

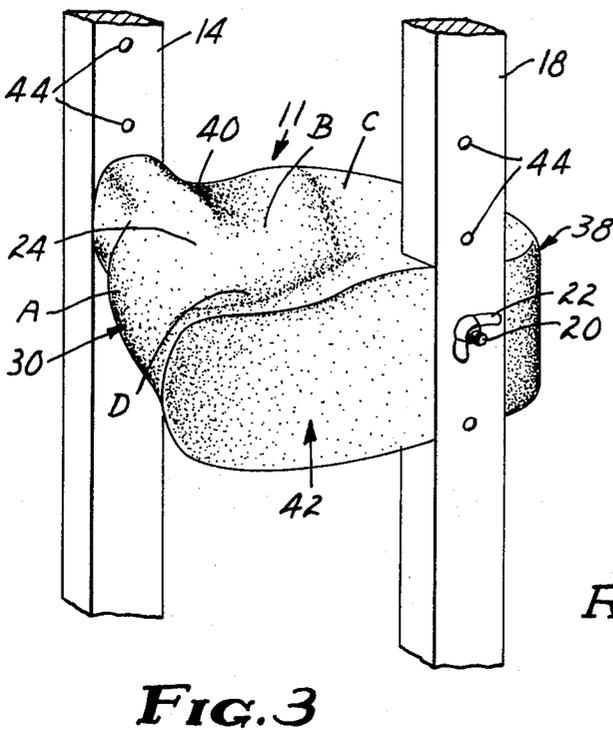
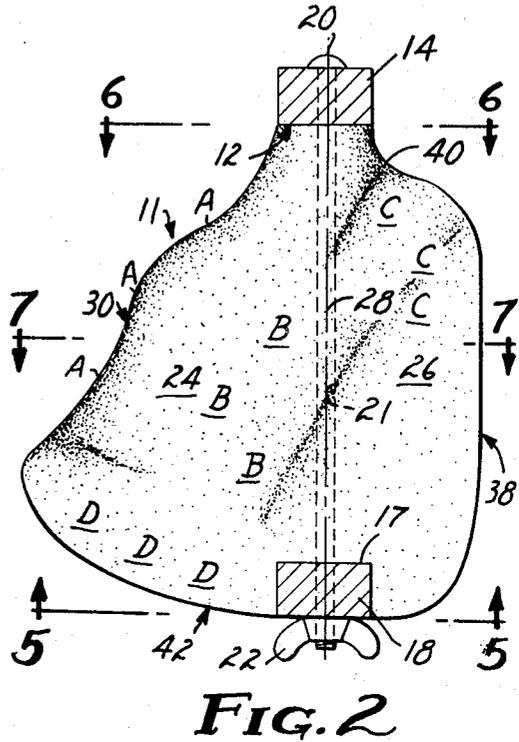
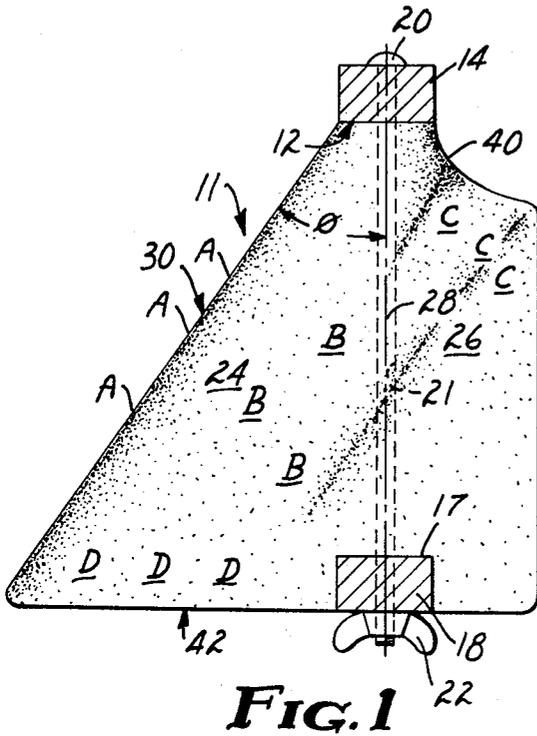
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R. B. GILSDORF
HAND GRIP FOR CRUTCH

3,517,678

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

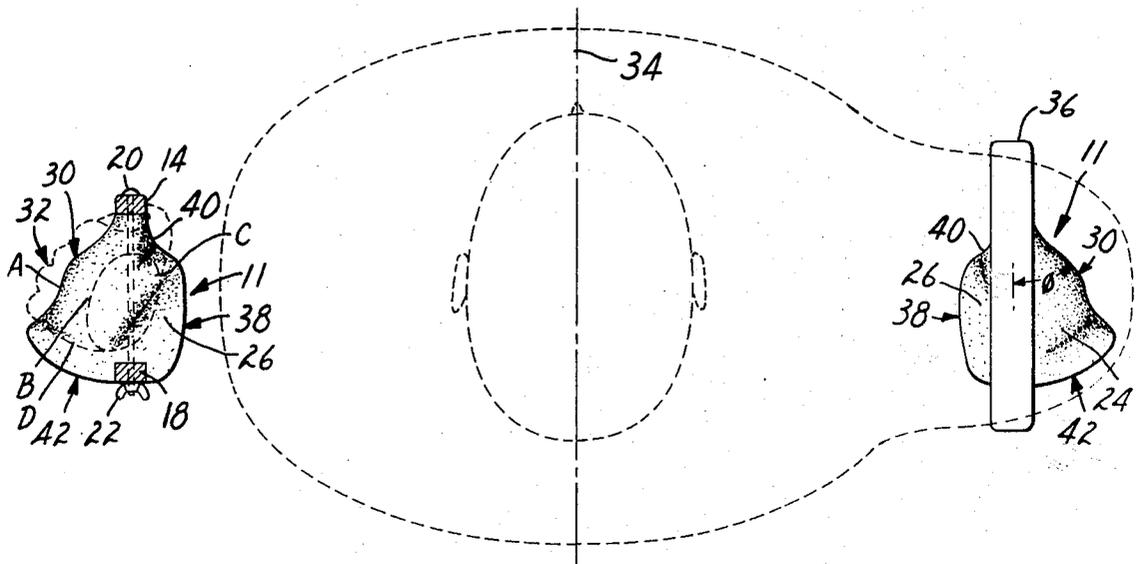


FIG. 4

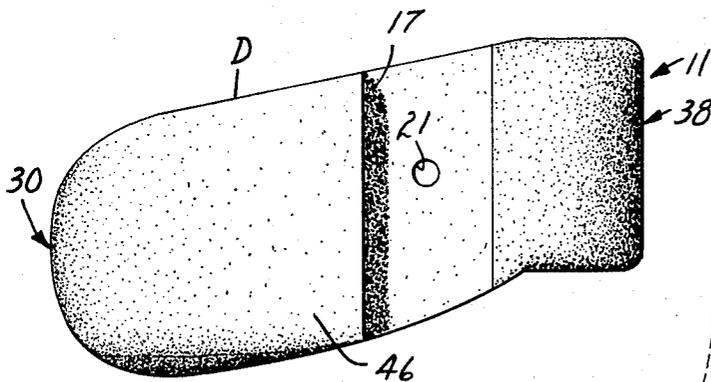


FIG. 5

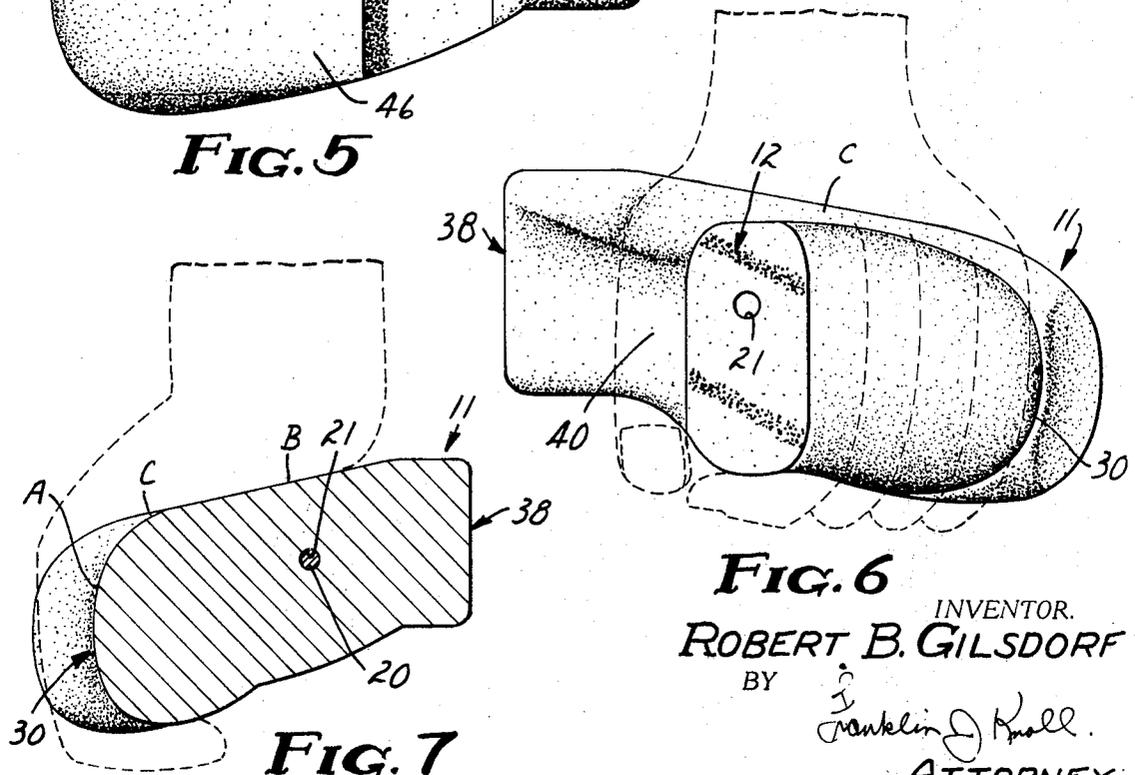


FIG. 6

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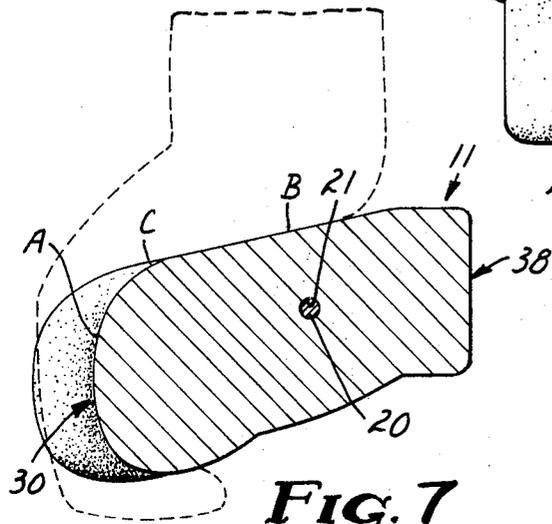


FIG. 7

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3,517,678

HAND GRIP FOR CRUTCH

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7 Claims

ABSTRACT OF THE DISCLOSURE

A crutch comprising a ground-engaging support member, at least one vertical support strut extending from said ground-engaging support member, a body support member disposed in an anterior and posterior direction so as to receive a crutch user's axilla and positioned on the upper end of said vertical support strut, and a shaped hand grip attached to said vertical support strut, said hand grip having

(a) A generally horizontally disposed upper surface shaped to accommodate substantially the entire palmar surface of the user's hand including the metacarpal-phalangeal pad, the mid-palm area, the thenar pad and the hypo-thenar pad thereof,

(b) A maximum horizontal dimension at least twice that of its maximum vertical dimension,

(c) An overall size sufficient to prevent the user's ulnar fingers from wrapping completely around said grip, thereby facilitating dorsi-flexion of the hand at the wrist and distributing the body's weight evenly over the palmar surface during use, and

(d) One side converging anteriorly so as to form an angle of between about 20° and about 45° with the plane defined by the said body support member and the said vertical support strut, said side having a length sufficient to accommodate the user's four ulnar fingers.

The present invention relates to improvements in crutches; more particularly it relates to crutches which include improved hand grips which are shaped and situated so as to provide maximum comfort to the user.

Heretofore, the use of conventional crutches has been the source of considerable discomfort and even pain to the user. This discomfort is often the result of a number of unnatural stresses and strains on the bones and muscles of the hand and forearm during the often prolonged periods during which crutches must be employed for support as well as a localized concentration of the body's weight on the heel of the hand. For example, the hand grips on conventional crutches generally extend in a "fore and aft" direction between the vertical support struts of the crutch, that is, they are situated parallel to the sagittal plane of the user's body when in use. This results in a forced, unnatural positioning of the hand parallel to said plane while the natural and more comfortable position for the hand is that in which the transmetacarpal axis thereof forms an angle (generally about 20°-45°) with the body's sagittal plane. This angular disposition is the more natural position for the hand since the hand is normally anatomically so disposed when hanging at the side in its relaxed, dependent position. Thus, the unnatural disposition of the hand parallel to, or in many cases even outward from, the sagittal plane, under the force of the body's weight, is source of discomfort usually in the form of fatigue and cramping of the hand muscles as well as those of the forearm.

Furthermore, the hand grips of conventional crutches are usually dowel-shaped, or at least do not provide a generally flat surface to receive the palm of the hand and, as such, are not adapted to distribute the body's weight over a large area of the palm but rather concen-

trate the weight in the area of the heel of the palm (i.e., the thenar and hypo-thenar pads). This lack of a generally flat surface, in addition to causing a concentration of weight on the heel of the palm, further causes the wrist to be held in a generally straight and unflexed position in which the fingers wrap completely around the underside of the grip and envelop it thus preventing or impeding dorsi-flexion of the hand at the wrist. Such preclusion of dorsi-flexion further adds to the localized concentration of the weight on the heel of the palm to the exclusion of the mid-area of the palm and the metacarpal-phalangeal pad. Often, too, conventional hand grips are shaped and situated such that the dorsal aspect of the metacarpal-phalangeal joint of the thumb and the ulnar side of the wrist are forced against the anterior and posterior vertical support struts of the crutch, respectively, when the grips are grasped firmly under the weight of the body, thus causing pain to, and abrasion of, said areas of the thumb and wrist.

It is, therefore, an object of this invention to provide an improved crutch which includes a hand grip shaped and mounted in said crutch so as to minimize cramping and fatigue of the bones and muscles of the hand and forearm of the user during use. A further object of the invention is to provide a hand grip for use in a crutch which allows the user's hand to grasp the grip at an angle with the body's sagittal plane which closely approximates the angle formed by the transmetacarpal axis of the hand with the sagittal plane when the hand is hanging at the side disposed in its normal, relaxed, dependent position. Another object is to provide a hand grip for use in a crutch whose surface is large enough to allow for even distribution of the body's weight over substantially the entire palmar area and to prevent abrading contact of the thumb and the ulnar side of the wrist with the vertical support struts of the crutch. Other objects and advantages will be evident from the discussion which follows.

By means of the present invention there is provided a crutch comprising a ground-engaging support member, at least one vertical support strut extending from the ground-engaging support member, a body support member disposed in an anterior-posterior direction so as to receive a crutch user's axilla and positioned horizontally on the upper end of the vertical support strut, and a shaped hand grip attached to the vertical support strut. The novel hand grip has a generally flat upper surface shaped to accommodate substantially the entire palmar surface of the user's hand including the metacarpal-phalangeal pad, the mid-palm area, the thenar pad and the hypo-thenar pad thereof. The grip's maximum horizontal dimension is at least twice that of its maximum vertical dimension thus providing an overall size sufficient to prevent the user's ulnar fingers from wrapping completely around the grip. This adequate size and flat shape facilitates dorsi-flexion of the hand at the wrist during use and tends to distribute the body's weight evenly over the palmar surface during use. One side of the grip (the side farthest to the outside of the user's body) converges anteriorly to form an angle of between 20° and 45° with the plane defined by the body support member (to engage the axilla) and the vertical strut; this side has a length sufficient to accommodate the user's four ulnar fingers.

In many cases, other than the hand grips, the crutch comprises a ground-engaging support shaft which bifurcates into two vertically extending support struts having a body support member to engage the body's axilla extending transversely of the support struts at their upper ends. It is to be understood, however, that the present invention is not limited to a crutch having two vertical support struts and that the improved hand grip thereof may be effectively employed in other body supporting

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orthopedic devices, e.g., a crutch having only one vertical support strut.

A particular feature of this invention is the provision of a hand grip which is shaped and situated so as to allow the transmetacarpal axis of the user's hand to form an angle with the sagittal plane which closely approximates the angle formed with said sagittal plane by the transmetacarpal axis of the hand when hanging at the side disposed in its normal relaxed dependent position. Another feature is that the grip is generally flat and has a large enough horizontal area to distribute the weight of the user's body over substantially the entire palmar surface so as to include the mid-palm area and the metacarpal-phalangeal pad as well as the thenar and hypo-thenar pads. Still another feature of the invention is that the grip has sufficient horizontal surface area to prevent the fingers from wrapping completely around the underside of the grip so as to envelop it. Thus, dorsi-flexion of the hand at the wrist is facilitated which further contributes to maximum palmar contact with the horizontal surface area of the grip which in turn contributes to an even distribution of weight thereon. Additionally, it is a feature of the invention that the grip is of such a shape and size so as to prevent abrading contact of the dorsal aspect of the metacarpal-phalangeal joint of the thumb and the ulnar side of the wrist with the vertical support struts of the crutch when the grips are grasped firmly under the weight of the body.

It is a still further feature of the invention that the grip can be simply made from inexpensive materials and employed by the public with otherwise conventional crutches.

Further features and objects of this invention will become evident in the following detailed description.

The invention may be more clearly illustrated by the accompanying non-limiting drawings which show one embodiment of the invention and modifications thereof.

FIG. 1 is an elevational view in section of one embodiment of the hand grip of the invention;

FIG. 2 is an elevational view in section of a modified embodiment of the hand grip of FIG. 1 wherein the edges are rounded and the surfaces are contoured so as to more comfortably fit the palm of the user's hand;

FIG. 3 is a view in perspective of the hand grip illustrated in FIG. 2 mounted between the vertical support struts of a crutch, parts thereof being broken away;

FIG. 4 is a top view of a person using hand grips of the invention with some parts thereof shown in section and some parts shown in phantom;

FIG. 5 is a view as shown from the line 5—5 of FIG. 2;

FIG. 6 is a view as shown from the line 6—6 of FIG. 2 of a hand grip of the invention in use showing dorsi-flexion of the user's hand, the user's hand being shown in phantom;

FIG. 7 is a sectional view taken through the line 7—7 of FIG. 2 of a hand grip of the invention in use showing dorsi-flexion of the user's hand, the user's hand being shown in phantom.

Referring now in more detail to the drawings, the hand grip of FIGS. 1 through 7 is a left hand grip and is identified generally by the reference numeral 11. FIG. 1 illustrates the hand grip of the invention in one of its simplest embodiments wherein the grip comprises a block of structural material such as wood, plastic or hard rubber generally in the shape of a truncated triangle whose maximum horizontal dimension is at least twice that of its maximum vertical dimension. The truncated edge of the block serves as the anterior point of attachment 12 to the anterior vertical support strut 14 of the crutch. The posterior point of attachment 17 is located on the aft edge of the block and is preferably recessed to form a notch the size of the posterior vertical support strut 18 so that the twisting force of the weight of the body is exerted on the said strut rather than on the means for securing the

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block in place (normally a bolt 20 passing through a hole 21 in the block and nut 22). The two points of attachment 12 and 17 lie along the anterior-posterior axis 28 of the block. The block's upper and lower surfaces are generally flat and lie along its horizontal plane and are situated generally perpendicular to the said struts when attached thereto. Portions 24 and 26 of the horizontal plane extend both laterally and medially respectively from the axis 28 between the two struts providing a large enough upper surface area to accommodate substantially the entire palmar surface of the hand including the metacarpal-phalangeal pad and the mid-area of the palm, as well as the thenar and hypo-thenar pads. (By the word "laterally" is meant extending outward of the axis 28 while the word "medially" means extending inward of the axis 28 or toward the user's body.) Thus, according to the parts of the palm it accommodates, the upper surface of the grip may be said to include a metacarpal-phalangeal area A, a mid-palm area B, a thenar area C, and a hypo-thenar area D as shown in the drawings.

The generally flat, horizontal surfaces of the grip are large enough so that the fingers do not wrap completely around the under surface so as to envelop the grip and so that the hand is dorsi-flexed during use, thus, further facilitating weight bearing contact of its upper surface with substantially the entire palmar area as is demonstrated in FIGS. 6 and 7.

Other than the truncated edge, which serves as the anterior point of attachment 12 to the vertical support strut 14, the grip has three major sides or edges. The outward facing side (or edge) 30 (i.e., the edge being most laterally removed from the sagittal plane of the user's body when in use) gradually converges anteriorly to the anterior point of attachment 12 so as to form an angle θ during use with the anterior-posterior axis 28 closely approximating the natural angle formed by the transmetacarpal axis 32 of the hand with the sagittal plane 34 when the hand is disposed in its relaxed dependent position. This angle θ is normally approximately 20° – 45° as is shown in FIGS. 1 and 4. Element 36 represents the body support member for the axilla and is included in FIG. 4 to further illustrate the angle θ between the outward facing edge 30 and the said body support means 36 which is generally in a parallel relationship with the sagittal plane 34. The inward facing side (or edge) 38 (i.e., the edge closest to the user) preferably is provided with a concavity 40 just aft of the anterior point of attachment 12, thus forming a notch to receive the user's thumb. The aft or backward facing edge 42 has located thereon the posterior point of attachment 17 for the posterior vertical support strut 18.

Preferably the grip is contoured so as to fit comfortably in the user's palm and fingers and its surfaces and edges are rounded and smoothed. Also the horizontal surfaces are preferably slanted downward laterally at a gradual angle (preferably about 5° to about 15°) as demonstrated in FIG. 5 and the lower surface is provided with an eminence 46 to receive the volar pads of the middle and distal phalangeal portions of the four ulnar fingers in a comfortable position, while the rounded surface of the outer edge 30 serves as an abutment for the volar pads of the proximal phalangeal portions of the said fingers. The said downward slant of the lateral surfaces facilitates a comfortable angle of dorsi-flexion of the hand at the wrist as illustrated by FIG. 7.

The grip may be removably secured to the vertical support struts and normally a bolt 20 and wing nut 22 are used to fit through holes 44 drilled into the struts to secure the hand grip therebetween. It will be understood that holes may be provided in the struts at varying levels to receive the bolt at varying levels so as to alter the effective lengths between the hand grip and the body support means 36 engaging the body's axilla so that individuals can obtain the proper adjustment for their arm lengths. Further, in order to prevent slippage of the palm

due to perspiration while using the grip, the surfaces thereof may be abraded, or otherwise coated, covered or modified so as to provide a slip-resistant surface thereon. Also the grip may be constructed of a light-weight material or it may be hollow so as to reduce its weight and rubber or the like coatings may be incorporated on the surfaces to provide additional comfort to the user. It is also to be understood that, while the hand grip described herein is of a size to accommodate a normal adult hand, the grip may be made with smaller or larger dimensions for use by, for example, children or persons with other than normal sized hands. Various other changes and modifications may be made within the scope of this invention as will be readily apparent to those skilled in the art. Such changes and modifications are within the scope and teaching of this invention as defined by the following claims.

What is claimed is:

1. A crutch comprising a ground-engaging support member, at least one vertical support strut extending from said ground-engaging support member, a body support member disposed in an anterior and posterior direction so as to receive a crutch user's axilla and positioned on the upper end of said vertical support strut, and a shaped hand grip attached to said vertical support strut, said hand grip having

- (a) a generally horizontally disposed upper surface shaped to accommodate substantially the entire palmar surface of the user's hand including the metacarpal-phalangeal pad, the mid-palm area, the thenar pad and the hypo-thenar pad thereof,
- (b) an overall size sufficient to prevent the user's four ulnar fingers from wrapping completely around said grip, thereby facilitating dorsi-flexion of the hand at the wrist and distributing the body's weight evenly over the palmar surface during use, and
- (c) one side converging anteriorly so as to form an angle of between about 20° and about 45° with the plane defined by the said body support member and the said vertical support strut, said side having a length sufficient to accommodate the user's four ulnar fingers.

2. The crutch of claim 1 wherein the hand grip is contoured so as to complement the natural contours of the user's hand.

3. The crutch of claim 1 wherein the hand grip is provided with a concavity at its anterior end to receive the user's thumb.

4. The crutch of claim 1 wherein the upper and lower surfaces of the hand grip are slanted downward laterally with respect to the said vertical support strut at a gradual angle and the lower surface is provided with an eminence.

5. A crutch comprising a ground-engaging support member which bifurcates into an anterior vertical support strut and a posterior vertical support strut, a body support member disposed to receive a crutch user's axilla extending horizontally and transversely of the support struts at their upper ends, and a shaped hand grip secured between said struts, said hand grip having:

- (a) a generally horizontally disposed upper surface

shaped to accommodate substantially the entire palmar surface of the user's hand including the metacarpal-phalangeal pad, the mid-palm area, the thenar pad and the hypo-thenar pad thereof,

- (b) a maximum horizontal dimension at least twice that of its maximum vertical dimension,
- (c) an overall size sufficient to prevent the user's four ulnar fingers from wrapping completely around said grip, thereby facilitating dorsi-flexion of the hand at the wrist and distributing the body's weight evenly over the palmar surface during use, and
- (d) one side converging anteriorly so as to form an angle of between about 20° and 45° with the plane defined by the said body support member and the said vertical support strut, said side having a length sufficient to accommodate the user's four ulnar fingers.

6. The crutch of claim 5 wherein the hand grip is contoured so as to complement the natural contours of the user's hand, and is provided with a concavity at its forward end to receive the user's thumb, and the upper and lower surfaces of the grip are slanted downward laterally with respect to said vertical support struts at a gradual angle.

7. The crutch of claim 5, wherein said hand grip has—the general overall shape of a truncated triangle when viewed from above having three major sides, a first major side facing medially with respect to the plane defined by said vertical support struts and the said body support member, a second major side facing laterally with respect to said plane, and a third major side facing backward and a smaller truncated side facing forward, the second major side converging anteriorly so as to form an angle of between about 20° and about 45° with the plane defined by the said vertical support struts and the body support member, said second major side having a length sufficient to accommodate the user's four ulnar fingers, said first major side having a concavity at its anterior end to receive the user's thumb, the surfaces and edges of said hand grip being contoured so as to complement the natural contours of the user's hand.

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J. KARL BELL, Primary Examiner

U.S. Cl. X.R.

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