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VISUAL INDICATING APPARATUS FOR DETERMINING
CORRECTION OF POSTURAL FOOT ALIGNMENT
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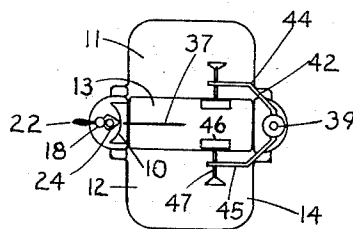
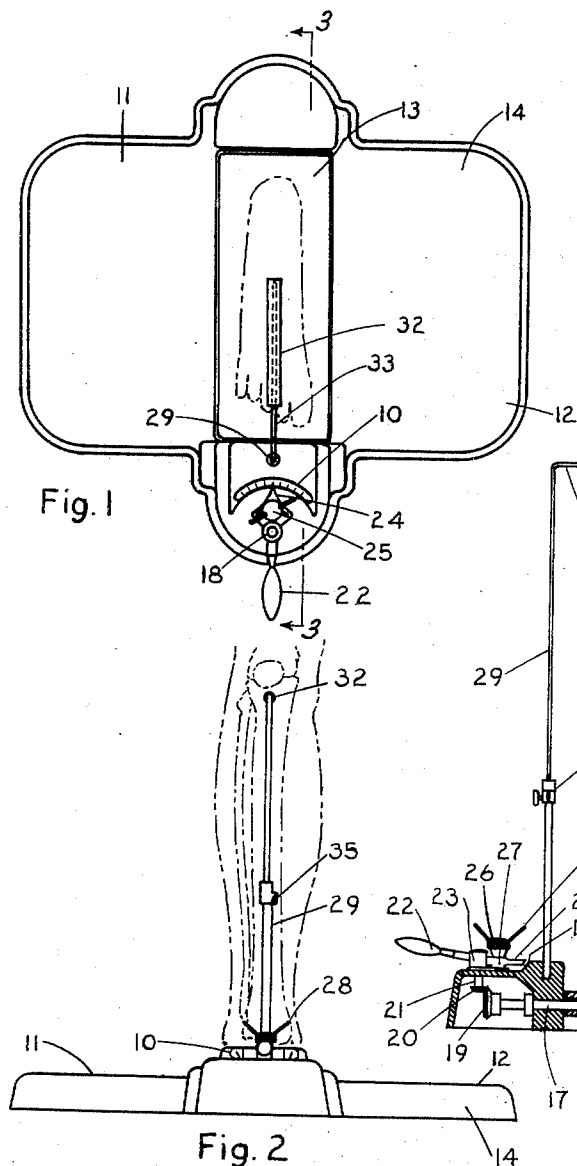


Fig. 4

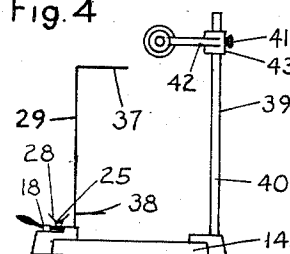


Fig. 5

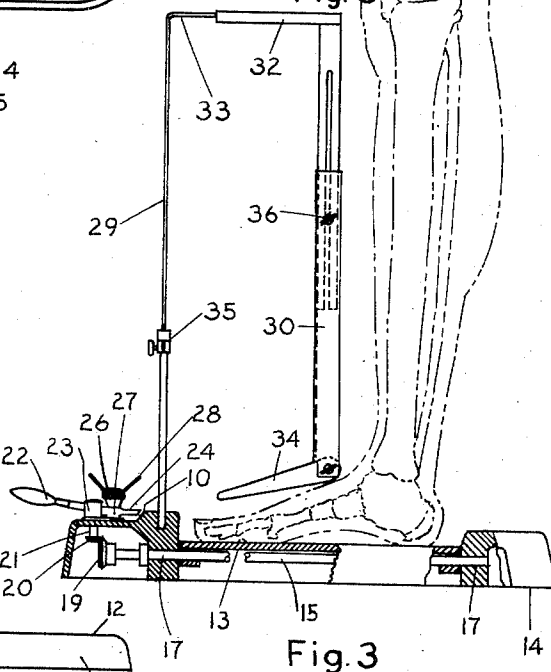


Fig. 3

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VISUAL INDICATING APPARATUS FOR DETERMINING CORRECTION OF POSTURAL FOOT ALIGNMENT

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15 Claims. (Cl. 33—174)

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This invention relates in general to apparatus for visibly indicating whether or not there is misalignment of the feet from proper postural position, and is particularly useful for physicians, surgeons, orthopedists, and even ordinary skilled shoe or footwear repairers, rebuilders, and others, in more readily, easily and accurately determining the amount of misalignment of a person's foot from the normal walking angle, and the amount of elevation required for the sole and heel of the shoe or footwear to correct an incorrect walking angle to the normal walking angle, in the course of walking.

More specifically, the present invention is directed to the provision of apparatus having a stationary support for the sole of one of the feet, and a central pivotally-mounted support in the same horizontal plane for the sole of the other foot of a patient standing with normal stance, in conjunction with a member providing a straight line of sight, preferably a vertical straight line of sight, mounted in position to confront and correspond with a straight line passing through the patella and the head of the femur, and extending down along the limb on the pivotally-mounted support, from the knee along the crest of the tibia or shin bone, down through the center of the foot. The member providing the straight line of sight is vertically adjustable to accommodate persons of varying heights, and is preferably also provided with an inner extension, in the form of a pendulent plumb, or of upper and lower pointers, reaching in closely to the shin bone, for greater accuracy in determining alignment.

The pivotally mounted support is provided with actuating means for rotatably adjusting the support, to rotate a misaligned foot relative to the tibia and figula, patella and head of the femur of the patient's limb, to bring it into alignment with a straight line passing through the patella and femur, which restores the normal walking angle in correction of an incorrect anatomical walking angle. Means are also provided for accurately indicating the amount of rotation of the foot, and hence the degree of elevation required in correction of the incorrect walking angle. Means are also provided for holding the pivotally-mounted support against accidental rotation while the patients are adjusting themselves thereon, until the operator has in hand the control of the actuating means.

In one embodiment, the apparatus also provides an adjustable gripping means for centering and affixing the knee in set position, in con-

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fronting relation with the member providing the straight line of sight. In this embodiment, the member providing the straight line of sight comprises upper and lower inwardly extending pointers in vertical alignment in closer proximity to the center of the patella and over the top of the toes of a patient's limb, when standing with their normal stance on the apparatus or device.

In the preferred embodiment of the invention, the aforesaid adjustable gripping device is, however, omitted, and the inward extension of the member providing a straight line of sight comprises instead, a pendulent plumb having an outwardly extending plumb bob arranged to extend outwardly over, and in close proximity to the toes in horizontal alignment with the straight line of sight member, and more particularly in the same vertical plane as the plumb.

More especially, the present invention is directed to apparatus for more facily determining with greater accuracy, the degree of elevation, and hence the thickness of elevation, required in embodying the invention of my co-pending application Serial No. 676,691, filed June 14, 1946, entitled Walking Angle Corrective Footwear and Method, which provides for correcting the normal walking angle of humans in the course of walking, by elevating the medial side of the shoe or other footwear with an elevated outer foresole and heel by means of separate or integrally formed partial outer lift portions, in or on the bottom of the outer foresole and heel of footwear of the patient, so as to effect an adjustment of the bones of the medial side of the foot by the single upward motion of the bones, unaccompanied by either attendant rocking motion of the upper leg members, or twisting of the foot or shoe, before the weight of the wearer is transmitted to the foot by the weight bearing members of the leg above the foot in the process of ambulation, thus correcting the walking angle up through the patella, the head of the femur, and finally the spinal column.

The amount of elevation is corrected to each individual's need.

The lateral margin of the tibia if extended downward, passes through the center of the foot or slightly lateral to center on the small toe side. This is the normal walking angle.

If this line passes medial to center or to the big toe side, the person has an incorrect walking angle, which causes extra strain on the muscles and ligaments of the entire lower extremity, eventually throwing the whole skeletal system out of balance.

Normally, the outer portion of the longitudinal arch of the foot is very low and almost rests on the ground. The inner part is high and only touches the ground behind. The inner border of the foot is naturally straight or concave inward when weight is borne.

A vertical line dropped from the head of the femur through the patella and along the crest of the tibia should pass normally through the second inter-metatarsal space (between the third and fourth toes, from the little toe side).

Alteration of the correct walking angle, such as occurs in the case of flat foot results in the forefoot being deflected laterally, the arch drops and becomes flattened, the inner border, which should normally show a slight concavity, is replaced by convexity, and the vertical line dropped from the head of the femur through the patella along the crest of the tibia, instead of normally passing through the second intermetatarsal space (between the third and fourth toes), passes internal to this space, toward the big toe side. This throws the whole skeletal system out of balance.

In the development of the invention of my aforesaid copending application Serial No. 676,691, it was found that the employment of wedge shaped partial lifts as inter-lifts which are intermediate the upper surface of the bottom lifts of the fore-outsole and heel, and the bottom surface of the insole, with the wedges restricted to exclude the shank, and decreasing in thickness from the medial side to the center of the shoe's outer sole structure, the incorrect walking angle is corrected to the acknowledged anatomical normal walking angle, without any accompanying rocking or twisting action of the shoe, foot, or limp, and the balance of skeletal system restored to normal.

In my copending application, for proper fitting in a relatively short period of time, such as fifteen minutes to a half hour, and for fashioning footwear to the specific needs of different individuals, under simple technique, which can be readily explained and understood in ordinary lay language, there was described a manner of practicing the invention in which the patient stands erect on a flat surface, with the toes slightly turned inward toward each other, slightly so-called pigeon toed. A straight edge is positioned along the shin bone touching the center of the patella and center of the top of the foot. The fitter, holding the straight edge in this position by the hand, then sights along the straight edge to determine where the vertical line passes through the foot.

When the vertical line passes medial to center, or to the big toe side (from the space between the third and fourth toes, counting from the little toe side), partial lifts of the invention, of the estimated required height, are fitted to or prescribed for, the footwear, of the thickness necessary to shift the foot (rotate it relative to the tibia) until the vertical line of sight shifts laterally toward the little toe side, to pass through the space between the third and fourth toes, which is the acknowledged anatomical center of the foot, or even slightly lateral to this center on the small toe side, which restores the normal walking angle and thus the center of gravity to the whole skeletal system.

The present invention, however, is primarily directed to providing instead, a simple mechanical apparatus for attaining the same end with

greater accuracy and certainty, and more readily and easily, as well as with precision.

In addition to the general objects recited above, the invention has for further objects such other improvements and such other operative advantages or results as may be found to obtain in the structure and method hereinafter described and claimed.

In the accompanying drawing, forming a part of this specification, and showing, for purpose of exemplification, preferred form and manner of embodying and practicing the present invention:

Figure 1 is a top plan view of apparatus embodying the preferred form of the invention;

Figure 2 is a front elevational view of the same;

Figure 3 is a vertical cross-sectional view, with parts shown in elevation, and taken on the line 3-3 of Figure 1;

Figure 4 is a diagrammatic view, in top plan, of another manner of embodying the present invention;

Figure 5 is a diagrammatic view, in side elevation, of the same apparatus shown in Figure 4.

Referring to the drawings, there is shown the preferred embodiment of the invention in which is provided two side-by-side stationary supports, 11, 12 with an intermediate centrally pivotally mounted support 13, whereon the patient stands with normal stance, with the right foot on stationary support 11 while the left foot is on the adjustable support 13, and with the left foot on the stationary support 12 while the right foot is on the adjustable support 13, during the operation of determining the amount of deviation of the feet from that required for the normal walking angle, and hence the amount of elevation required of the soles and heels of footwear, in accordance with the invention of my aforesaid copending application, to correct an incorrect walking angle.

The apparatus comprises a base 14 in the form of a casting, in which the supports 11, 12 and 13 are all disposed in one and the same horizontal plane. The intermediate, adjustable support 13, is mounted for pivotal movement on a centrally disposed shaft 15, extending longitudinally of the support 13, and disposed centrally on the transverse axis of the support 13. The shaft 15 is mounted for rotation in bearings 17 in the base 14, and is provided at its forward end with an actuating means 18, for adjusting the support 13 while the patient is standing thereon, to align the foot with the tibia in accordance with the anatomically acknowledged normal walking angle.

As shown, this actuating means 18 comprises a gear 19 on the front end of the shaft 15 with which meshes a mitre gear 20 at the lower end of a shaft 21 mounted for rotation about a vertical axis in a bearing surface in the base 14. For rotation of the shaft 21, a handle 22 is secured thereto, as at 23, and there is affixed therewith a pointer 24 which partakes of the same movement of the rotation of the handle and shaft 21. A scale 10 is mounted on the base 14 in relation to the pointer 24, which scale 10 is marked off to indicate the degree or amount of rotation of the actuating means 18, and hence the degree of movement of the left foot, when the handle 22 is turned to the right (anti-clockwise) in tilting the right side of the adjustable support 13 upward, to raise the medial (inside) of the left foot of a patient when standing on the adjustable support 13; and likewise for the right foot when the handle 22 is turned to the left (clock-

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wise) to raise the medial (inside) of the right foot.

To prevent the adjustable support from tilting when a patient is standing with one foot thereon, or preparing to do so, and until the operator has control of the handle 22, means 25 are provided in the form of an adjustable bolt 26 which is threaded through the handle lever 22 as at 27, and provided with wings 28, for facility in tightening and loosening the bolt 26, to prevent and permit, respectively, the turning of the actuating means 18, and thus the adjustable support 13, while the patient is standing thereon.

Mounted on the base 14, in vertical alignment with the axis of rotation 15 of the adjustable support 13 is a member 29 providing a straight line of sight. This member 29 is mounted therein so as to have its straight line of sight in position to confront and correspond with a straight line extending downwardly from the knee of the limb of a patient, while standing on the adjustable support 13, to the sole of the foot on the support 13, as for instance, to provide a vertical line confronting and corresponding with a vertical line dropped from the head of the femur through the patella and extending downwardly along the crest of the tibia, or shin bone, and projecting on down through the foot.

Preferably the straight line-of-sight provided by the member 29 takes the form of a vertical line in the member 29, together with an inward extension in the same vertical plane, which extension extends inwardly into closer proximity to the patient's limb and foot, when standing with normal stance on the support 11, 12, 13.

In the preferred form of the invention, this inward extension takes the form of a pendulent plumb 39 freely pivotally supported at the upper end as at 32 from a horizontal member 33, and provided at its lower end with an outwardly projecting plumb-bob 34, arranged to extend closely over the toes of the patient.

The straight line-of-sight member 29 and the plumb 39 are vertically elongatable, to accommodate patients of varying heights. For this purpose they are composed of telescopic members and provided with set screws 35 and 36 for firmly fixing them in vertically adjusted position.

In another embodiment, as shown merely diagrammatically, in Figures 4 and 5, in lieu of the pendulent plumb, there is provided as the inner extension, upper and lower pointers 37 and 38. The upper 37 being longer to project into abutting relation with the limb on the adjustable support 13 in the region of the patella, or close thereto, in vertical alignment with the centers of the patella and the head of the femur. The lower pointer 38 is shorter and projects closely over the top of the toes in the same vertical plane as the upper pointer 37.

The invention also embodies means 39 for affixing the limb of a patient in proper alignment with the straight line-of-sight provided by the member 29. As shown in Figures 4 and 5, this comprises a vertically extensible telescopic member 40, provided with a set screw 41, which member 39 is mounted at its lower end in fixed relation in the base 14 and is provided at its upper end with means 42 for clamping the knee of the patient in fixed position relative to the straight line-of-sight, when on the support 13.

This knee clamping member is vertically adjustable at 42, and comprises two arms 44, 45 which extend around the limb, and which arms are provided with bearings 46 (usually provided

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with a soft pad) adjustably mounted at 47 for centering the limb by clamping.

In the preferred form of invention, as shown in Figures 1-3, the knee clamping feature 42 is omitted for greater ease of patients in orientating themselves relative to the straight line-of-sight member 29.

In operation, with the embodiment of the invention as illustrated in Figures 1 to 3, the person, or patient stands erect with one foot on one of the stationary supports 11, 12 and the other on the adjustable support 13, with the toes slightly turned inwardly toward each other, slightly so-called pigeon toed. In this position, with the limb confronting the member 29 so that a vertical line dropped through the patella along the crest of the tibia is in horizontal alignment with the straight line-of-sight provided by the member 29, as that member itself or its extension the plumb 30, the plumb-bob 34, or the lower portion of the member 29 itself should be normally in the same vertical plane as the space between the third and fourth toes, the plumb-bob 34 immediately thereover. When the plumb-bob 34 is, however, medial to center, i. e., to the big toe side, the operator after taking hold of the handle 22, and releasing the set screw 25, turns the handle (to the right for the left foot, to the left for the right foot) until the tilting of the pan 13 elevates the medial side of the sole and heel of the foot sufficiently to bring the space between the third and fourth toes into the vertical plane of the plumb-bob 34. The pointer turns over the scale 10, which is read, giving the degree or amount of elevation required. Partial lifts of the invention of my aforesaid copending application are then prescribed for, or fitted to, the outsole structure of the footwear of the person or patient.

The height of the member 29 and its plumb-bob are adjusted by the set screws 35 and 36 to accommodate the height of the knee of the person or patient.

In operation of the embodiment of the invention as illustrated in Figures 4 and 5, the procedure is the same, except the alignment is with the upper and lower pointers 37, 38, and the knee of the person is clamped between the pads 46.

It will of course be understood that the invention in all its aspects is not confined to the specific use hereinabove described, but much of the advantage of the invention is attainable in co-relating other lines of the foot or limb, and may be, by obvious modification, of utility in co-relating lines other than vertical, as for instance straight, but inclined lines, or in ascertaining alignment, or misalignment, in respect of other abnormalities than so-called flat foot.

The invention as herein above set forth is embodied in a particular form and manner but may be variously embodied within the scope of the following claims.

I claim:

1. Apparatus for determining the degree of postural foot disorder, comprising: oppositely disposed stationary support-surfaces and an adjustable pivotally mounted intermediate support all in the same horizontal plane, for supporting a person standing thereon with normal stance with the sole of either foot on a said stationary surface while the sole of the other foot is on the adjustable intermediate support; a member providing a straight line-of-sight mounted in fixed relation relative to said adjustable support with the straight line-of-sight in position to confront and correspond with a straight line projecting

downwardly from the knee through the foot of the limb of a person standing on the adjustable support; and actuating means for adjusting the intermediate support about its pivotal axis to align a predetermined portion of the foot with the straight line-of-sight.

2. Apparatus for determining and indicating the degree of postural foot disorder, comprising: oppositely disposed stationary support surfaces and an adjustable pivotally mounted intermediate support all in the same horizontal plane, for supporting a person standing thereon with normal stance with the sole of either foot on a said stationary surface while the sole of the other foot is on the adjustable intermediate support; a member providing a straight line-of-sight mounted in fixed relation relative to said adjustable support with the straight line-of-sight in position to confront and correspond with a straight line projecting downwardly from the knee through the foot of the limb of a person standing on the adjustable support; actuating means for adjusting the intermediate support about its pivotal axis to align a predetermined portion of the foot with the straight line-of-sight, and indicator means for indicating the degree of adjustment of the intermediate support by the actuating means.

3. Apparatus as claimed in claim 1, and which includes adjustable means for holding the intermediate support and its actuating means against movement under the weight of the foot of a person standing thereon.

4. Apparatus as claimed in claim 1, and which the member providing a straight line-of-sight includes an inner extension providing a line-of-sight reaching in closely to the shin bone for greater accuracy in determining alignment.

5. Apparatus as claimed in claim 1, and in which the member providing a straight line-of-sight includes a pendulent-plumb.

6. Apparatus as claimed in claim 1, in which the member providing a straight line-of-sight includes an inner extension providing a line-of-sight reaching in closely to the shin bone for greater accuracy in determining alignment having a plumb-bob at its lower end in position to be closely over the toes of a foot on the intermediate support, for greater accuracy in determining alignment.

7. Apparatus as claimed in claim 1, in which the member providing a straight line-of-sight includes upper and lower pointers reaching in closely to the upper portion of the limb and over the toes of the foot thereof on the intermediate support, for greater accuracy in determining alignment.

8. Apparatus as claimed in claim 1, and which includes a member providing adjustable knee-clamps mounted in fixed relation to the intermediate support and the straight line-of-sight, for firmly affixing the limb in accurate relationship with respect to the straight line-of-sight.

9. Apparatus for determining the degree of postural foot disorder, comprising: an adjustable support mounted for adjustment about a horizontal axis, and a stationary support in the same horizontal plane, for supporting a person in standing position with the sole of one foot on the adjustable support and the sole of the other foot on the stationary support; a straight line-of-sight member mounted perpendicular to the horizontal axis of the adjustable support, and in position to be in line with the front of the leg on the adjustable support and in the same plane as

the axis of the adjustable support, and means for adjusting the adjustable support, to adjust the foot of a person thereon relative to the straight line-of-sight.

10. Apparatus as claimed in claim 9, and which includes indicating means for indicating the degree of adjustment made of the adjustable support relative to the straight line-of-sight member.

11. Apparatus for determining the degree of postural foot disorder, comprising: an adjustable support mounted for adjustment about a horizontal axis and a stationary support in the same horizontal plane, for supporting a person in standing position with the sole of one foot on the adjustable support and the sole of the other foot on the stationary support; a straight line-of-sight member mounted perpendicular to the horizontal axis of the adjustable support, and in position to be in line with the front of the leg on the adjustable support and in the same plane as the axis of the adjustable support, and means for adjusting the adjustable support, to adjust the foot of a person thereon relative to the straight line-of-sight, and in which the straight line-of-sight member includes an inner extension providing a line-of-sight reaching in closely to the shin bone for greater accuracy in determining alignment.

12. Apparatus as claimed in claim 9 and in which the straight line-of-sight member includes a pendulent-plumb.

13. Apparatus as claimed in claim 9, and in which the straight line-of-sight member includes a pendulent-plumb having a plumb-bob at its lower end in position to be closely over the toes of a foot on the adjustable support, for greater accuracy in determining alignment.

14. Apparatus for determining the degree of postural foot disorder, comprising: an adjustable support mounted for adjustment about a horizontal axis and a stationary support in the same horizontal plane, for supporting a person in standing position with the sole of one foot on the adjustable support and the sole of the other foot on the stationary support; a straight line-of-sight member mounted perpendicular to the horizontal axis of the adjustable support, and in position to be in line with the front of the leg on the adjustable support and in the same plane as the axis of the adjustable support, and means for adjusting the adjustable support, to adjust the foot of a person thereon relative to the straight line-of-sight, and in which straight line-of-sight member includes upper and lower pointers reaching in closely to the upper portion of the limb and over the toes of the foot thereof on the adjustable support, for greater accuracy in determining alignment.

15. Apparatus for determining the degree of postural foot disorder, comprising: an adjustable support mounted for adjustment about a horizontal axis and a stationary support in the same horizontal plane, for supporting a person in standing position with the sole of one foot on the adjustable support and the sole of the other foot on the stationary support; a straight line-of-sight member mounted perpendicular to the horizontal axis of the adjustable support, and in position to be in line with the front of the leg on the adjustable support and in the same plane as the axis of the adjustable support, and means for adjusting the adjustable support, to adjust the foot of a person thereon relative to the straight line-of-sight, and which includes a member pro-

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viding adjustable knee-clamps mounted in fixed relation to the adjustable support and the straight line-of-sight, for firmly affixing the limb in accurate relationship with respect to the straight line-of-sight.

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