July 5, 1960 K. B. NELSON 2,943,622

LEG BRACE ORTHOPEDIC APPLIANCE

Filed Oct. 5, 1959 2 Sheets-Sheet 1

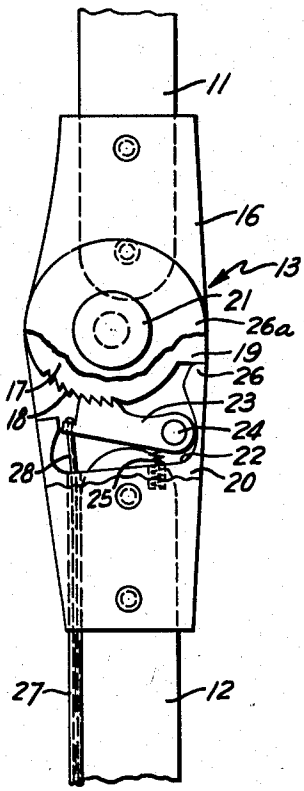

Fig. 2

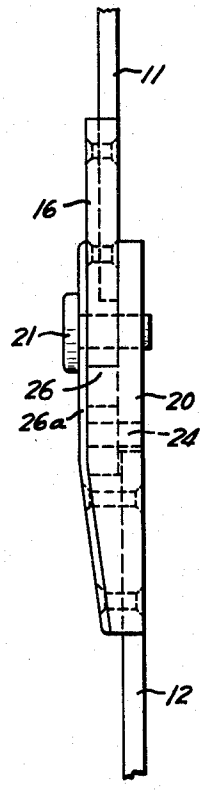

Fig. 3

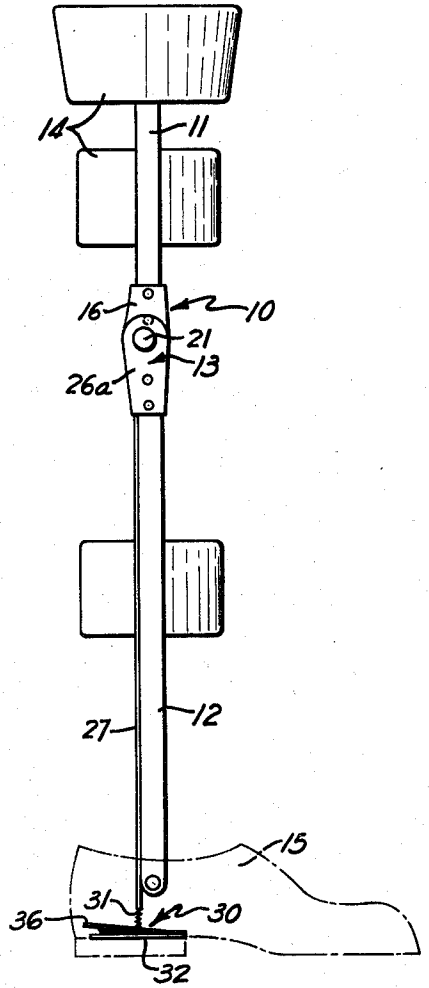

Fig. 1

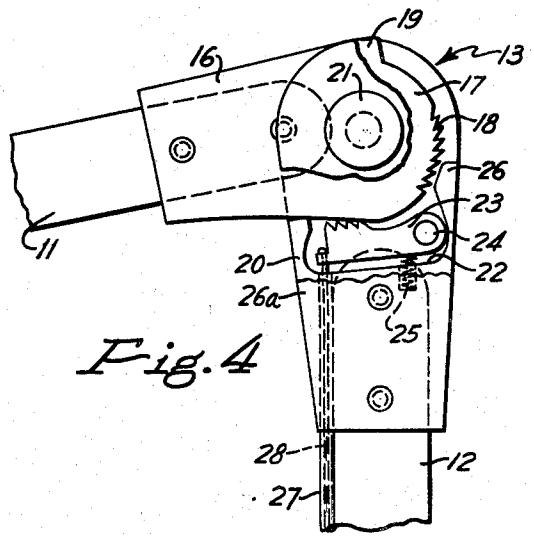

Fig. 4

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LEG BRACE ORTHOPEDIC APPLIANCE

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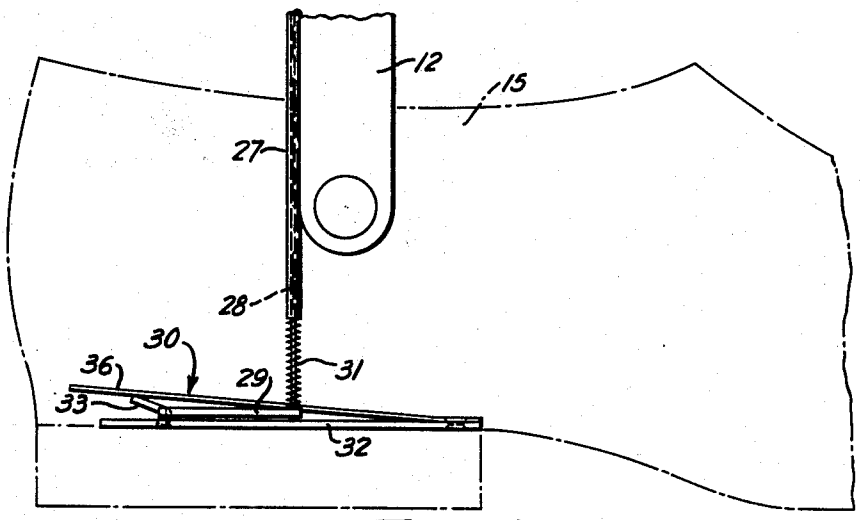

Fig. 5

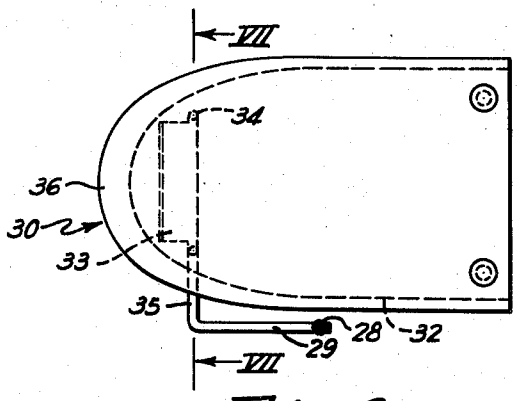

Fig. 6

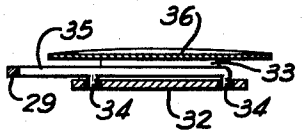

Fig. 7

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LEG BRACE ORTHOPEDIC APPLIANCE

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Filed Oct. 5, 1959, Ser. No. 844,537

1 Claim. (Cl. 128—80)

This invention relates to an orthopedic appliance and, in particular, to a hinge-joint lock for a leg brace having means controlled by the wearer's heel for rendering it effective.

Locks for the hinge joints of leg braces operable by the wearer have been proposed but those with which I am familiar are clumsy, ineffective in operation and generally unsatisfactory. It is accordingly the object of my invention to provide locking means which is positive in action, easily controlled and inexpensive to manufacture.

In a preferred embodiment, I provide one member of a leg brace with a ratchet disc and the other with a pawl cooperating therewith. I also provide a control wire extending downwardly from the joint into a shoe with which the brace is equipped, and fit into the heel of the shoe means for operating the wire by heel pressure.

A complete understanding of the invention may be obtained from the following detailed description which refers to the accompanying drawings illustrating a preferred form of the invention. In the drawings,

Fig. 1 is a side elevation;

Fig. 2 is a partial side elevation to enlarged scale with parts broken away for clearness;

Fig. 3 is an edge view;

Fig. 4 is a view similar to Fig. 2 showing the parts in alternate positions;

Fig. 5 is an enlarged side elevation of the heel operator;

Fig. 6 is a plan view thereof; and

Fig. 7 is a section through the heel operator taken on the plane of line VII—VII of Fig. 6.

Referring now in detail to the drawings, a leg brace **10** is composed of pairs of upper and lower side bars **11** and **12** connected by a hinge joint **13**. The upper bars are fitted with the usual thigh cuffs **14** and the lower bars are pivoted to a shoe **15**. The bars are, of course, arranged in pairs in the usual manner. Only the outer bars of the two pairs are shown. The inner bars are connected by a plain pivot joint.

Upper bar **11** is fixed to a hinge block **16**. A ratchet disc **17** is formed on the lower end of block **16** and is provided with teeth **18** over a limited segment thereof, and a shoulder **19** spaced therefrom, the function of which will appear shortly. The lower bar **12** is fixed to a hinge block **20** which is pivoted to block **16** by a pin **21**. One face of block **20** is recessed as at **22** to accommodate a pawl **23** pivotally mounted therein on a pin **24** for engagement with the teeth **18** of ratchet disc **17**. A compression spring **25** seated in a socket in block **20** constantly urges the pawl toward engaging position. One end wall **26** of recess **22** affords an abutment or stop for engagement by shoulder **19**, limiting the angular movement of the two bars **11** and **12**. A cover plate **26***a* overlies the adjacent portions of blocks **16** and **20**.

A flexible tube **27** extends downwardly along bar **12** and is secured thereto. A control wire **28** passes through the tube, with its upper end extending through a hole in the end of pawl **23** remote from pivot pin **24**. The extreme end of the wire is headed so it can exert a pull on the pawl. The lower end of wire **28** is secured to a

crank **29** on a heel operator **30**. A spring **31** compressed between the crank and the end of tube **27** exerts a constant downward pull on the wire which overcomes the force of spring **25** and normally withdraws the pawl from engagement with the ratchet disc **17**.

Heel operator **30** comprises a base plate **32** secured inside the heel of shoe **15** and a tilting plate **33** pivoted thereon by means of spaced bearing studs **34**. Crank **29** is part of an arm **35** which extends laterally of plate **33** through a hole in the side of the shoe. A spring plate **36** has its forward edge secured to plate **32**. The rear portion of plate **36** overlies the uptilted edge of plate **33** and is therefore effective to turn it downwardly under the pressure of the heel of the wearer of the brace **10** and shoe **15**. This turns crank **29** counterclockwise, compressing spring **31** and thus permitting spring **25** to set pawl **23** into operative engagement with the ratchet teeth **18** on disc **17**.

The manner in which the device described above functions in use will now be explained. When the wearer of the brace is standing, with heel pressure applied to plate **36**, bars **11** and **12** are alined as shown in Fig. 2, shoulder **19** engages abutment **26** and pawl **23** is free to engage teeth **18** under the pressure of spring **25**. The hinge joint **13** is thus locked rigidly. When the wearer desires to free the hinge for turning movement as in sitting down, he raises his heel slightly within shoe **15**. This permits spring **31** to pull down on control wire **28** whereupon the force of spring **25** is overcome and pawl **23** is disengaged from the ratchet disc **17**, permitting angular movement of bar **11** relative to bar **12**. When the wearer desires to arise from a sitting position, the weight of his heel raises wire **28** by means of crank **29**, permitting re-engagement of the pawl with the ratchet under the force of spring **25**. As he rises, therefore, the hinge lock is effective to prevent reverse angular movement of the bars **11** and **12** but permits turning of bar **11** upwardly to vertical position.

It will be apparent from the foregoing that the invention provides a compact, simple joint lock which is progressively effective and yet may be easily released by a slight movement of the wearer's foot. A particularly important feature is the fact that the pawl locks the bars in intermediate as well as final positions.

Although I have illustrated and described but a preferred embodiment of the invention, it will be understood that changes in the details thereof may be made without departing from the spirit of the invention as defined by the appended claim.

I claim:

In a leg brace including upper and lower bars pivoted together and a shoe pivoted to the lower end of the lower bar, the combination therewith of a ratchet disc rigid with one of said bars and a pawl pivoted to the other adapted to engage said disc, a heel plate yieldably tiltable in said shoe under the wearer's weight, a crank pivoted in said shoe operable by tilting of said plate, a control wire connected to said pawl and extending downwardly to said crank, a spring tending to seat said pawl against said ratchet, and a spring urging said wire downwardly to unseat the pawl, said crank acting to overcome said last-mentioned spring when weight is applied to said plate.

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