July 6, 1948. R. F. MARKKULA 2,444,839

DROP-FOOT BRACE

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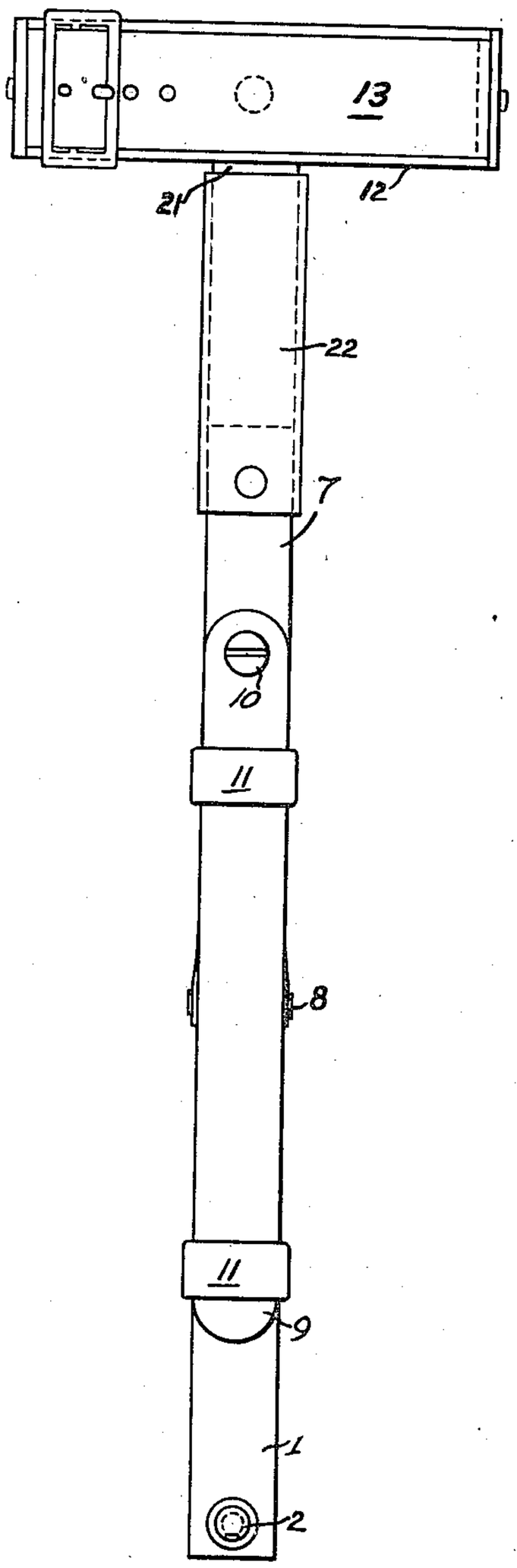

Fig - 2

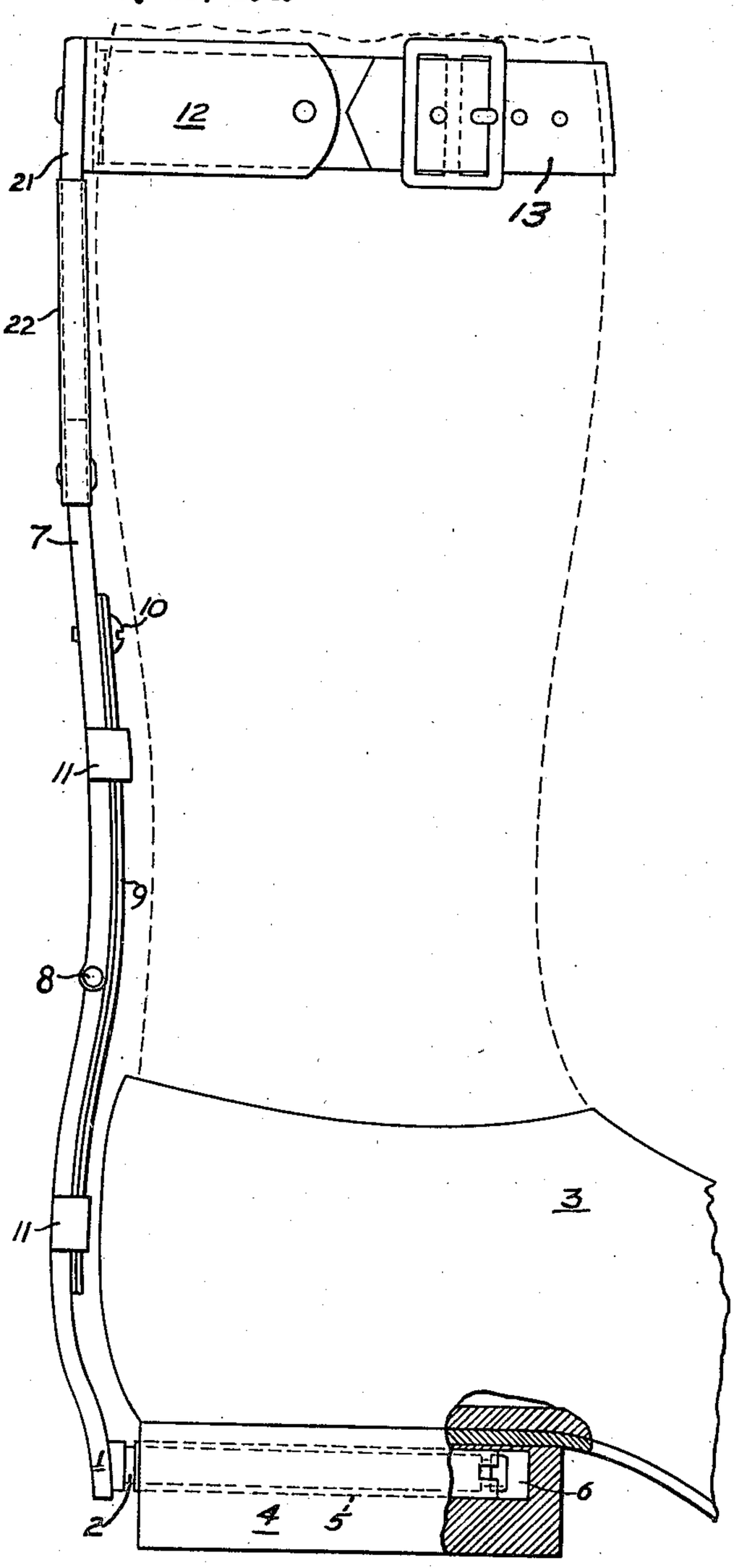

Fig - 1

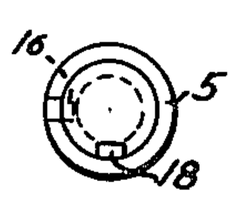

Fig - 3

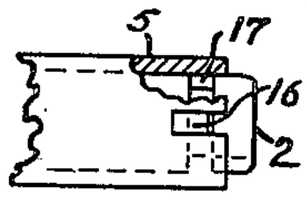

Fig - 4

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DROP-FOOT BRACE

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5 Claims. (Cl. 128—80)

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My invention relates to a brace for holding the foot of a wearer against downward movement about the ankle joint.

It is among the objects of my invention to provide a brace arranged to be anchored to the heel of a shoe and to engage a wearer's leg for limiting movement of the wearer's foot.

Another object is to provide a brace which will substantially lock against movement in one direction about a pivot associated with the ankle of a wearer, and permit a limited resilient yielding movement in the opposite direction as an aid to persons afflicted with drop-foot.

Another object is to provide a brace which may be readily transferred from one shoe to another, and locked in operative relation to a selected shoe.

Another object is to provide a brace in which provision is made to prevent chaffing of a wearer's leg due to movement of the brace.

My invention possesses other objects and features of value, some of which with the foregoing will be set forth in the following description of the invention. It is to be understood that I do not limit myself to the showing made by the said description and the drawings as I may adopt variant forms of the invention within the scope of the appended claims.

In the drawings:

Figure 1 is a side elevation of the brace as applied to a shoe.

Figure 2 is a front elevation of the brace, detached from the shoe and sleeve.

Figure 3 is an inner end elevation of the interengaging sleeve and pin portions of the brace mounting, drawn upon an enlarged scale.

Figure 4 is a fragmental side elevation, partly in section, of the inner end portions of the interlocking sleeve and pin, drawn upon an enlarged scale.

In terms of broad inclusion, the drop-foot brace of my invention comprises a heel piece detachably anchored to the heel of a wearer's shoe, and a pivoted extension extending upwardly from the heel piece along the back of the wearer's leg and having means for securing the brace to the leg. The extension is resiliently yieldable in one direction about the pivot, and is locked against movement beyond a predetermined point in the other direction.

In terms of greater detail, the drop-foot brace of my invention comprises a substantially L-shaped heel piece 1 having an upright back portion extending upwardly at the back of the heel and a bottom portion 2 arranged to underlie the heel of a wearer. The back portion of the heel

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piece 1 is preferably made of bar metal of a suitable weight, strength and resiliency, such as steel or spring brass, while the bottom or heel engaging portion 2 is preferably a pin or rod of circular cross-section riveted, welded or otherwise secured to the back portion 1. The bottom portion is preferably arranged to be detachably secured to the heel 4 of a shoe 3 by means of a sleeve 5 inset in a recess 6 formed in the heel 4 and opening outwardly at the back thereof. A lip 16 is turned inwardly at the inner end of the sleeve, to provide a key for effecting interlocking engagement with an annular groove 17 formed in the pin adjacent its inner end. A longitudinal groove 18 permits the lip to enter the groove 17 when the pin is moved into the sleeve with the groove 18 in registry with the lip 16, the lip being held in the groove for locking the pin in the sleeve when the pin is turned to move the groove 18 and lip 16 out of alignment. Preferably the lip 16 and groove 18 are positioned to permit the lip 16 to enter the groove 18 when the brace is moved to a substantially horizontal position so that the pin and sleeve will be effectually interlocked when the brace is moved to its normal upright position. A sleeve 5 may be provided in each of any number of shoes so that the brace may be attached to whichever shoe the wearer may select.

The pin 2 is freely rotatable within the sleeve 5, and permits the foot to be turned from side to side through an adequate range of movement about the ankle joint.

The upwardly extending back portion 1 of the heel piece is positioned immediately in back of the heel portion of the shoe and terminates at a point substantially opposite the ankle of a wearer. An extension 7 is pivoted to the upper end of the heel piece by means of a pivot joint 8 arranged to permit a limited relative movement of the parts in one direction, and to lock them against relative movement beyond a predetermined point in the opposite direction.

A leaf spring 9 is secured to one of the parts, preferably the extension 7, by a screw 10 or other suitable securing means. Clips 11 yieldably bind the leaves of the spring 9 together and to the heel piece and extension. The spring 9 normally holds the extension 7 in substantial alignment with the upright back portion 1 of the heel piece, and in a position such that a very small degree of pivotal movement will cause the heel piece to be locked against pivotal movement in a clockwise direction as viewed in Figure 1 of the drawings.

A yoke 12 is riveted or otherwise secured to the top of the extension 7. The yoke is substantially semi-circular in shape, and is forwardly faced to seat against the back of a wearer's leg as indicated in dotted lines in Figure 1. The extension 7 and yoke 12 are shaped to conform to the dimensions of the leg, and to cause the least discomfort to the wearer. A buckled strap 13 is fixed to the yoke, and provides a band encircling the leg near the top of the brace.

In order to accommodate the normal movement of the wearer's leg while walking, and at the same time permit the strap 13 to be firmly tightened onto the leg, I prefer to attach the yoke 12 to a post 21 slidably engaging a sleeve 22 secured to and forming the upper end of the extension 7. The post 21 slides up and down within the sleeve 22 as the wearer walks, and takes up the movement resulting from the flexing of the leg and foot about the ankle joint.

The brace is designed primarily for wear by a person handicapped by what is commonly called "drop-foot," and who lacks the ability to control the movement of a foot about the ankle joint. When such a person attempts to walk, the foot swings down loosely and drags along the ground, to the serious inconvenience of the person.

The brace of the present invention serves to prevent the downward movement of the foot. As the wearer lifts the foot in walking, the downward swinging movement is limited by the joint 8. The yoke 12 bears against the back of the wearer's leg at a substantial distance above the ankle, and the curved ends of the yoke and the strap 13 prevent lateral displacement of the extension 7 relative to the leg. As the foot is raised, it is held in a substantially horizontal position. The spring 9 yieldingly resists pivotal movement of the heel piece about the pivot joint 8, and resiliently returns the parts to normal position after displacement therefrom, thereby permitting a limited flexing of the foot about the ankle joint and obviating objectionable rigidity.

I claim:

1. A drop-foot brace comprising a heel piece having bottom and back portions angularly disposed to approximately conform to the heel portion of a shoe, means for securing the heel piece to the shoe, a brace pivotally connected to the heel piece and extending upwardly therefrom for engaging a wearer's leg, and a leaf spring secured to one of the pivotally connected parts and extending into slidable engagement with the other part at points upon opposite sides of the pivot and spaced therefrom, said pivot and spring providing a lock against movement about the pivot in one direction and permitting a limited yielding movement in the other.

2. A drop-foot brace comprising a heel piece having bottom and back portions angularly disposed to approximately conform to the heel portion of a shoe, means for securing the heel piece to the shoe, a brace pivotally connected to the heel piece and extending upwardly therefrom for engaging a wearer's leg, a leaf spring secured to one of the pivotally connected parts and slidably connected to the other part at points upon opposite sides of the pivot and spaced therefrom, said pivot and spring providing a lock against movement about the pivot in one direction and permitting a limited yielding movement in the other, a leg engaging band, and means slidably connecting the band and the brace and permitting relative movement thereof as the wearer walks.

3. A drop-foot brace comprising a bar shaped to substantially conform to the back of the heel and lower portion of the leg of a wearer, a pin mounted upon the lower end of the bar and rotatably engaging a recess in the heel of the wearer's shoe, interlockingly engaging key means detachably securing the pin in rotatable engagement with the recess, and means upon the upper end of the bar for holding the same in bracing engagement with the back of the wearer's leg.

4. A drop-foot brace comprising a bar shaped to substantially conform to the back of the heel and lower portion of the leg of a wearer, a pin secured to the lower end of the bar at substantially right angles thereto, a sleeve secured within the heel of the wearer's shoe for engaging the pin, and means upon the upper end of the bar for holding the same in bracing engagement with the back of the wearer's leg.

5. A drop-foot brace comprising a bar shaped to substantially conform to the back of the heel and lower portion of the leg of a wearer, a pin secured to the lower end of the bar at substantially right angles thereto, a sleeve secured within the heel of the wearer's shoe for engaging the pin, interengaging key and groove means upon the pin and sleeve for releasably locking the brace to the shoe, and means upon the upper end of the bar for holding the same in bracing engagement with the back of the wearer's leg.

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