ability to use the brace, and the wear on his shoe.

It usually is not feasible for the wearer of this type of brace to remove the shoe from the brace when it is desired to send the shoe out for repairs or to have it replaced. This means that he must send the entire brace along, with the shoe attached, and wait until the required work has been completed and the brace returned before he can walk again.

Some braces have been made wherein the lower ends of the side frame members extend inwardly at right angles and clamp by spring action into holes in the sides of the heel of a shoe. Such braces, however, are subject to springing out of the holes when the wearer turns his ankle, and for this reason are not recommended by many doctors.

In some cases, it is desirable for one to start using a brace while an incapacitated leg is still heavily bandaged, or in a cast. In such cases, it has been necessary with previous brace structures either to make a temporary brace for use during the wearing of the bandage or cast, or to make the permanent brace large enough to receive the bandage or cast, and then alter it to fit the leg after the bandage or cast has been removed. In either case, considerable additional expense is involved, and the difficulties encountered in securing a proper fit must be duplicated.

In my copending application for patent, Serial No. 652,016, filed March 5, 1946, now Patent No. 2,567,195, for Orthopedic Drop-Foot Brace, I have disclosed a brace stirrup having some advantages over previous structures, and the present application is a continuation in part of the subject matter thereof.

An object of the present invention is to make an improved stirrup for orthopedic braces.

Another object is to make a stirrup for orthopedic braces which has cooperative locking engagement with brace side portions.

Another object is to make a brace stirrup which is adjustable as to width of a shoe or leg on which it is to be mounted.

Another object is to make a brace stirrup with angular foot adjustment facilities.

In order to attain these objects, there is provided, in accordance with one feature of the invention, a brace stirrup having side portions adapted to have interlocking supporting relation with straight brace side portions, the stirrup being adjustable laterally with respect to the brace side support portions, and having a shoe supporting platform with angular sole positioning means associated therewith.

These and other features of the invention are set forth in the following description and the accompanying drawings, comprising one sheet. In the drawings:

Fig. 1 is a fragmentary view in side elevation of a brace stirrup incorporating the present invention as it would appear connected to a brace and mounted on a wearer's shoe;

Fig. 2 is a fragmentary sectional view through the stirrup taken in the plane of the line 2—2 of Fig. 1, brace side portions being shown in dot-dash lines;

Fig. 3 is a plan view of the stirrup shown in Figs. 1 and 2; and

Fig. 4 is a sectional view taken in the planes of the broken line 4—4 of Fig. 3.

Referring to the specific embodiment of the invention illustrated in the drawings, a shoe 10 and the ankle 11 of a wearer, are shown with one form of orthopedic brace 12 applied thereto. The brace as illustrated has an ankle joint 13 somewhat similar to that set forth in my pending application for patent referred to above. Brace side members 14 and 15 terminate in substantially straight lower end portions for connection to the stirrup in a manner to be brought out later herein.
If used with a brace having but one side member, one only of the stirrup connections would be employed, and in such case would of course be made to project from a side or end, as required, to meet the brace member.

The stirrup illustrated has a relatively thin, rigid, metal plate 17 of general cross shape. This plate has a longitudinally extending body portion 18, and laterally extending arms 19 and 20 (see Fig. 3) which may be formed integrally therewith. The plate 17 is mounted on the shoe 10 with which it is to be used, with the laterally extending arms 19 and 23 substantially centered beneath the transverse axis of the wearer's ankle joint. Metal guides 21 and 22 are provided beneath these laterally extending arms, and in these guides are inserted a pair of slidably adjustable brace side anchor members 27 and 28.

Each of the slidably adjustable anchor members has a straight portion, 23 and 24, respectively (see Fig. 3) with a longitudinally extending slot 29 therein through which the Shank of an adjustment locking screw 30 is inserted. The adjustment locking screws 30 are screwed into threaded holes in the plate 17 to clamp the brake side anchor member 27 in a predetermined position. The outer end of each of the brake side anchor members 27 and 28 has an upwardly extending portion 31 and 32, respectively, in the upper end of which there is a threaded opening to receive a screw 32 thereinto. The lower end of each of the brake side members 27 and 28 is of a shape and size to fit closely into a socket loop 33, formed integrally with, and projecting outwardly from, the lower end of the upwardly extending portion 31 of each of the adjustable brake support members 27 and 28. The Shank of the screw 32 fits closely through a hole in each brake side member, and is screwed into the threaded hole in the upright portion 31 when the lower end of each brake side member is inserted to a predetermined depth in its socket loop 33.

An angular adjustment plate 34, for distributing adjustment stresses over a substantial sole area, overlaps the body portion 15 of the stirrup plate 17. This adjustment plate is mounted to overlie adjustment bushings or screws in the stirrup plate 17 for adjusting the sole of a shoe 10 worn with the brake at a required angle relative to the plane of the plate body portion 15. The angular adjustment plate 34 is preferably of thin flexible spring metal, such as, for example, brass or steel shim stock. When the stirrup is mounted on a shoe, as shown in Fig. 4, the angular adjustment plate 34 is interposed between the plate body portion 15 and the sole of the shoe beneath the instep of the wearer, and the rear end of the angular adjustment plate may be secured to the rear of the plate body portion 15 as by rivets 35 and 36.

A pair of externally threaded plate adjusting bushings 35, each having an axial opening 45 therethrough, are screwed into threaded openings in the forward end of the plate body portion 15. One of these bushings is each of a length to project above the plate body portion when screwed in their entire length to support the forward end of the angular adjustment plate 34 in adjusted raised position relative to the forward end of the plate body portion 15. Screws 41 for securing the stirrup to the shoe beneath the instep arch portion of the shoe sole 43 are of a diameter to pass through the axial opening in each of the bushings 35. As illustrated, these screws are adapted to pass through the socket loops 33 in anchoring nuts 42, mounted in holes in the sole 43 of a wearer's shoe, to anchor the forward end of the stirrup plate to the shoe. The rear end of the plate 17 is gripped between the shoe sole 43 and a shoe heel 45 which is recessed closely to receive the plate 17 and the socket loops 33 in the shoe sole 43.

By regulating the clearance between the front end of the angular adjusting plate 34 and the stirrup plate 17, the angular position of the front portion of the sole which overlies it will also be regulated relatively to the plane of the stirrup plate. Thus, if the toe of the wearer's shoe has a tendency to drag, or to catch on slight irregularities in the sidewalk, a slight raising of the toe of the shoe relatively to the brace frequently will correct the difficulty.

Such adjustment can be accomplished readily in the present stirrup by unscrewing the retaining screws 41 slightly to release the pressure on the bushings 35, and then screwing the bushings inwardly slightly to raise the forward end of the angular adjusting plate 34. The retaining screws 41 then adjusted position and again to clamp the parts in adjusted position.

In case one side or the other of the sole of the shoe mounted on the stirrup shows excessive wear, the condition causing it can be corrected by screwing in the bushing 35 on the side of the shoe exhibiting excessive wear to raise that side of the plate 34. This twists the thin flexible spring plate 34 slightly about the longitudinal axis of the shoe. The leather sole of the shoe, under the weight of the wearer, will conform to the contour of the plate 34, and the defect thus can be minimized.

This is a much simpler and more natural type of correction than the securing of wedges of leather or wood to the sole of the shoe, or by the making of a special shoe with built-in wedge, as is sometimes done in an attempt to correct uneven wear on the sole of the shoe in a brace.

The present stirrup with its attached shoe may be removed easily from its brace by removing the screws 32 and moving the stirrup downwardly to release the lower ends of the side brace portions of the stirrup plate 17.

Adjustment of the width of the lateral separation of the side brace member from the stirrup plate can be accomplished by loosening the screws 30 to permit slidely adjustable adjustment of the brace side anchor members 27 and 28 inwardly or outwardly as desired. For example, if the brace initially is to be fitted over a cast, the members 27 and 28 may initially be secured in widely separated position. Then when the cast is removed the screws 30 may be loosened, the members 27 and 28 slidably moved inwardly to a newly adjusted position, and then secured in such newly adjusted position by again tightening the screws 30.

The stirrup illustrated can be used with any orthopedic brace of this general type simply by making the lower ends of its brace side anchor members the stirrup body portion 15. It can be adapted to fit into a corresponding anchoring device on the stirrup, and securing it in position thereon. The stirrup also, of course, is adapted for use with braces having but one side or back vertical member. The adaptation for such use would be apparent to any skilled brace maker having the present disclosure of the invention before him.

The stirrup permits the use of any desired
number of shoes interchangeably with a brace by providing an additional stirrup for each shoe. The present invention assures that each shoe, when replaced on the brace, will be in the same relative position thereto as when it was removed therefrom. It also permits individual adjustment for each shoe, as is frequently required by wearers of braces, by providing an additional stirrup for each shoe. This change in the physical condition of the wearer or by wear on the shoe itself. While I have illustrated and described a preferred form of the invention, it will be understood by those familiar with the art that the device is capable of some changes without departing from the spirit of the invention. It is desired, therefore, not to limit the invention except as set forth in the following claims.

I claim:

1. An orthopedic brace having a pair of brace side members, a stirrup member comprising a planiform member adapted to be secured beneath the instep portion of a shoe sole, a pair of laterally adjustable brace side receiving members mounted on said planiform portion, locking means mounted on said socket firmly to secure the stirrup to the side members, and means mounted on said planiform portion for supporting the front end of said plate in adjustably spaced relation to said sole, means carried by said plate and the sole of the shoe for securing the front end of said plate to said sole in such adjustably spaced relation thereto, and means for securing said plate to an upright brace member.

2. A stirrup for an orthopedic brace, said stirrup comprising a thin, rigid plate adapted to be mounted to extend lengthwise beneath the instep portion of a shoe with the rear end of said plate closely beneath the sole of a shoe, means, carried by said plate and the sole of the shoe for supporting the front end of said plate in adjustably spaced relation to said sole, and means for securing said plate to an upright brace member.

3. An orthopedic brace structure, a stirrup comprising a cruciform, thin but stiff member, the body portion thereof being of substantial width, relatively to the sole instep portion and being mounted lengthwise beneath the instep portion of a shoe sole, the arms of said cruciform member extending laterally to lie substantially beneath the transverse axis of the ankle joint of a wearer, a laterally adjustable brace side element secured to each arm of the cruciform member, an adjusting bushing threaded into each side of the forward end of said side body portion and adapted to extend upwardly therefrom to support a shoe sole element thereon, and fastening means passing through each of said bushings and into the shoe sole to secure the forward end of said body portion in adjustably spaced relation to each side of the shoe sole, and to clamp the bushings against turning movement.

4. An orthopedic brace structure, a stirrup comprising a cruciform, thin but stiff member, the body portion thereof being of substantial width, relatively to the instep portion and being mounted lengthwise beneath the instep portion of a shoe sole, the arms of said cruciform member extending laterally to lie substantially beneath the transverse axis of the ankle joint of a wearer, a laterally adjustable brace side element secured to each arm of the cruciform member, an adjusting member threaded through the forward end of said side body portion and adapted to extend upwardly therefrom to support a shoe sole element thereon in adjustably spaced relation to the shoe sole, and fastening means passing through said adjustable bushing and into the shoe sole to secure the forward end of said body portion in adjustably spaced relation to the shoe sole and to clamp the bushings against turning movement.

5. An orthopedic brace structure, a stirrup comprising a thin but stiff planiform member mounted to underlie a substantial area beneath the instep arch portion of a shoe sole, a laterally adjustable upright brace anchoring element secured to project from said planiform member, means for securing an upright brace member removably to said anchoring element, an adjusting member mounted on each side of the forward end of said planiform member and adapted to project upwardly therefrom to support a shoe sole element thereon, and fastening means passing through said planiform member and connected to the shoe sole to secure the forward end of said body portion in adjustably spaced relation to each side of the shoe sole, and to clamp the adjusting members against movement.

6. An orthopedic brace as defined in claim 5 in which a thin spring plate is interposed between the adjusting members and the shoe sole.

7. In an orthopedic brace structure, a stirrup comprising a thin, stiff plate adapted to be mounted to underlie a substantial area beneath the instep arch portion of a shoe, means on said plate for securing an upright brace member
thereto, an adjusting member mounted on each side of the forward end of said plate and projecting from the upper side thereof, and fastening members extending through the respective adjusting members for connection to the shoe sole.

11. An orthopedic brace as defined in claim 10 in which a thin spring plate is interposed between the adjusting members and the shoe sole, said plate being apertured to receive the fastening members.

EMMETT C. ELLERY.

REFERENCES CITED

The following references are of record in the file of this patent:

<table>
<thead>
<tr>
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