Dec. 4, 1956 E. SWIECH ET AL 2,772,674

ORTHOPEDIC TORSION LEG BRACE

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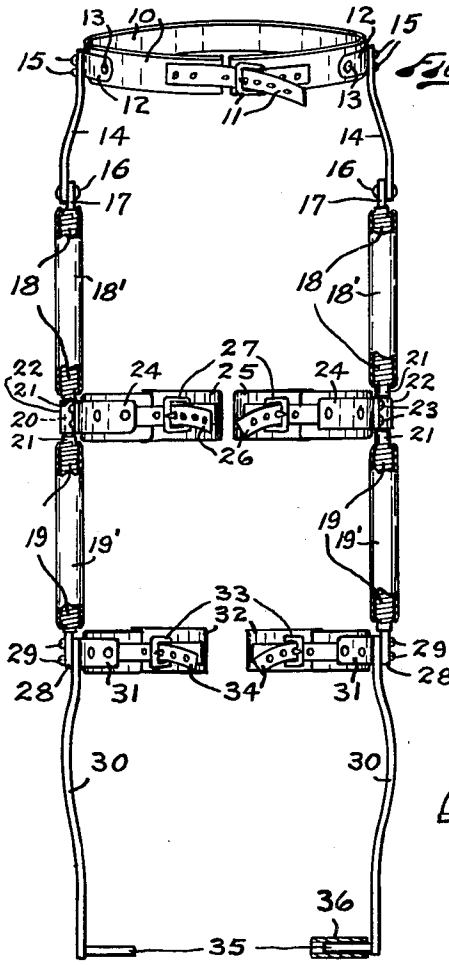


Fig. 1

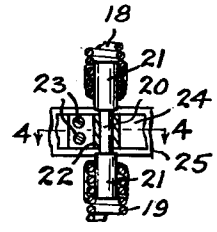


Fig. 3

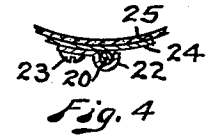


Fig. 4

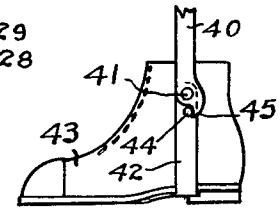


Fig. 5

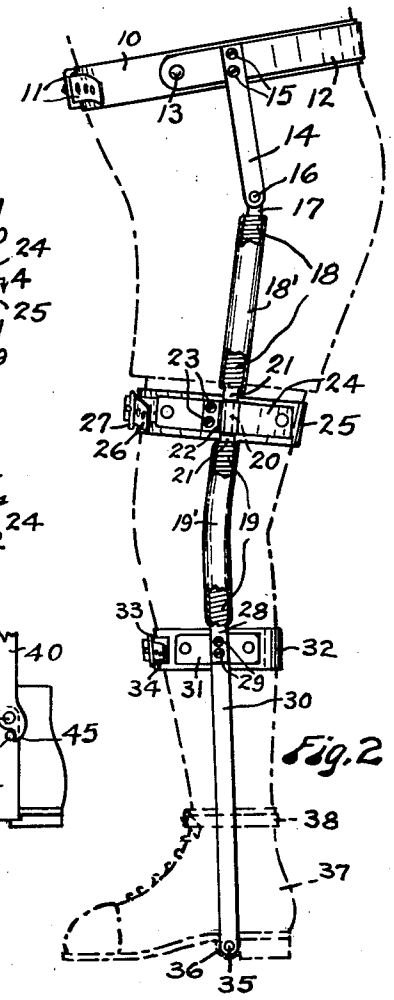


Fig. 2

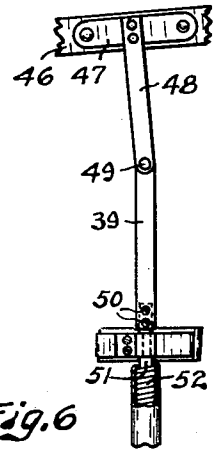


Fig. 6

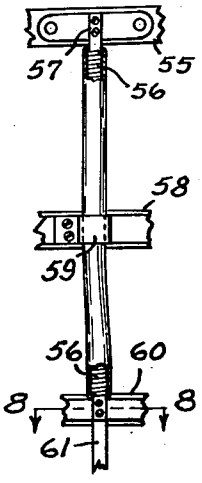


Fig. 7



Fig. 8

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ORTHOPEDIC TORSION LEG BRACE

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6 Claims. (Cl. 128—80)

This invention relates to an orthopedic torsion brace of a type adapted to be worn on the lower portion of the body to correct deformities of the muscles which control rotary or torsional movement of the legs and feet.

An object of this invention is to provide a brace by which an adjustable torsion in either direction may be exerted on one or both feet of the user to correct deformities or muscular weaknesses which cause either one or both of the feet to toe-out or toe-in to too great an extent.

This brace is primarily designed for use by spastic patients who have weakness in the muscles which control rotative positioning of the legs and feet but obviously it may be used in substantially all cases where correction in the rotative positioning of the legs and feet is required.

Another object of this invention is to provide an orthopedic torsion brace of this nature by which a constant but adjustable torsion is directly applied by helical torsion spring means to the part to be corrected without interfering with movement of the leg joints or other parts of the body.

Another object is to provide an orthopedic torsion brace having a waist encircling pelvic band or belt connected by torsion means, including at least one torsion spring with a lower leg brace which attaches to a shoe and further having devices for holding the torsion means in substantial alignment with and close to the leg, whereby the torsion is correctly and directly and constantly applied to the part to be corrected and whereby the torsion means is maintained in the most comfortable and out of the way position for the user.

Other objects of this invention will be apparent from the following description taken in connection with the accompanying drawings.

Figure 1 is a front elevation of a torsion brace constructed in accordance with this invention and showing a duplex construction adapted for corrective use on both legs and feet of a patient.

Fig. 2 is a side view of this brace showing by dot and dash lines the outline of a patient to which the brace is applied.

Fig. 3 is a fragmentary view, partly in section and partly in elevation illustrating connecting means used between the ends of two spring members to form a bearing and to adapt the spring members for operation like a single spring.

Fig. 4 is a fragmentary sectional view on broken line 4—4 of Fig. 3.

Fig. 5 is a fragmentary side elevation showing a modified form of lower leg brace which provides a pivot joint at the location of the ankle.

Fig. 6 is a fragmentary side view of a modified form of torsion brace constructed in accordance with this invention.

Fig. 7 is a fragmentary side view of still another modified form of torsion brace.

Fig. 8 is a plan view looking in the direction of broken line 8—8 of Fig. 7 and showing a calf engaging leg band of modified form.

Like reference numerals designate like parts throughout the several views.

Figs. 1, 2 and 3 illustrate a preferred form of this invention comprising a pliable waist encircling pelvic band or belt **10** having adjustable fastening means **11** and having a plate **12**, preferably of metal or like non-flexible material secured thereto by rivets **13** and extending around the back and sides of said pelvic band. The band **10** may be made of leather and buckle type securing means is shown for this band.

The corrective devices which are shown in Fig. 1 as attached to the plate **12** at each side of the belt or pelvic band are of duplicate construction and the following description applies equally well to the corrective devices at either side of said band **10**. It will be understood that in instances where torsion is to be applied to the lower limbs at both sides of a patient then two sets of corrective devices will be provided, as shown in Fig. 1, but where correction is needed only at one side of the patient then only one set of corrective devices will be used.

Each set of corrective devices shown in Figs. 1, 2 and 3 comprises a waist-to-hip plate **14** of metal or other fairly rigid material detachably secured as by screws **15** to the plate **12** of the pelvic band **10**. The lower end of each waist-to-hip plate **14** is positioned substantially in transverse alignment with the hip joint of the patient when the torsion brace is in use and is connected by a pivot member **16** with a fitting **17** which is fixedly attached to the upper end portion of a torsion spring **18**. The lower end portion of the torsion spring **18** is fixedly attached to the upper end portion of another torsion spring **19**, see Fig. 3, by a short bearing rod **20**. The rod **20** has two end portions **21** of enlarged diameter which telescope into the adjacent ends of the springs **18** and **19** and are secured to said springs **18** and **19** as by silver soldering these enlarged end parts **21** to the springs. This, in effect, attaches the two springs **18** and **19** together so that, functionally, they constitute a single spring member with a bearing intermediate its length.

The short bearing rod **20** is rotatively supported in a bearing clip **22** which is secured by screws **23** or like means to a plate **24** on the side of the thigh encircling upper leg band **25**. Preferably the clip **22** is shaped as shown in Fig. 4 so that it is easily applied to and detached from the bearing rod **20**. Detachable fastening means, shown as a strap **26** and buckle **27** is provided on each thigh encircling band **25**. Preferably the springs **18** and **19** have elastic tubes **18'** and **19'** fitted thereover as a protective covering. These elastic tubes are shown partially broken away in Figs. 1 and 2.

The lower end portion of the spring **19** is provided with a fitting **28** which is rigid with the spring and is attached by screws **29** to the upper end portion of a lower leg brace **30**. Preferably the screws **29** also attach both the fitting **28** and the lower leg brace **30** to a metal plate **31** on the side of a calf engaging leg band **32** of leather or like pliable material. A buckle **33** and a strap **34** may be used as adjustable and detachable fastening means for the calf engaging lower leg band **32**. This calf engaging lower leg band **32** can be of semicircular shape, like the leg band **60** shown in Figs. 7 and 8 and hereinafter described. Its function is to hold the parts **19** and **30** in place alongside of the leg and at the same time allow the torsion of spring means **18, 19** to be exerted on the lower leg brace **30**. The lower end of the lower leg brace **30** is provided with shoe attachment means. The shoe attachment means shown in Figs. 1 and 2 is a caliper pin **35** perpendicular to the leg brace **30** and fitting within a tubular receptacle **36** which is secured to the shoe **37**, a fragment of this receptacle **36** being shown in section in Fig. 1. The shoe **37** is shown by dot and dash lines in Fig. 2. This shoe **37** is provided at its top with a strap **38** which may be ap-

plied outside of the leg brace 30 so that it helps to hold the leg brace 30 close to the leg.

In the operation of the torsion brace shown in Figs. 1, 2 and 3 the brace is applied as shown in Fig. 2. The pivot 16 will be positioned substantially in transverse alignment with the hip joint and this permits free hip joint movement, for instance in leaning forward, as illustrated in Fig. 2, or in sitting down. The thigh encircling upper leg band 25 is positioned well above the knee and the torsion spring means 18, 19 is rotatively supported and held against sidewise movement and close to the leg by this thigh encircling band. The lower spring member 19 permits freedom of movement of the knee joint in spanning this joint. The calf engaging member 32 holds the spring 19 and upper end portion of the lower leg brace 30 in proper alignment with the leg and close to the leg and at the same time does not interfere with the effective application of spring torsion to the lower leg brace 30.

In applying this torsion brace to the user the required initial torsion to hold the foot and leg in a desired angular position may be imparted to the spring 18, 19 after the pelvic band 10 and thigh encircling band 25 have been fastened but before the calf engaging band 32 is applied to the leg. This may be done by axially turning the lower leg brace 30 the desired amount either while said leg brace is removed from the shoe or while it is attached to the shoe and before the foot is placed in the shoe. If a half turn of the spring in either direction is desired to obtain the correct amount of torsion the screws 29 may be removed, the fitting 28 rotated one half turn and the screws 29 replaced. The springs 18 and 19 preferably are substantially closed coil springs, as illustrated in Figs. 1 and 2. These springs can be made to exert the desired torsion irrespective of whether they are twisted in a direction which tends to wind up the coils or to unwind the coils. The pelvic band 10 is the anchor means which resists the torsion transmitted by the springs 18 and 19 to the lower leg and foot and it does not occasion any discomfort to the user. The springs 18 and 19, being closely wound, offer enough resistance to lengthening and shortening so that they help to hold the thigh encircling band 25 in place lengthwise of the leg.

If it is desirable to provide greater freedom of movement of the ankle joint than is provided by the structure shown in Figs. 1 and 2 then the lower leg brace, see Fig. 5, may comprise an upper part 40 connected by a pivot pin 41 with a lower stirrup part 42. The stirrup part 42 is capable of being fixedly attached to the sole portion of a shoe 43. The pivot pin 41 is positioned substantially in transverse alignment with the ankle joint of the user. The torsion means is attached to the upper end portion of the upper leg brace part 40 in the same manner as it is to the leg brace 30 of Figs. 1 and 2. In the construction shown in Fig. 5 downward pivotal movement of the toe portion of the shoe is limited by providing on the stirrup part 42 a fixed stop pin or lug 44 positioned to be engaged by a shoulder 45 on the upper leg brace part 40.

It is possible to replace the upper spring member 18, shown in Figs. 1 and 2, with a bar or rod 39, as shown in Fig. 6 and still retain the benefits of the torsional action of the lower spring member 19. Fig. 6 shows a fragment of a pelvic band 46 having a side plate 47 to which a waist-to-hip plate 48 is rigidly secured. The plate 47 differs from the previously described plate 12 in that said plate 47 does not extend entirely around the back of the pelvic band 46 to which it is attached. The upper end of the bar 39 is connected by a pivot member 49 with the lower end of the waist-to-hip plate 48. The lower end of the bar 39 is rigidly secured, as by screws 50, to the upper end portion of a short bearing rod 51. The bearing rod 51 is similar to the previously described bearing rod 20, 21 and has a torsion spring 52 similar to the spring 19 secured thereto. The parts which rotatively support the bearing rod 51 and all parts below the spring 52 are identical with those shown in Figs. 1 and 2. The structure shown in Fig. 6 is not as flexible as the structure shown in Figs. 1 and 2 but is operable to apply torsion to the lower legs and feet.

It is also possible to dispense with the waist-to-hip plate as shown in Figs. 1, 2 and 6 and to use a torsion spring made from one integral piece of spring wire which extends substantially from a pelvic band or belt to a lower leg brace. Such a construction is illustrated in Figs. 7 and 8. Fig. 7 shows a waist encircling pelvic band 55; a torsion spring 56 having its upper end directly secured, by a fitting 57, to the pelvic band 55; a thigh encircling band 58 having a guide and bearing tube 59 of large enough diameter to receive the spring 56 and with the spring 56 rotatively supported in said tube 59 and a calf engaging semi-circular leg band 60 and lower leg brace 61 secured to the lower end of the spring 56. The lower end of the leg brace 61 may be connected with a shoe in the same manner as the leg brace 30 shown in Figs. 1 and 2. The calf engaging band 60 shown in Figs. 7 and 8 does not extend entirely around the leg but fits over the leg and encircles the leg sufficiently so that when the lower leg brace is held by a shoe strap like the strap 38 shown in Fig. 2 the upper end portion of said lower leg brace will be held in place by said semi-circular band 60.

In operation, the brace means shown in Figs. 7 and 8 can be used to apply constant torsion to the lower leg and foot in substantially the same manner as the brace means shown in Figs. 1 and 2.

The foregoing description and accompanying drawings clearly disclose preferred embodiments of this invention but it will be understood that this disclosure is merely illustrative and that changes may be made within the scope of the following claims.

We claim:

1. In a torsion leg brace, a waist encircling pelvic band; a calf engaging leg band; a substantially rigid lower leg brace having its upper end connected with said calf engaging leg band; shoe engaging means provided at the lower end of said lower leg brace; torsion spring means; devices connecting the upper end of said torsion spring means with said pelvic band; and devices connecting the lower end of said torsion spring means with said lower leg brace, said torsion spring means when placed under stress torsionallly exerting torque on said lower leg brace while providing a high degree of flexibility between the pelvic band and the lower leg brace.

2. In a torsion leg brace, a waist encircling pelvic band; a waist-to-hip plate attached to the side of said pelvic band and extending downwardly therefrom; a calf engaging leg band; a lower leg brace having its upper end connected with said calf engaging leg band; shoe engaging means provided at the lower end of said lower leg brace; and a torsion spring having its upper end attached to the lower end of said waist-to-hip plate and its lower end attached to said leg brace, said spring when torsionally stressed providing constant torsion on said lower leg brace and providing a high degree of flexibility between the waist to hip plate and the lower leg brace.

3. In a torsion leg brace, a waist encircling pelvic band; a waist-to-hip plate attached to the side of said pelvic band and extending downwardly therefrom; a calf engaging leg band; a lower leg brace having its upper end attached to said calf engaging leg band and having shoe engaging means at its lower end; a torsion spring having its upper end attached to the lower end of said waist-to-hip plate and its lower end attached to said lower leg brace; and a thigh encircling band rotatively supporting said torsion spring intermediate its length, said torsion spring when torsionally stressed being capable of exerting constant torsion on said lower leg brace while having a high degree of flexibility in transverse directions.

4. In a torsion leg brace, a waist encircling pelvic band; a calf engaging leg band; a lower leg brace having its upper end connected with said calf engaging leg band and

having shoe engaging means at its lower end; torsion spring means; devices connecting the upper end of said torsion spring means with said pelvic band; other devices connecting the lower end of said torsion spring means with said lower leg brace, said spring means when torsionally stressed being capable of exerting a constant torsion on said lower leg brace; and a thigh encircling band rotatively supporting said torsion spring means intermediate its length.

5. In a torsion leg brace, a waist encircling pelvic band; a substantially rigid waist-to-hip plate attached to the side of said pelvic band and extending downwardly therefrom; a thigh encircling leg band; a calf engaging leg band; a substantially rigid lower leg brace having its upper end connected with said calf engaging leg band and having shoe engaging means at its lower end; an upper helical torsion spring positioned between said waist-to-hip plate and said thigh encircling leg band and having its upper end connected wth said waist-to-hip plate; a lower helical torsion spring positioned between said thigh encircling leg band and said calf engaging leg band and having its lower end connected with said

lower leg brace; a short bearing rod attached to and connecting the adjacent ends of said two springs; and bearing means on said thigh encircling leg band rotatively receiving said bearing rod, said two torsion springs operating as a unit and when torsionally stressed exerting torsion on said lower leg brace.

6. In a torsion leg brace, a waist encircling pelvic band; a substantially rigid waist-to-hip plate attached to the side of said pelvic band and extending downwardly therefrom; a substantially rigid lower leg brace having shoe attachment means at its lower end; a torsion spring having its upper end attached to the lower end of said waist-to-hip plate and having its lower end attached to said lower leg brace; and a thigh encircling band rotatively supporting said torsion spring intermediate the length of said spring, said torsion spring when stressed by twisting of said lower leg brace relative to said waist-to-hip plate exerting a constant torsion on said lower leg brace while providing a high degree of flexibility between the waist-to-hip plate and the lower leg brace.

No references cited.