

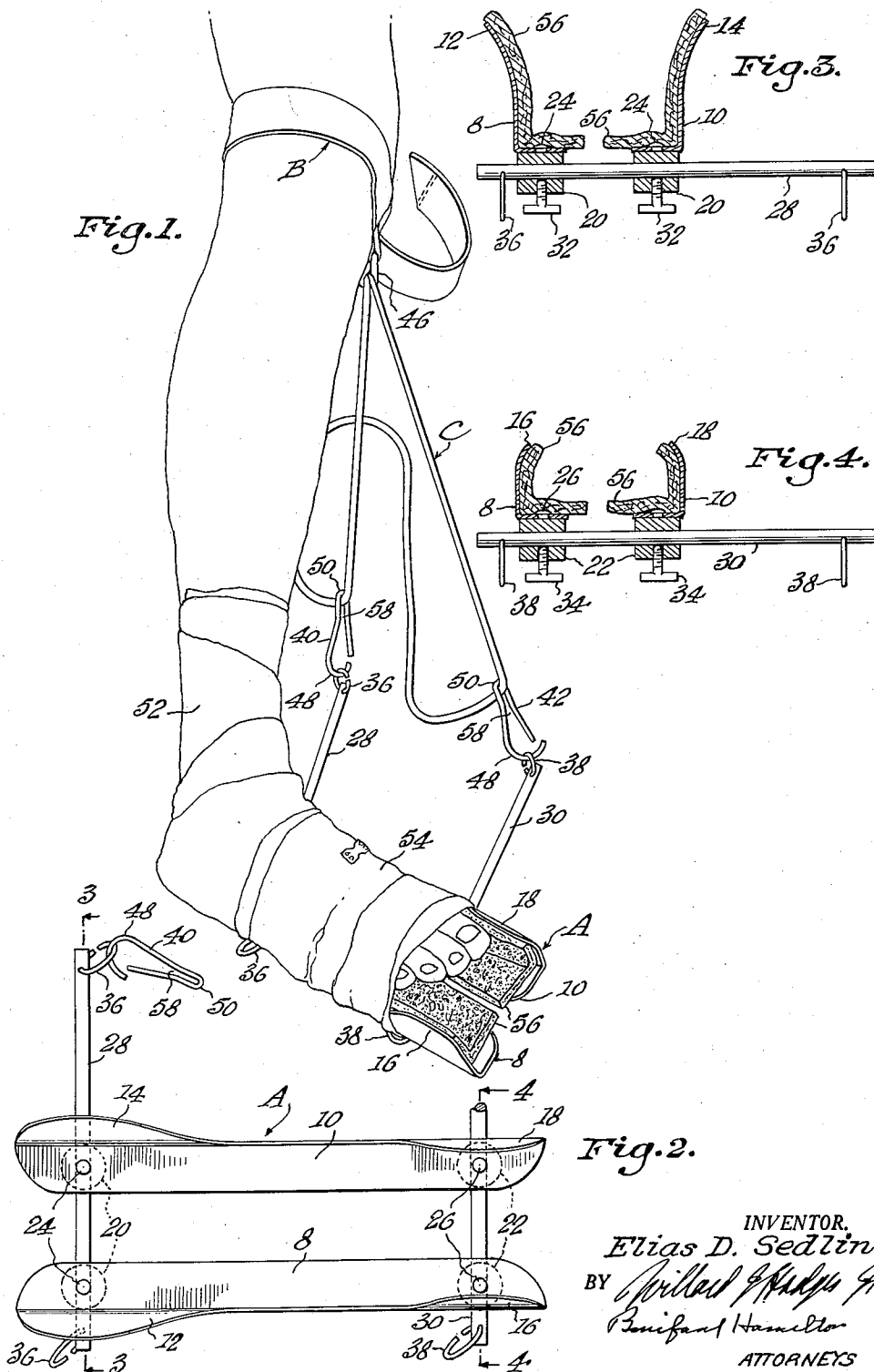
Jan. 24, 1961

E. D. SEDLIN
APPLIANCE FOR FACILITATED X-RAY
EXAMINATIONS OF ANKLE INJURIES

2,969,061

Filed Dec. 1, 1959

2 Sheets-Sheet 1



INVENTOR,
Elias D. Sedlin
BY *William H. Sedlin*
Benjamin Hamilton
ATTORNEYS

Filed Dec. 1, 1959

2 Sheets-Sheet 2

2,969,061

2 Sheets-Sheet 2

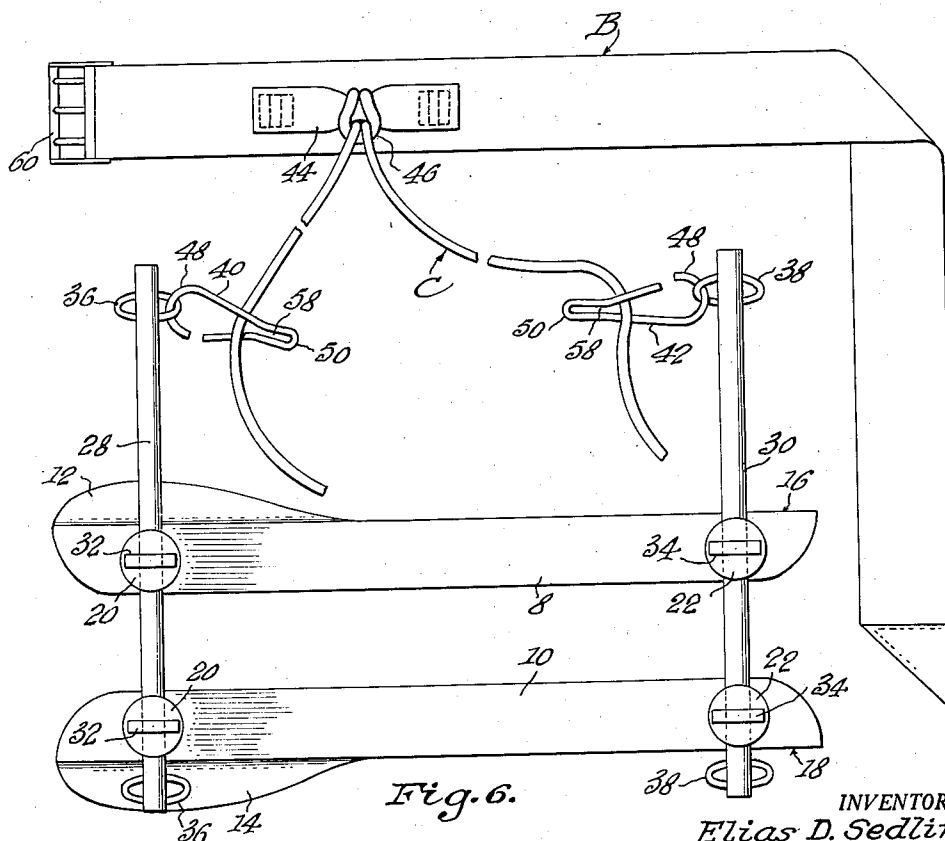


Fig. 6.

INVENTOR.
Elias D. Sedlin
BY *Willard H. Hays Jr.*
Bonifant Hamilton
ATTORNEYS

1

2,969,061

APPLIANCE FOR FACILITATED X-RAY EXAMINATIONS OF ANKLE INJURIES

Elias D. Sedlin, Bronx, N.Y., assignor to the United States of America as represented by the Secretary of the Army

Filed Dec. 1, 1959, Ser. No. 856,622

2 Claims. (Cl. 128—84)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

Injuries to the lower extremities of individuals engaging in outdoor sports and activities of highly diversified character, are so frequent in occurrence that special provisions are required at many locations for diagnostic and treatment purposes. Thus, for example, military posts, wherein the primary mission is that of basic infantry training, are required to diagnose and to treat large numbers of both acute and chronic ankle injuries, and the necessity therein for stress inversion or eversion roentgenography in the accurate diagnosis of chronic and acute angle conditions has been cited numerous times.

The instant invention presents a device which in actual operation constitutes a very material aid when stress inversion or eversion films of the ankle are needed. Prior to the present invention, stress inversion or eversion films have been obtained by use of the surgeon's hand holding the foot in the desired position; and it has been emphasized that prior to the instant invention, in diagnosis of lateral tear, the surgeon should position the ankle himself, wearing rubber gloves to protect his hands. However, in the development of the present invention, it has been noteworthy that the wearing of gloves, which provide sufficient protection against irradiation, interferes with the surgeon's ability to grasp the heel of the injured foot and to maintain the foot and ankle of the patient in proper position while films are being taken.

The wearing of gloves, moreover, obviously does not protect the surgeon from irradiation except for his hands, and the continued use of stress roentgenography in examining large numbers of ankle injuries has an inherent hazard of excess exposure to irradiation for surgical and medical personnel, especially where such personnel are located on a military post where such injuries are of common and numerous occurrence. In addition, an unduly large amount of the surgeon's time is taken up by the gloved positioning and holding of the injured part.

Consequently, it has been desirable to design and to construct a mechanical device or surgical accessory which would provide an adequate substitute for a surgeon's hands for this type of work, and it is considered that, on the basis of experience gained from actual use, the appliance of the instant invention which will be described hereinafter fulfills all requirements and is, in some ways, superior to the use of the surgeon's hands.

From the foregoing, it may be considered that the instant invention has for an object the provision of a surgical appliance or accessory for use in instances where there is present the necessity for stress inversion or eversion roentgenography in the accurate diagnosis of both acute and chronic ankle conditions, which accessory is applicable easily to the injured member, and holds such member in proper position for the making of either stress inversion or eversion roentgenograms. In practice, there are found only limited indications for stress eversion roentgenograms, so that actual experience in the use of

2

the instant device has been predominantly with stress inversion roentgenograms and the description and discussion which follows is concerned with the use of the appliance for stress inversion.

The accompanying drawings represent an exemplary, although a preferred embodiment of the device of the invention, in which drawings:

Fig. 1 is a perspective view of the accessory when in service;

Fig. 2 is a top plan view of the metallic foot-piece, the padding liner being omitted;

Fig. 3 is a transverse vertical sectional view, taken on the line 3—3 of Fig. 2, looking in direction of the arrows, the view, however, showing the padding lining for the foot-piece in position;

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 2 looking in the direction of the arrows;

Fig. 5 is a side elevation of the foot-piece of the accessory; and

Fig. 6 is a bottom plan view of the accessory of the invention with the thigh strap attached thereto.

Referring more particularly to the drawings, the illustrated embodiment of the invention comprises a foot-piece A composed of complementary elongated metallic plates or strips 8 and 10, which may be adjusted laterally to fit snugly any adult foot, each strip 8, 10, having its rear outer edge portions formed into corresponding upstanding heel flanges 12, 14, and the forward portions formed into forefoot flanges 16, 18, the heel flanges 12, 14 being adapted to engage snugly the heel of a patient, and the forefoot or frontal flanges 16, 18 being adapted to engage snugly against the patient's forefoot. The foot-piece A is designed to enable it to fit any adult foot and to be used to maintain inversion or eversion in combination with dorsiflexion, plantar flexion, or neutral positions of the foot, selectively.

For accomplishing the desired position of the foot, an anchoring thigh strap B is provided, together with a flexible traction cable or rope C. The foot-piece A is composed of complementary elongated plates or strips 8, 10, as aforesaid, these being made of a light metal, preferably aluminum, and turret clamps 20, 22, are riveted as shown at similar locations on the underside of the complementary plates 8, 10, at the heel and forefoot areas of these plates. Rivets 24 and 26 turnably secure the turret clamps to the plates of the foot-piece, the turret clamps being similarly apertured for receiving movable connecting rods 28 and 30 along which the foot plates 8 and 10 may be adjusted laterally to correspond to the width of a patient's foot with the heel and forefoot flanges on the plates snugly engaging the foot on both sides thereof. Adjustment may be secured by tightening set screws 32, 34 against the connecting rods 28, 30, the connecting rods 28 and 30 having holes through them adjacent to their ends for receiving eyelet rings 36, 38, which receive rope clamps 40, 42, through which is passed the traction rope C, the thigh band B being provided similarly with a sewed-on strip 44 for holding a loop 46 of the flexible traction rope or cable C. Each of these clamps 40, 42, has an enlarged clip end 48 which receives an eyelet ring and a restricted clamping end 50 into which the traction rope C is pulled and is compressively clamped and held tightly until it becomes desirable to release the same.

The movable connecting rods 28, 30, enable the accessory of the instant invention to be applied to either foot for both inversion and eversion stress roentgenograms. As has been noted above herein, there are only limited indications for stress eversion roentgenograms, so that the foregoing description and discussion as well as that which follows is concerned with the use of the appliance for stress inversion.

3

Application of the appliance for stress inversion films is as follows:

With the patient supine, the anchor strap B is applied just above the knee, into the traction rope C placed medially. One or two turns of elastic bandage 52 then are wrapped slightly above the ankle. The foot-piece A then is fitted so that it conforms snugly to the heel and forefoot of the patient; with the beginning of the heel flanges 12 and 14 placed inferiorly to the malleoli, the elastic wrapping is continued, as is indicated at 54, over the foot-piece A until the latter is firmly attached to the foot, there having been glued or cemented layers of felt or equivalent padding 56 to the plates 8 and 10 of the foot-piece, which padding layers are extended to include the heel flanges 12, 14, and the forefoot flanges 16 and 18 of the plates 8 and 10 for inhibiting any likelihood of slipping between the patient's foot and foot-piece A. The connecting rods 28 and 30 then are passed medially as far as possible and the plates of the foot-piece A again are squeezed against the patient's foot and the set screw clamps 32 and 34 of the connecting rods are tightened. The hindfoot and forefoot of the patient now are movable as a unit. Maximum inversion and moderate plantar flexion stress are applied, and traction rope C is pulled through the tapered slots 58 on the rope clamps and clamped in the restricted clamping ends 50 thereof, and the patient's ankle is ready for an AP stress inversion film.

Reversal of the anchor strap B and the connecting rods 28 and 30 prepares the ankle for stress eversion films.

As further illustrating the method of fabrication of the device of the instant invention, the following specific procedure may be noted as being a preferred procedure.

The foot-piece A is fashioned from 16-gauge sheet aluminum and is cut from a pattern measuring substantially 11¼ inches in length and 3¾ inches in width at the level of the heel flanges 12, 14, and substantially 3½ inches in width at the level of the forefoot flanges 16, 18. The heel flange 12, 14, measures approximately four inches in length and is gently curved posteriorly. The forefoot flange 16, 18, is curved internally about one-third of its width. Each turret clamp 20, 22, is machined from substantially one-inch round stock 24 ST aluminum, or an equivalent, and is drilled to retain a ¾ or ⅝-inch rod (connecting rods 28, 30), and at right angles to this a small hole is drilled and threaded to retain the clamping screws 32, 34, each of which is ¼"—20 x ½", or as available. Each connecting rod 28, 30, is made of ¾- or ⅝-inch cold rolled steel approximately six inches in length and is drilled at either end for a retaining ring 36, 38, and rope clamp 40, 42. Each rope clamp is bent from approximately ⅜-inch wire to hold the traction rope C firmly where it is pulled into the tapered slot 58. The retaining rings 36, 38, are formed from approximately ⅜-inch welding rod. An anchor strap B is prepared from approximately 1½-inch webstrap approximately 18 inches long with a buckle 60 and a sewed-on strip 44 to which a traction rope C is attached so that each end of the traction rope extends about 2½ feet from the loop 46. The foot-plate A now is drilled anteriorly and posteriorly to receive turret clamps 20, 22, and each section of the foot-piece now is bent to a 90° angle in its long axis along a point through the middle of the narrow center portion. The turret clamps are placed in the previously drilled holes in the foot-plate and riveted in place by rivets 24, 26, so that the turret clamps are free to rotate on the foot-piece and yet be firmly attached. The foot-plate A now is divided along the line of the 90° bend, thus forming the complementary plates 8, 10. The crossbars 28, 30, now are fitted through the holes in these turret clamps 20, 22, the two halves of the foot-piece (the complementary plates 8, 10) are brought together and the retaining rings 36, 38, carrying rope clamps 40, 42, are placed through the previously drilled holes on the cross-

4

bars 28, 30. A layer of felt or equivalent padding 56 is glued or equivalently secured to the inside of the complementary plates 8, 10, to cover the inside surface of these plates and their flanges to a depth of approximately one-fourth inch. The appliance now is complete and ready for use.

It has been found in practice that the instant device is superior to the former practice of manually grasping the heel, placing an inversion stress on the ankle, and counter-pressure on the tibia. When desired, far greater stress can be placed on the ankle than with hands, due to the leverage obtainable through the crossbars and traction rope. The felt padding 56 and the curves of the heel flanges 12, 14, and forefoot flanges 16, 18, eliminate the problem of slippage. Any technician of average intelligence can be taught to apply properly the instant device thereby eliminating the need for the presence of the surgeon during this procedure.

In practice it has been found that with both the manual procedure and with the use of the instant device, the degree of tilt is a direct measure of the amount of underlying damage, with the occasional exception of the case in which an injury has been superimposed upon a previously hyper-mobile point. In no case in which there has been suspected tear of the lateral ligaments has the instant device failed to demonstrate significant talar tilt. The criterion of fifteen degrees of talar tilt is used as being indicative of tears sufficiently severe to warrant operative intervention or prolonged cast immobilization.

It has been found in practice that a stoic patient can tolerate stress with no sedation or anesthesia. However, the placement of stress on an acute ankle injury is uncomfortable at best, so in order to eliminate the question of personal spasm, and make the testing pain-free, there may be employed a common peroneal nerve block with lidocaine at the neck of the fibula in routine testing of borderline injuries. Where it is obvious that a severe soft tissue injury has taken place, the femoral nerve is blocked just below the inguinal ligament, and the sciatic nerve is blocked in the buttock, and the ankle tested while preparations are made for a primary suture.

It does not appear that testing under anesthesia introduces a tilt which would not have been present otherwise. Based upon operative attempts to extend incomplete tears by stress inversion, it does not appear that testing under anesthesia will increase the severity of incomplete tears.

The instant device maintains stress positions of diagnostic significance. No talar tilt of significance is produced in a normal joint either with or without anesthesia. In practice, it is desirable to obtain films of the contralateral joint in order to eliminate the question of bilateral hypermobility.

While the foregoing description and accompanying drawings are directed to a preferred illustrative embodiment of the appliance of the instant invention and its manner of use, it will be understood that structural details may be modified to suit the invention to particular specific adaptations without departing from the spirit of the invention, and that, accordingly, it will be understood that it is intended and desired to embrace within the scope of the invention such modifications and changes as may be necessary or desirable to adapt it to varying conditions and uses as defined by the scope of the appended claims.

I claim:

1. A surgical appliance for facilitating X-ray examinations of injured ankle joints, which comprises a rigid foot-piece including a pair of complementary elongated laterally adjustable foot-strips adapted to extend longitudinally beneath a patient's foot, each strip having an inner edge and an outer edge, an upstanding contoured heel flange on each foot-strip along rear portions of each outer edge, an upstanding contoured forefoot flange along forward portions of each outer edge of each foot-strip,

5

each heel flange being gently curved divergently posteriorly and each forefoot flange being curved inwardly with respect to its foot-strip, means enabling relative lateral adjustment of the foot-strips for enabling the flanges to engage snugly against the heel and forefoot, respectively, of a patient's foot, the means for laterally adjusting the complemental foot-strips with respect to each other including a turret clamp secured to each strip in similar forward and rear locations underside each strip, a forward crossbar extending transversely with respect to the complemental foot-strips through the forward turret clamps, a rear crossbar similarly extending through the rear turret clamps, the crossbars interconnecting the foot-strips forwardly and rearwardly thereof, the strips being slidable along the cross bars for snugly interfitting the flanges on the foot-strips with the patient's foot, and clamping set screws for each of the strips operatively disposed in the turret clamps at right angles to the crossbars for releasably securing the foot-strips in clamping position on the patient's foot; a thigh band adapted to encircle the patient's thigh, traction cable means interconnecting the foot-piece and thigh band for imparting stress and tilt to the foot-piece and patient's foot held thereby upon application of maximum inversion and moderate plantar flexion stress thereto through the

6

traction cable means, and means for securing the foot-piece and traction cable means in desired stress, and tilt for obtaining selectively both inversion and eversion stress roentgenograms of an injured area.

2. A surgical appliance as claimed in claim 1, wherein each cross bar is provided with clamping instrumentalities for flexible tensioning means, and flexible tensioning means releasably secured to the clamping instrumentalities and to the thigh band for maintaining the foot-strips and a patient's foot clamped in the foot-strips in a selected position.

References Cited in the file of this patent

UNITED STATES PATENTS

15	620,582	Goff	Mar. 7, 1899
	2,520,248	Klaassen	Aug. 29, 1950
	2,545,510	Bosler	Mar. 20, 1951
	2,696,208	Falls	Dec. 7, 1954

FOREIGN PATENTS

20	7,337	Great Britain	Apr. 4, 1837
	719,416	Great Britain	Dec. 1, 1954

OTHER REFERENCES

Hawley-Scanlan Catalog, received in Patent Office Mar. 24, 1936. (Copy in Div. 55, pp. 10-11 relied on.)