July 9, 1940. A. KOST 2,206,902

FOOT CORRECTIVE DEVICE

Filed April 29, 1935 4 Sheets-Sheet 1

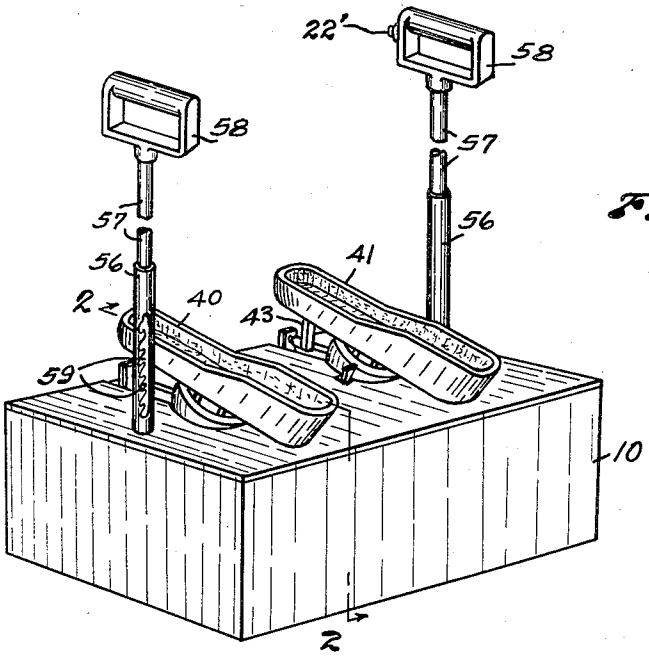


Fig. 1

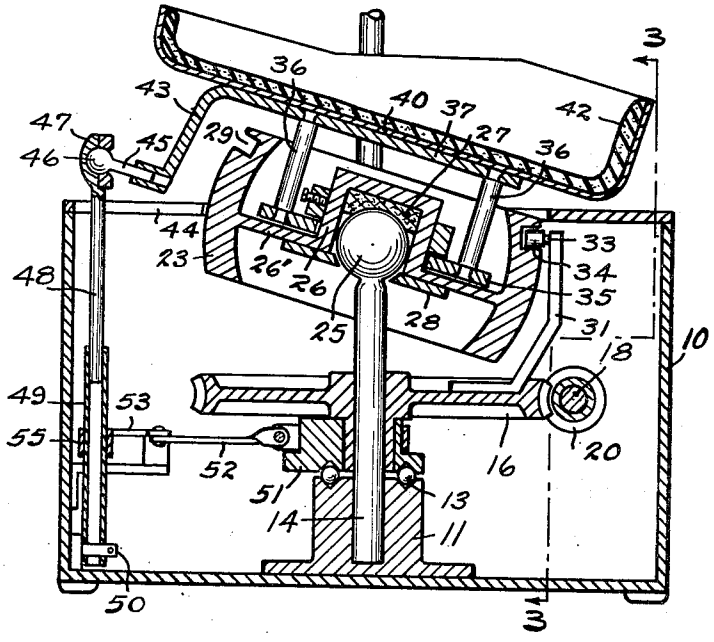


Fig. 2

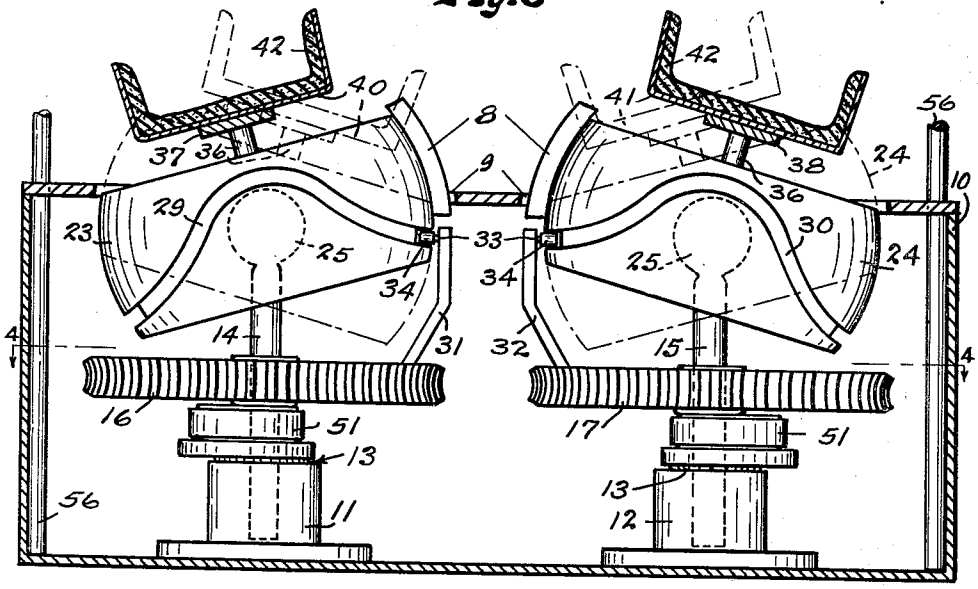
INVENTOR
Alwin Kost
BY
Fred C. Matheny
ATTORNEY

July 9, 1940. A. KOST 2,206,902

FOOT CORRECTIVE DEVICE

Filed April 29, 1935 4 Sheets-Sheet 2

Fig. 3



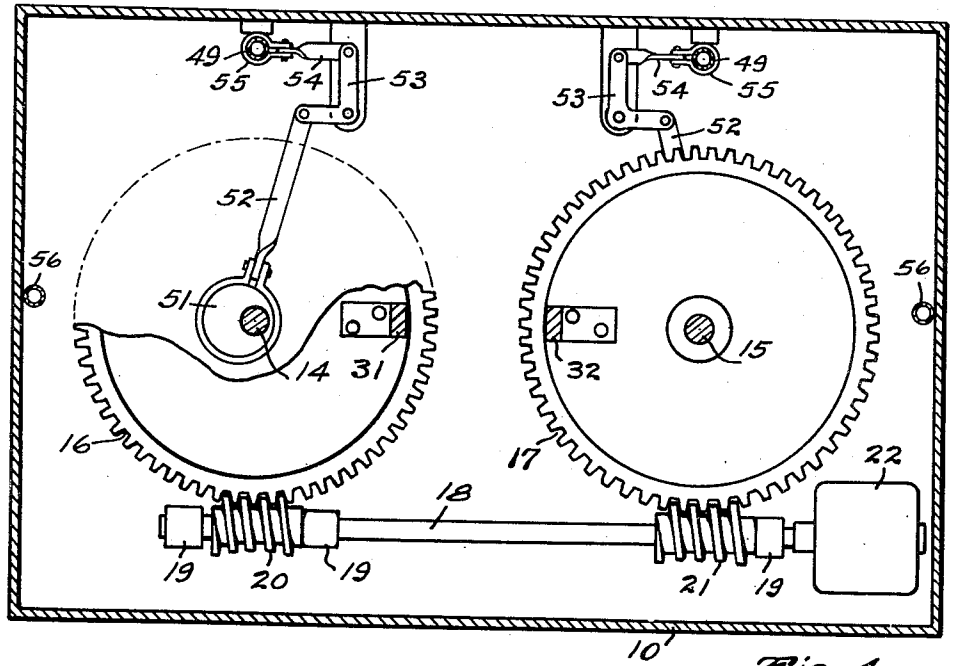


Fig. 4

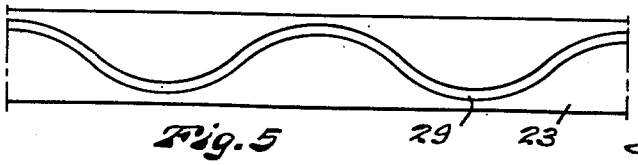


Fig. 5

INVENTOR
Alwin Kost
BY
Fred C. Matheny
ATTORNEY

July 9, 1940. A. KOST 2,206,902

FOOT CORRECTIVE DEVICE

Filed April 29, 1935 4 Sheets-Sheet 3

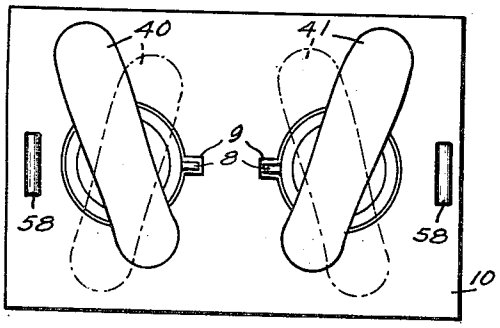


Fig. 6

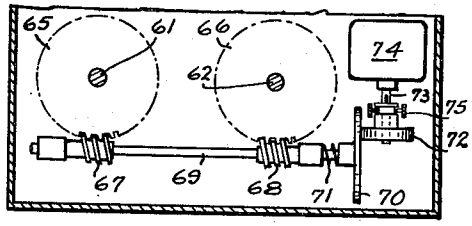


Fig. 11

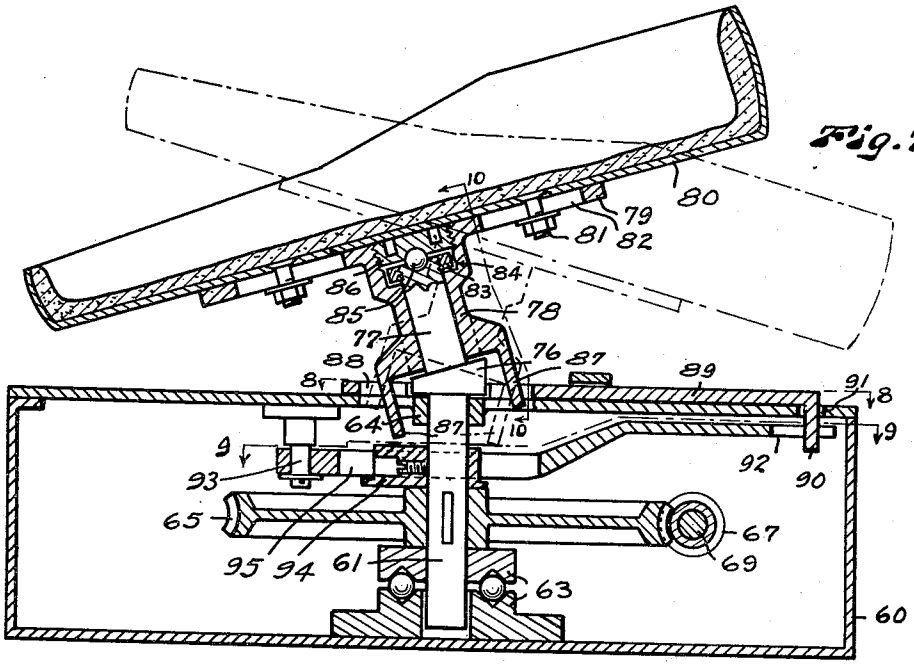


Fig. 7

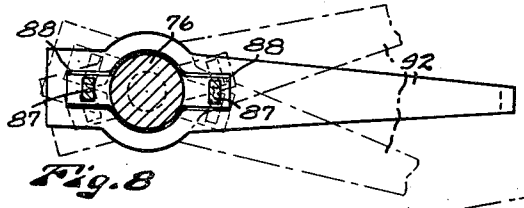


Fig. 8

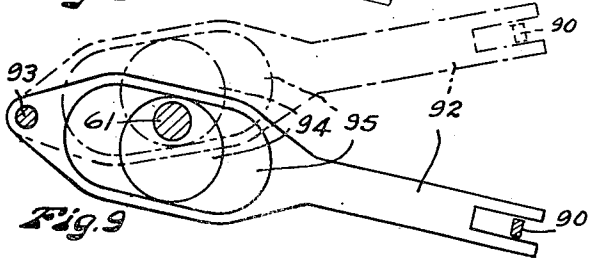


Fig. 9

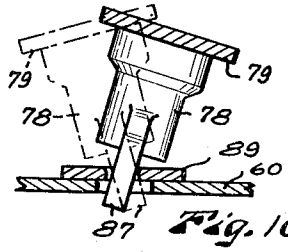


Fig. 10

INVENTOR
Alwin Kost
BY
Fred C. Matheny
ATTORNEY

July 9, 1940. A. KOST 2,206,902

FOOT CORRECTIVE DEVICE

Filed April 29, 1935 4 Sheets-Sheet 4

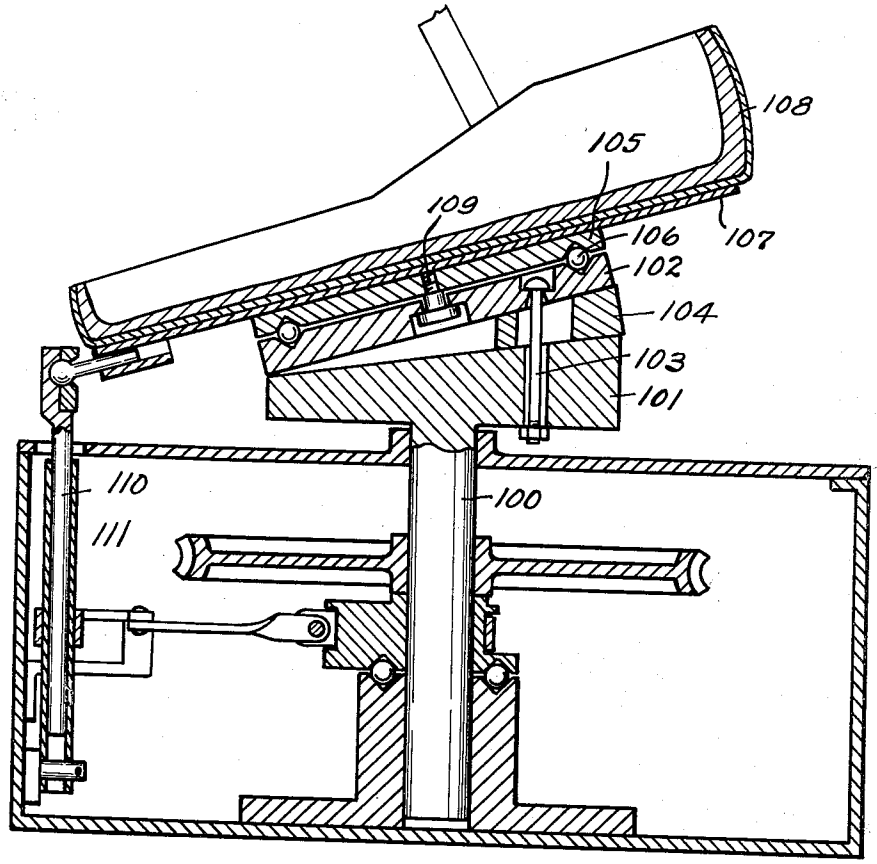


Fig. 12

INVENTOR
Alwin Kost
BY
Fred C. Matheny
ATTORNEY

Patented July 9, 1940

2,206,902

UNITED STATES PATENT OFFICE

2,206,902

FOOT CORRECTIVE DEVICE

Alwin Kost, Portland, Oreg.

Application April 29, 1935, Serial No. 18,867

15 Claims. (Cl. 128—25)

This invention relates to foot corrective devices and the general object of this invention is to provide a device which will manipulate and move the feet and ankles in such a manner as to correct the position of the bones in the feet, relieve pressure on the nerves and blood vessels, overcome unnatural shapes which have been produced by the wearing of tight and improperly constructed shoes and generally restore the feet and ankles to a stronger and more healthy and more normal condition.

Another object is to provide a foot corrective device which will improve the physical condition and posture of the entire body by strengthening and normalizing the feet and ankles.

The feet are the foundation on which the human body is carried and the physical condition of the feet has an effect on the condition of other parts of the body. Under modern living conditions, people are liable to wear incorrectly shaped, high heeled, tight, ill fitting shoes. Many people walk very little and only on smooth surfaces, as floors and level sidewalks. Walking on these smooth surfaces does not subject all of the muscles and bones of the feet and ankles to the use and movement required to keep them in a strong and healthy condition. The result is that the foot muscles deteriorate and allow the arches of the foot to flatten, displacing the tarsal and metatarsal bones and subjecting the blood vessels and nerves in the foot to unnatural pressures. This tends to obstruct the circulation in the feet, ankles and legs and restricts and irritates the nerves which lead to the feet and ankles. As the nerves which lead to the feet and those which lead to the lower abdominal organs all emanate from the spine at the location of the small of the back, an irritation of the nerves of the feet is very liable to cause trouble with the organs of the lower abdomen.

The present foot corrective device provides an easy and efficient means for obviating, overcoming and correcting the troubles above pointed out by making it relatively easy for a user of the device to subject the feet and ankles, at frequent intervals, to corrective movements which will strengthen the muscles, stimulate the circulation, restore the bones to normal position and relieve abnormal pressures on the nerves and blood vessels. These movements are, to a certain extent, communicated to the legs and lower portions of the body and are particularly beneficial in reducing swollen ankles and varicose veins in the legs and in bringing about a more healthy condition of the lower abdominal organs.

Further objects of the invention are to provide a foot corrective device or machine which is strong and compact in construction, attractive in appearance, efficient and substantially noiseless in operation, not liable to get out of order, and easy and convenient to use.

Other and more specific objects of the invention will be apparent from the following description in connection with the accompanying drawings.

Fig. 1 is a perspective view of a foot corrective device constructed in accordance with this invention.

Fig. 2 is a vertical sectional view of the same substantially on broken line 2—2 of Fig. 1, parts being shown in elevation.

Fig. 3 is a view partly in section and partly in elevation substantially on broken line 3—3 of Fig. 2, parts being omitted.

Fig. 4 is a view partly in section and partly in plan taken substantially on broken line 4—4 of Fig. 3.

Fig. 5 is a development of a cam embodied in the invention showing the same as it might appear if spread out onto a flat surface.

Fig. 6 is a plan view on a smaller scale than the preceding figures, illustrating horizontal oscillation of the foot plates.

Fig. 7 is a sectional view of a modified form of the invention.

Figs. 8 and 9 are views partly in plan and partly in section substantially on broken lines 8—8 and 9—9 of Fig. 7, showing two different levers, parts being omitted and operative positions of the levers being shown by dot and dash lines.

Fig. 10 is a fragmentary sectional view, with parts in elevation, substantially on broken line 10—10 of Fig. 7.

Fig. 11 is a somewhat diagrammatic plan view, on a smaller scale than Figs. 7 to 10 showing a variable speed driving means.

Fig. 12 is a section of another modified form of the invention.

Like reference numerals designate like parts throughout the several views.

Considering first the device shown in Figs. 1 to 6 inclusive, 10 is a rectangular housing having two spaced apart sockets secured to the bottom thereof. These sockets, numbered 11 and 12, serve as supports for two upright posts or shafts 14 and 15 respectively. Two worm wheels 16 and 17 are rotatably mounted on the respective posts 14 and 15 and preferably positioned in a common plane. A thrust bearing 13 is provided

for each worm wheel. A drive shaft 18 is positioned alongside of the worm wheels 16 and 17 and journaled in bearings 19. Two worms 20 and 21 on the shaft 18 mesh with the respective worm wheels 16 and 17. A variable speed electric motor 22 is directly connected with the shaft 18, see Fig. 4. As an alternative of this driving means I may use means including a variable speed friction transmission, as shown in Fig. 11 and hereinafter described.

Two non-rotatable cam drums 23 and 24 are supported by two universal joint devices on the upper ends of the two posts 14 and 15 respectively. The two universal joint devices are similar and will be understood from the following description applied to the devices connected with the post 14. An L shaped member 8 on each cam drum operates in a slot 9 in the cover of the housing preventing rotation of the cam drum to which it is secured. 25 is a ball on the upper end of the post 14. This ball 25 is positioned within a socket 26 in the drum 23. A thrust member 27, of sound deadening material, as leather, is preferably provided in the socket 26 for the ball 25 to engage with. A plate 28 is secured to the lower side of a transverse wall 26', which is integral with and supports the socket 26. The plate 28 engages with the lower portion of the ball 25 preventing upward displacement of the cam drum 23 but allowing free universal movement of said cam drum within a limited range.

The non-rotatable cam drums 23 and 24 are respectively provided externally with cam slots 29 and 30. Each of these cam slots is formed on gradually curved lines providing two crest and two trough portions, as more clearly shown in Fig. 5, which shows one of said cam drums as it would appear if flattened out. In the drawings I have shown the two crest portions as diametrically opposite to each other and the two trough portions as diametrically opposite to each other and offset ninety degrees as respects the crest portions. Obviously the shape of these cam slots may be varied to secure different movements of the cam drums.

Two roller supporting arms 31 and 32 are secured to the respective worm wheels 16 and 17 and extend upwardly therefrom alongside of the respective cam drums 23 and 24. A bearing member 33 projects at right angles from the upper end of each arm 31 and 32. A roller 34 is rotatively mounted on each bearing member 33 and projects into the cam slot of the adjacent non-rotatable cam drum. Rotation of the worm wheels 16 and 17 will carry rollers 34 around the non-rotatable cam drums 23 and 24 in a horizontal circular path. These rollers 34 operating in the undulating cam slots 29 and 30 will impart a wabbling motion to each of the cam drums.

A plate 35 is rotatively mounted on each of the socket members 26 and rests on the transverse wall 26'. A collar rigidly mounted on the socket 26 prevents upward displacement of each plate 35. Two upright posts 36 are secured to each plate 35 in spaced apart relation. These posts extend upwardly through suitable holes in the cover of the housing 10.

Two frame bars 37 and 38, Fig. 3, are rigidly connected with the top end portions of the posts 36 of the respective cam drums 23 and 24. Two foot plate members 40 and 41 are respectively secured to the plates 37 and 38. The foot plate members 40 and 41 are preferably cup shaped so as to best receive and support the foot of the user and are preferably lined with padding material 42.

The parts hereinbefore described constitute an operative mechanism for imparting a wabbling or undulating motion to the foot plates 40 and 41. By this motion the feet of the user are correctively manipulated by imparting to them an oscillating motion in a cycle which tilts them forwardly then to one side, then rearwardly and then to the other side. In addition to these vertical tilting movements it is desired, at the same time, to impart to the feet a horizontal twisting motion which moves the toe portions of the feet alternately toward one side and then toward the other side. This movement is diagrammatically indicated in Fig. 6. In the device shown in Figs. 1 to 6 this movement is accomplished by the following described mechanism. Each bar member 37 and 38 has a downwardly extending arm 43, operative through an opening 44 in the cover portion of the housing 10. The lower end of each arm 43 is slidably connected with a member 45 having a ball 46 on the outer end thereof. Each ball 46 is received within a socket 47 on the upper end of a bar member 48. Each bar member 48 extends downwardly and is telescopically connected with another bar member 49. Each bar member 49 has its lower end portion mounted on a pivot 50. Each pair of bar members 48 and 49 constitute a telescopic lever arm by which the foot plate connected therewith is angularly moved horizontally at the same time it is being moved vertically by the cam drum means. Telescoping of the two bar members 48 and 49 permits vertical movement of the arm 43 which is connected therewith. The sliding connections between the arms 43 and members 45 accommodate the arms 43 in moving up and down in a circular path while the bar members 48 move up and down in a vertical plane.

The ball members 46 are positioned in lines parallel with the foot plates and passing through the centers of the balls 25 and said ball members 46 constitute a part of the mechanism which causes the arms 43 to swing freely as the foot plates oscillate from side to side. The upright lever arms, each formed of the two bar members 48 and 49, are oscillated sidewise by mechanism which is connected with the worm wheels 16 and 17. This mechanism, for each lever arm, comprises an eccentric 51 secured to or formed integral with the worm wheel of said lever arm. The eccentric 51 is connected by a link 52 with one arm of a bell crank lever 53. The other arm of the bell crank lever 53 is connected by a link 54 and member 55 with the upright lever arm. Rotation of the eccentric 51 will move the bell crank lever 53 angularly and oscillate the upright lever member 48—49. This will impart the desired sidewise swinging motion to the foot plate with which the upright lever member is connected. Angular adjustment of the eccentric 51 relative to the worm wheel with which it is connected will vary the time sequence, in the cycle, between the vertical tilting movements and the horizontal twisting movements. Two rigid tubular posts 56 extend upwardly from the housing 10 on opposite sides of the foot plates. Two other post members 57 are telescopically associated with the posts 56 and two hand holds 58 are provided on the upper ends of the post members 57. The post members 57 are vertically adjustable relative to the posts 56 to suit the convenience of persons of different heighths. Notch and pin means indicated at 59 may be used to hold the post members 57 in adjusted positions relative to the posts 56. A switch

22' is preferably provided in connection with one of the handholds 58 so that the circuit to the motor 22 can be opened and closed at will by the person using the device. Control wires, not shown, to the motor 22 may be placed within the tubular post members 56—57.

In the use of this device the user steps onto the foot plates 40 and 41 and grasps the handholds, 58, preferably while the machine is at rest. After the user is on the machine the switch 22' is closed to start the motor. This rotates the worm wheels and moves the rollers 34 around the non-rotatable drums 23 and 24 imparting a wabbling motion to said drums. The wabbling motion of these drums is communicated to the foot plates tilting said foot plates forwardly, to one side, rearwardly, and to the other side. At the same time a twisting movement is imparted to the foot plates, turning them first to one side and then to the other side as indicated in Fig. 6. This imparts to the feet and ankles substantially every movement that they would be subjected to in walking over rough grounds, helps to put the bones of the feet back into normal shape and, when used from day to day, quickly strengthens the feet and ankles. It also makes the feet and ankles more supple and pliable, and helps to correct the posture of the entire body.

In Figs. 7 to 11 inclusive, I have shown an alternative form of the invention comprising a housing 60 having two upright shafts 61 and 62, see Fig. 11, rotatably mounted in bearings 63 and 64. Worm wheels 65 and 66 are provided on the respective shafts 61 and 62. Worms 67 and 68 on a drive shaft 69 engage the respective worm wheels 65 and 66. A friction disc 70 is splined on the shaft 69 and urged by a spring 71 into engagement with a friction wheel 72 which is splined on the shaft 73 of a motor 74. A shifting lever 75 is connected with the friction wheel 72 for moving the same transversely of the disc 70 to secure different driving speeds for the shaft 69. This lever 75 preferably extends upwardly through the top of housing 60 to any suitable location where it may be grasped and operated by the user of the machine. The provision of the variable speed friction transmission between the motor 74 and the shaft 69 makes it possible to use a constant speed motor. The friction wheel 72 is moved inwardly toward the center of the disc 70 to obtain a higher speed ratio and is moved outwardly to obtain a lower speed ratio between the motor shaft and the shaft 69.

The mechanism connected with the shaft 61 is shown in Figs. 7, 8, 9 and 10 and hereinafter described in detail. It will be understood that the mechanism connected with shaft 62 is of duplicate construction.

The shaft 61, Fig. 7, extends upwardly through the bearing 64 in the cover of the housing 60 and is provided, above said cover, with a hub 76. An inclined crank portion 77 projects upwardly from the hub 76. The crank portion 77 and hub 76 are preferably integral with the shaft 61. A tubular bearing sleeve or hub 78 fits over the crank portion 77. A foot plate receiving member 79 is rigidly connected with the upper end of the bearing hub 78. A foot plate 80 is adjustably secured to the member 79, as by bolt means 81 operative in slots 82 in the member 79. A collar 83 threaded onto the top end of the crank member 77 and seated in a counterbore 84 in the upper end of the bearing hub 78 prevents upward movement of said bearing hub 78 and the foot plate connected therewith. Any suitable thrust bearing means, as a ball 85 interposed beneath the top end of the crank member 77 and a plug 86 in the bearing hub 78 may be provided. At the lower end the bearing hub 78 is provided with means which serves the double purpose of preventing the foot plate 80 from rotating with the crank member 77 and controlling the angular movement of said foot plate in horizontal directions. The means illustrated in the drawings for performing these functions is in the nature of two prong members 87 projecting down through slots 88 in a lever plate 89. The lever plate 89 rests on top of the cover of the receptacle 60 and is pivotally mounted on the hub 76. An arm 90 on the plate 89 extends down through a slot 91 in the housing 60 and is connected with a lever 92. The lever 92 is fulcrumed at 93 and is adapted to be moved angularly on its fulcrum 93 by an eccentric member 94 secured to the shaft 61 and operating between a forked or slotted end portion 95 of said lever 92, see Fig. 9. As the shaft 61 rotates the eccentric 94 will move the lever 92 angularly on its pivot, as indicated by dot and dash lines in Fig. 9. This will angularly move the lever plate 89 about the hub 76 as indicated by dot and dash lines and will impart a similar angular movement to the foot plate 80. As the shaft 61 is rotated the inclined crank member 77 will be moved in a conical path and a wabbling movement will be imparted to the foot plate 80 similar to the wabbling movement imparted to the foot plates hereinbefore described, tilting said foot plates forward, to one side, rearward, and to the other side.

In Fig. 12 I have shown another modified form of my invention in which an upright rotating shaft 100 is provided on its upper end with swash plate means of adjustable angle. This swash plate means embodies a plate 101 rigid with the shaft 100, a plate 102 rigidly but adjustably secured to the plate 101 by bolts 103, only one of which is shown, and a wedge 104. By loosening the bolts 103 and adjusting the position of the wedge 104 the angle of the plate 102 may be adjusted to vary the throw or incline of foot plates supported thereon. A non-rotatable plate 105 is supported on the plate 102 by ball bearings 106. A bar 107 is secured to the upper side of the plate 105. Foot plate means 108, of a form hereinbefore described is secured to the bar 107. A centrally positioned screw member 109 secures the two plates 105 and 102 together and yet leaves said plates free for relative rotation. Rotation of the foot plate means with the swash plate means is prevented by connection of the forward or toe end of the bar 107 with the upper end of an oscillating lever formed of two telescopic sections 110 and 111. These lever sections are substantially identical with the telescopic lever sections 48 and 49 hereinbefore described and are oscillated by lever and eccentric connections with the shaft 100 similar to the parts 51 to 55 inclusive shown in Figs. 2 and 4 and hereinbefore described. In the operation of the device shown in Fig. 12, rotation of the swash plate means 101—102 will impart a wabbling motion to the foot plate means 108 substantially the same as described in connection with the other embodiments of this invention. By adjusting the position of the wedge 104 of Figure 12 toward or away from center the incline of the plate 102 may be varied to secure a greater or less tilting movement of the foot plate.

The specification and drawings disclose pre-

ferred embodiments of my invention but it will be understood that changes in the same may be made within the scope and spirit of the following claims.

I claim:

1. In a foot corrective device, a cam drum; means supporting said cam drum for universal tilting movement; a cam slot in said cam drum; driven means operative in said cam slot imparting a universal tilting movement to said cam drum; means preventing rotation of said cam drum; support means extending upwardly from said cam drum; and a foot plate mounted on said support means.

2. In a foot corrective device, a cam drum; means supporting said cam drum for universal tilting movement; a cam slot in said cam drum; roller means movable in a circular path around said cam drum and operative in said cam slot imparting a universal tilting movement to said cam drum; means preventing rotation of said cam drum; support means extending upwardly from said cam drum; and a foot plate mounted on said support means.

3. In a foot corrective device, a cam drum; means supporting said cam drum for universal tilting movement; an endless undulating cam slot in the exterior of said cam drum; a driven cam roller operative in said cam slot and movable in a circular path in a substantially horizontal plane around said cam drum imparting a universal tilting movement to said cam drum; means preventing rotation of said cam drum; support means extending upwardly from said cam drum; and a foot plate mounted on said support means.

4. In a foot corrective device, a housing; an upright post in said housing; a ball on the upper end of said post; a cam drum supported for universal tilting movement on said ball; an endless undulating cam slot in the exterior of said cam drum; a wheel rotatively mounted on said upright post; an arm carried by said wheel extending upwardly alongside of said cam drum; a roller mounted on said arm operatively positioned in said cam slot and movable in a circular path by rotation of said wheel; means preventing rotation of said cam drum; means rotating said wheel; support means extending upwardly from said cam drum; and a foot plate mounted on said support means.

5. In a foot corrective device, a cam drum; means supporting said cam drum for universal tilting movement; a cam slot in said cam drum; roller means movable around said cam drum and operative in said cam slot imparting a universal tilting movement to said cam drum; means supporting said cam drum against rotation; a plate rotatably connected with said cam drum; supporting means secured to said plate and extending upwardly from said drum; a foot plate secured to said supporting means and having a universal tilting movement corresponding to the tilting movement of said cam drum; and oscillating means operatively connected with said foot plate oscillating said foot plate from side to side simultaneously with the tilting movement thereof.

6. In a foot corrective device, a rotatably mounted upright shaft; a crank member rigid with the upper end of said shaft inclined as respects the shaft; driving means connected with the shaft; a foot plate rotatably mounted as respects said crank member; a lever member angularly movable about the axis of said shaft and positioned substantially in the plane of intersection of the axis of said shaft and the axis of said crank member, said lever member having slots therein; pins connected with said foot plate adjacent the location of said crank member, said pins extending through said slots in said lever member controlling rotary movement of said foot plate; another lever connected with said first named lever, and lever moving means on said upright shaft connected with said last named lever.

7. In a foot corrective device, an upright driven shaft; swash plate means on the upper end of said shaft having an inclined surface rotatable with said shaft; devices for adjusting the angle of the inclined surface of said swash plate means; a foot plate member parallel with said inclined surface; means preventing rotation of said foot plate member; and ball bearing means interposed between said foot plate member and said inclined surface.

8. In a foot corrective device, an upright driven shaft; a plate member rigid with the upper end of said shaft; another plate member positioned in an inclined plane above said first mentioned plate member; adjustable means rigidly securing said inclined plate member to said first mentioned plate member and providing for the angular adjustment of said inclined plate member; a foot plate member supported on said inclined plate member; and means preventing rotation of said foot plate member, whereby a wabbling movement will be imparted to said foot plate member by rotation of said inclined plate member.

9. In a foot corrective device, a foot plate; means supporting said foot plate for universal tilting movement; means preventing rotation of said foot plate; actuating means moving said supporting means; and foot plate oscillating means oscillating said foot plate from side to side angularly about the axis of said foot plate providing a toe-in and toe-out movement synchronously with the tilting movement.

10. In a foot corrective device, two foot plates positioned side by side for the reception of both feet of a user; means preventing rotation of said foot plates; means supporting said foot plates for universal tilting movement; actuating means operatively connected with said foot plate supporting means; and means oscillating said foot plates from side to side angularly about the axis of said foot plates providing a toe-in and toe-out movement synchronously with the tilting movement of said foot plates.

11. In a foot corrective device, two foot plates, mounting means supporting said foot plates for universal tilting movement whereby a wabbling motion is provided for said foot plates as respects their vertical axes; pivot means for said foot plates embodied in said mounting means; means preventing rotation of said foot plates; actuating means operatively connected with said mounting means; and oscillating means operatively connected with said foot plates oscillating said foot plates from side to side angularly about the axis of said foot plates simultaneously with the tilting of said foot plates.

12. In a foot corrective device, a rotatably mounted upright shaft; a crank member on the upper end of said shaft inclined as respects the shaft; driving means connected with said shaft; a foot plate having a bearing wherein said crank member is rotatably mounted; means preventing rotation of said foot plate whereby a universal tilting movement will be imparted to said foot plate by rotary movement of said crank member;

and means oscillating said foot plate from side to side angularly about the axis of said foot plate providing a toe-in and toe-out movement synchronously with said tilting movement when the foot corrective device is in operation.

13. In a foot corrective device, a rotatable shaft; an inclined swash plate member on an end portion of said shaft; driving means connected with said shaft; a foot plate member supported on said inclined swash plate; means preventing rotation of said foot plate whereby a wabbling movement will be imparted to said foot plate by rotation of said swash plate member; and foot plate oscillating means connected with said foot plate for oscillating the same from side to side angularly about the axis of said foot plate synchronously with the wabbling movement of said foot plate.

14. In a foot corrective device, a driven shaft; swash plate means on an end of said shaft having an inclined surface rotatable with said shaft; devices for adjusting the angle of the inclined surface of said swash plate means; a foot plate member parallel with said inclined surface; means preventing rotation of said foot plate member; and ball bearing means interposed between said foot plate member and said inclined surface.

15. In a foot corrective device, a rotatable shaft; an inclined swash plate member on an end portion of said shaft; driving means connected with said shaft; a foot plate member supported on said inclined swash plate; means preventing rotation of said foot plate whereby a wabbling movement will be imparted to said foot plate by rotation of said swash plate member; and foot plate oscillating means connected with said foot plate for oscillating the same from side to side angularly about the axis of said foot plate synchronously with the wabbling movement of said foot plate.

ALWIN KOST.