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GB 1212248 A **US 5038811 A**
US 1761497 A

(58) Field of Search:
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INT CL **A01D, A61H, F16B**
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(54) Abstract Title: **Automatic limb support gripper**

(57) A gripping support for a user's limb comprises: a pair of curved jaws 1 mounted at one end to a frame 3 for pivoting movement about substantially parallel first axes 4, the jaws defining a U-shaped opening when not in use; a plate 2 pivotally mounted to the frame for movement about a second axis substantially perpendicular to said first axes, the plate extending into the U-shaped opening when not in use. A mechanical coupling interconnects the plate 2 and the jaws 1 so that insertion of a user's limb to rotate the plate about the second axis causes rotation of the jaws about the first to grip the user's limb. A spring acts between the jaws 2 to bias them to an open position and the inner end of the plate 2 cams against the inner ends of the jaws to move them against the bias.

The device may be fitted to an implement or aid and can accommodate a user's arm or leg. The plate 2 may carry an arm which moves therewith and supports detents which can engage the jaws 1 in their gripping position to hold them closed.

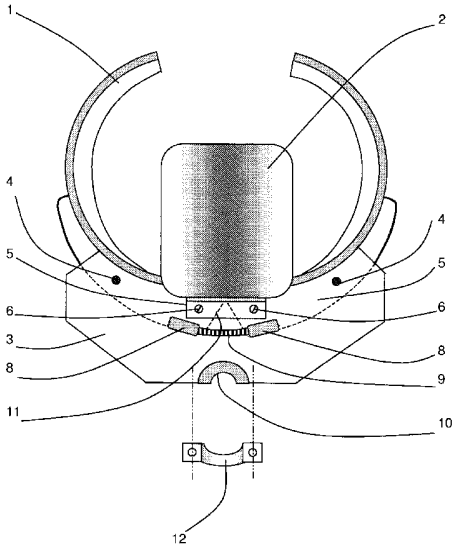

Fig 1

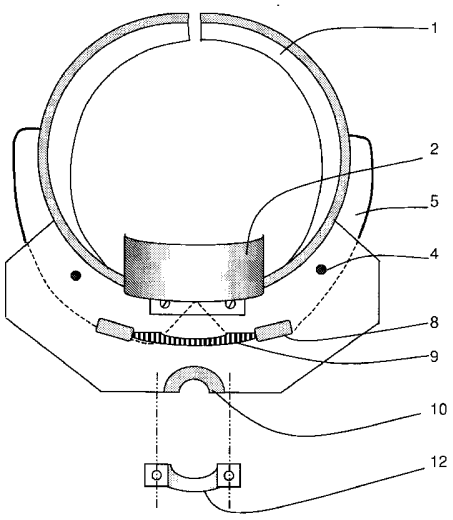

Fig 2

GB 2 434 828 A

GB 2434828 A continuation

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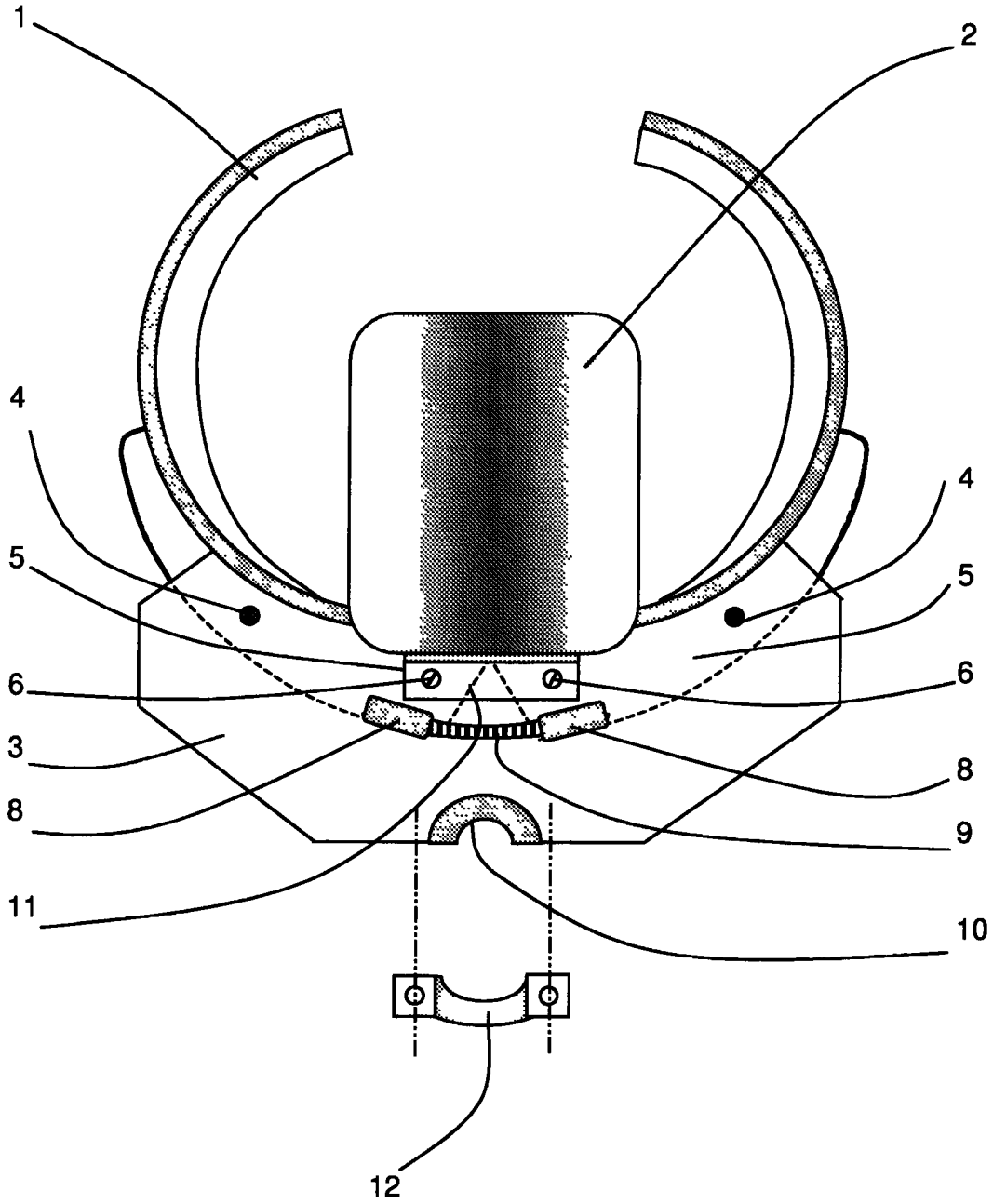

Fig 1

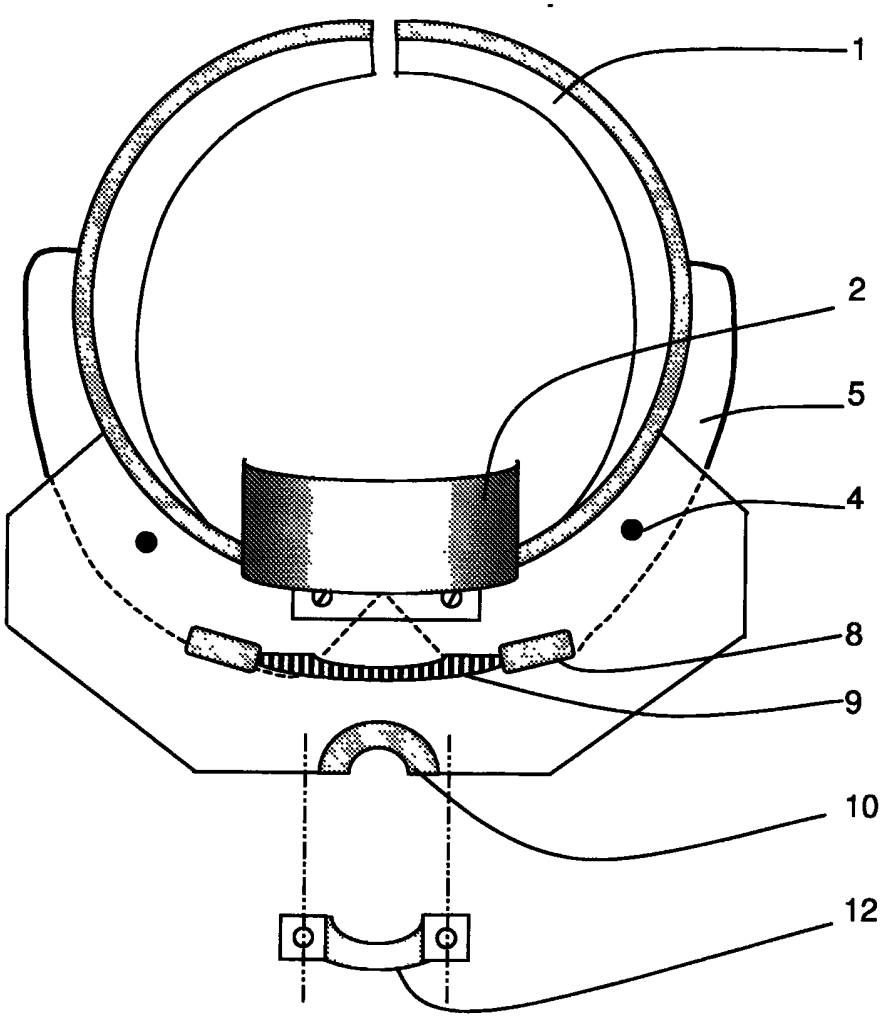

Fig 2

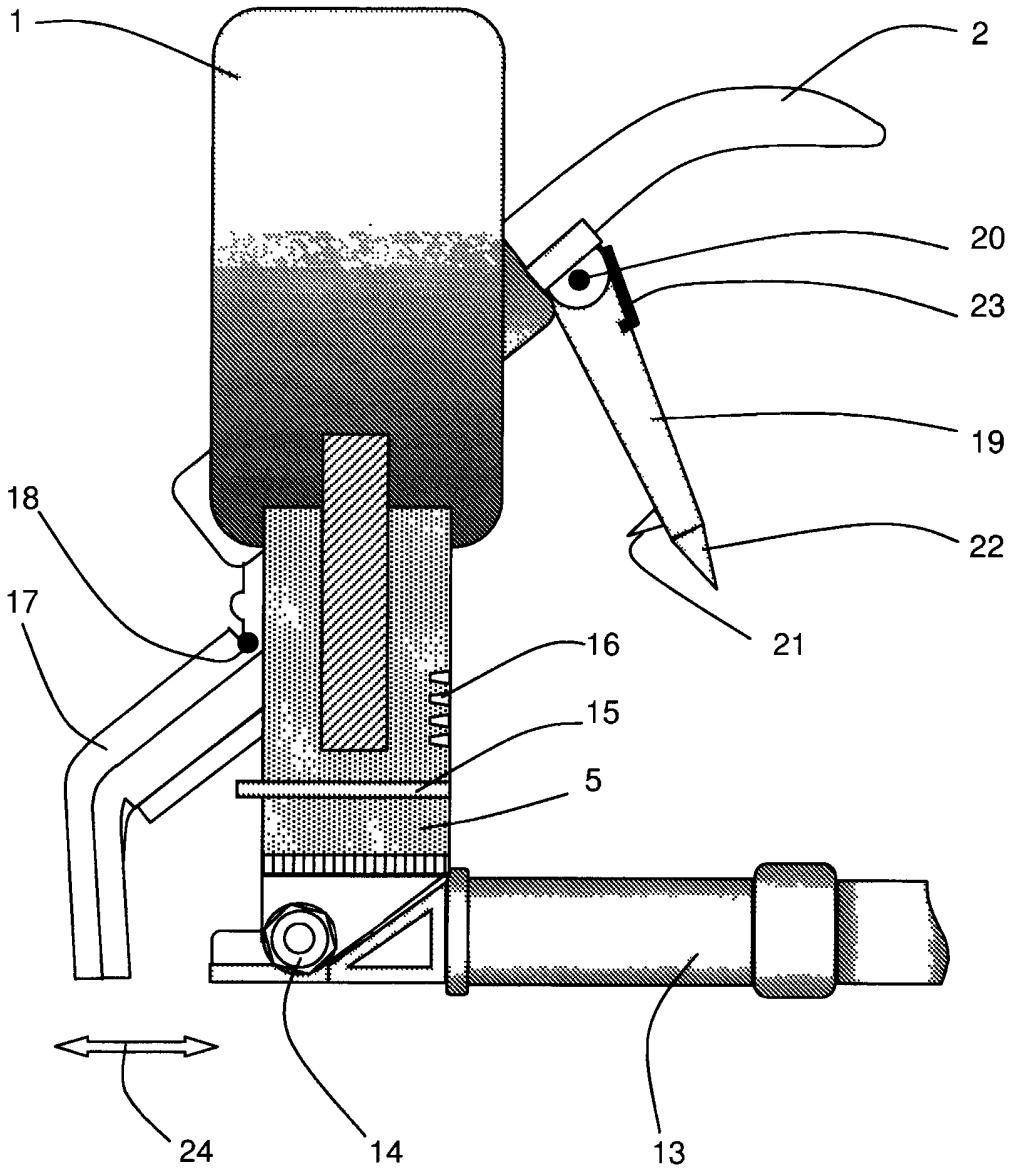

Fig 3

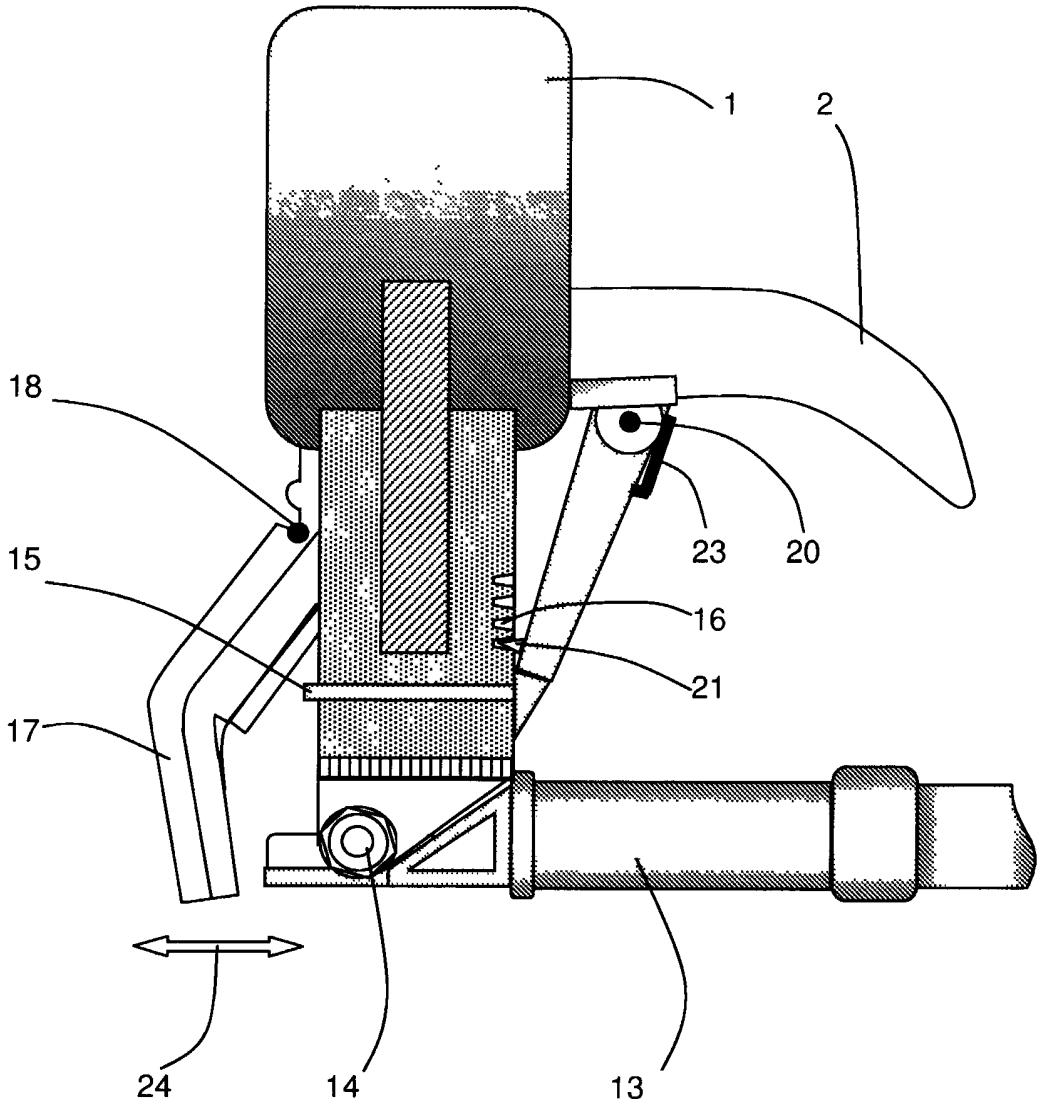

Fig 4

AUTOMATIC LIMB SUPPORT GRIPPER

Field of the Invention

The invention relates to devices arranged to grip and/or support a limb, typically the arm or forearm, of a user of an implement or appliance fitted with the device. It may be used with a variety of devices, such as medical crutches, metal detectors, brush cutters, rotary string trimmers, stilts, leg braces or other suitable devices.

Background to the Invention

There are a number of tools, implements, medical aids etc which require the user to place his arm or forearm into a support. These supports, sometimes referred to as cuffs, are usually U-shaped, providing an opening to accommodate varying girths of arm or forearm. The user normally inserts his forearm into the U-shape and grips a handle or other operative part of the device.

Other devices require a user to insert a leg into a support, such as in leg braces or stilts. Stilts may be worn for fun or for practical use, such as those used by plasterers to plaster ceilings, where ladders and/or trestles are impractical.

The known supports suffer from the fact that they are not normally adjustable, except perhaps at first fitting, especially in the case of medical appliances, such as crutches. However, the girth of a user's limb may vary considerably. This may mean that a user with a small arm (say) does not get adequate support from the device or, alternatively, a user with a large arm may not be able to slide it into the U-shape to get any support at all.

US patent No 5,038,811 discloses a crutch sleeve divided into two circumferential portions, one of which automatically opens under gravity when the cuff is pivoted upwardly, thereby enabling the user to insert an arm sideways into the cuff. US Patent No1,761,597 discloses a fishing rod holder attachable to an angler's leg and comprising a pair of spring loaded jaws operable to clamp a fishing rod when an over-centre catch is released. GB Patent No 1212248 discloses an over-centre clamping device comprising a resilient U-shaped part to which a pair of jaws are pivoted, pressure exerted in a direction towards the base of the U on a rod located loosely between the jaws causing

the jaws to grip the rod tightly. In none of these patents is the article to be supported or clamped inserted between jaws in the manner provided by the present invention.

There still remains a need, therefore, to provide limb support/grip that is adaptable to the individual user's physique without the need for elaborate and/or inconvenient adjustment.

Summary of the Invention

According to the invention, a gripping support for a user's limb comprises:

a pair of curved jaws mounted to a frame for rotation about substantially parallel first axes, the jaws defining a U-shaped opening when not in use;

a plate pivotally mounted to the frame for rotation about a second axis substantially perpendicular to said first axes, the plate extending into the U-shaped opening when not in use;

a mechanical coupling interconnecting the plate and the jaws so that rotation of the plate about the second axis causes rotation of the jaws about the first axes; whereby

insertion of a user's limb, in the direction of the first axes, into the U-shaped opening displaces the plate, causing the plate to rotate about the second axis and thereby to rotate the jaws about the first axes to engage the user's limb.

The invention also provides an appliance or implement fitted with such a gripping support device.

The invention also includes other preferred features as set out in the appended claims.

Brief Description of the Drawings

In the drawings, which illustrate an exemplary embodiment of the invention::

Figure 1 shows a device according to the invention viewed from above and with the jaws open;

Figure 2 shows the device of Figure 1 with the jaws deployed;

Figure 3 shows the device from a side, illustrating a locking mechanism in the unlocked condition; and

Figure 4 shows the locking mechanism in the locked condition.

Detailed Description of the Illustrated Embodiments

The invention is described in the context of a support for a user's forearm but it should be understood that the invention is equally suitable for use with a user's whole arm or a user's lower leg or whole leg. The principle of operation is the same whatever the limb.

The device has a pair of jaws 1 designed to grip the user's limb and an operating plate 2 designed to cause the jaws to move into a deployed position where they grip the user's limb. The plate 2 is pivoted to a frame, generally indicated at 3, by a hinge 5 held to the frame by screws or bolts 6. The jaws are pivotally mounted to the frame 3 by pivot pins 4. The jaws are connected by a tensions spring 9 held by anchors 8 to the jaws, so that when the device is not in use, the jaws are biased apart, as shown in Figure 1. The edges 11 of the jaws may engage each other or another part of the frame 3 to act as stops. The edge of the frame remote from the jaws is provided with a cut-out 10, co-operating with a clamp 12 to secure the device to an implement, such as the shaft of a crutch.

Figure 1 shows the jaws open, in the rest position. When a user inserts an arm over the plate and between the jaws, the plate deflects by rotation about its hinge 5. Cam surfaces (not shown) on the underside of the plate engage the near ends of the jaws and cause them to pivot about their pivot pins 4. This has the effect of closing the jaws around the user's arm, against the force of the spring 9. When the user's arm is fully inserted into the device, the jaws firmly engage the arm.

In the case where the device is fitted to a crutch, the user's arm is stably and firmly held in place, without the user needing to exert any tension in the arm to maintain the correct position of the crutch. This makes wearing more comfortable and enable the user to use the crutch for extended periods as desired.

In the case where the device is fitted to an implement of some sort, such as a garden/horticultural implement (a rotary string trimmer, for example) the

use of the implement is greatly improved because of the increased stability and comfort. Likewise, when the device is fitted to an implement intended to be attached to the user's leg(s), the gripping effect of the jaws increase comfort and stability. Suitable devices included leg braces/supports, splints, stilts, and possibly ski boots, skating boots and roller blade boots.

In a variation of the device shown in Figures 3 and 4, a locking mechanism is provided. When the device is attached to the user's limb, a latch can be operated to prevent inadvertent opening of the jaws. The device is shown fitted to a shaft 13 of an aid or implement etc by means of a bolt 14. The bolt may be of the self-locking type, permitting the device to be folded about the axis of the bolt.

Figure 3 shows the situation where the jaws 1 are open, the plate 2 is in a position partly blocking the jaw opening, and the lock is inoperative. A lever arm 19 is pivoted by a pivot pin 20 to the side of the plate 2. A spring 23, wrapped around the pivot pin 20, biases the arm 19 towards the frame 3. The end of the arm 19 remote from the pivot pin 20 has a protrusion 21 and a tapered end 22.

The frame 3 has a series of notches 16 positioned to engage the protrusion 21. A release pin 15 slides in a bore through the frame 3. A handle 17 is pivoted at 18 to the frame to operate and release the lock, as will now be described.

When the user inserts a limb over the plate 2 and between the jaws, the plate moves downwards (in Figure 3) to a position shown in Figure 4 where the protrusion enters one of the notches 16 and the tapered end 22 engages the frame 3, thereby preventing excessive force being applied to the protrusion and notches.. The user's limb keeps the plate in the Figure 4 position and the spring 23 keeps the protrusion in the notch. A number of notches (four are illustrated) are provided to accommodate different amounts of depression of the plate, depending on the girth of the user's limb.

A handle 17 is provided to release the device when the user wishes to remove it. The user presses against the handle 17 in the direction shown by arrow 24 so that the handle pivots about hinge pin 18 and a handle portion 25

engages the release pin 15. Continued pressure on the handle moves the release pin 15 within the bore towards the arm 19 and eventually pushes the protrusion completely out of the notch, at which time the plate 2 can move back into the Figure 3 position and the user can withdraw the limb completely from the jaws 1.

The invention therefore provides an automatic solution to the problem of supporting and/or gripping a user's limb when employing an implement or aid to which the device according to the invention is mounted.

The coupling between the plate 2 and the jaws 1 has only been described as a cam-type device, in which a cam surface or lobe is mounted to, or integrated with, the underside of the plate, and the cam engages directly with the ends of the jaws 1. This is the preferred construction. However, it is possible instead to replace the cam arrangement with intermeshing gears or a mechanical lever linkage.

CLAIMS

1. A gripping support for a user's limb, comprising:

a pair of curved jaws mounted to a frame for rotation about substantially parallel first axes, the jaws defining a U-shaped opening when not in use;

a plate pivotally mounted to the frame for rotation about a second axis substantially perpendicular to said first axes, the plate extending into the U-shaped opening when not in use;

a mechanical coupling interconnecting the plate and the jaws so that rotation of the plate about the second axis causes rotation of the jaws about the first axes; whereby

insertion of a user's limb, in the direction of the first axes, into the U-shaped opening displaces the plate and causes the plate to rotate about the second axis and thereby rotate the jaws about the first axes to engage the user's limb.

2. A gripping support as claimed in Claim 1, wherein the frame is provided with mounting means for mounting the frame to a shaft of an implement or aid.

3. A gripping support as claimed in Claim 2, wherein the mounting means is oriented so that the first axes are substantially parallel to the shaft when the gripping support is mounted to the shaft.

4. A gripping support as claimed in Claim 3, wherein said mounting means comprises a clamp to engage around the shaft.

5. A gripping support as claimed in any of Claims 1 to 4, comprising biasing means urging the jaws to form said U-shaped opening when not in use.

6. A gripping support as claimed in Claim 5, wherein said biasing means comprises a spring disposed between the jaws.

7. A gripping support as claimed in Claim 6, wherein said spring is a tension spring connected between the jaws.

8. A gripping support as claimed in any of Claims 1 to 7, wherein said mechanical coupling comprises a cam on one face of the plate and engageable with a cam surface on the jaws.

9. A gripping support as claimed in Claim 1, further comprising a latching mechanism to latch the jaws in a limb-engaging position when in use.

10. A gripping support as claimed in Claim 9, wherein said latching mechanism comprises a latching arm mounted to the plate, and a notch in the frame, the latching arm adapted to engage in the notch when the gripping support is in use.

11. A gripping support as claimed in Claim 10, wherein the latching arm is provided with a protrusion adapted to enter the notch.

12. A gripping support as claimed in Claim 10 or 11, wherein the latching arm is pivotally mounted to the plate.

13. A gripping support as claimed in Claim 12, further comprising a spring to bias the latching arm resiliently towards the notch.

14. A gripping support as claimed in Claim 13, wherein the spring is a torsion spring disposed around a pivot for the latching arm.

15. A gripping support as claimed in any of Claims 9 to 14, further comprising a release handle to disengage the latching mechanism from an engaged position.

16. A gripping support as claimed in Claim 10, wherein a release pin is mounted for sliding movement within a bore in the frame and said release handle is pivoted to the frame to engage the release pin and cause it to slide in the bore to disengage the latching arm from the notch when the handle is operated by a user.

17. A gripping support as claimed in Claim 10, wherein said notch is one of a plurality of notches provided in the frame.

18. An appliance or implement fitted with a gripping support as claimed in any of the preceding claims.

19. An appliance or implement as claimed in Claim 18, wherein said appliance or implement is selected from the group consisting of a garden implement, a crutch, or an item of footwear.

20. A gripping support substantially as herein described with reference to the accompanying drawings.

21. An appliance or implement substantially as herein described with reference to the accompanying drawings.

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Application No:	GB0616074.1	**Examiner:**	Philip Silvie
Claims searched:	1-19	**Date of search:**	13 December 2006

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A	1	US 5038811 A (JOHNSON) see figs. 4,5
A	1	US 1761497 A (GAROFF) see fig. 4
A	1	GB 1212248 A (WESTHEM) see figs. 5,6

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC[X] :

E2A

Worldwide search of patent documents classified in the following areas of the IPC

A01D; A61H; F16B

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC