A prosthetic limb (10) for a below-the-elbow amputee is constructed having a removable effector (16) removably mounted in a mount (18) having semicircular bands (20) set by “hand lapped” construction in sides of a body (12) near a closed end (22) thereof. The effector (16) is offset from the body (12) and is provided with supports (60, 62), each having a C-shaped slot (64, 66) for receiving a horizontally oriented bar, such as that on a chainsaw. A pair of semi-circular gripping members (68, 70) are pivotally mounted by pins (72, 74) near a closed end of the slots (64, 66) and are biased closed by a C-shaped leaf spring (90) disposed about an outer periphery of the members (68, 70).

14 Claims, 3 Drawing Sheets
DETAILED DESCRIPTION OF THE DRAWINGS

Referring initially to Fig. 1, a prosthetic device is shown for a below-the-elbow amputee, the device being adapted to allow the amputee to easily work with horizontal tubular objects such as the bar on a chainsaw, the handle of a push cart, dumbbells involved with weight lifting, etc., this bar being illustrated in Fig. 1 by dashed lines. In this device, a cast-like, hollow body is constructed to fit over the stump of the forearm and is conventionally held in place with straps (not shown) particular to those found in the art. Body 12 is also constructed to allow lifting of heavy objects and yet be as lightweight as possible. One example of such construction is found in the manufacture of high-quality recreational boat hulls wherein fiberglass netting impregnated with uncured, liquid resin mixed with hardener is placed on a core to form the hull. This "hand-lapped" construction in a prosthetic limb, yields a strong, durable, lightweight device with a fitting, or effector assembly 14, that will not become loose due to vibration or heavy use.

Effector assembly 14, as shown in the drawings, is constructed of two parts, a detachable effector 16 and a mount 18. Mount 18 is provided with anchor bands 20 of a semi-circular or circular shape, with bands 20 embedded in body 12 and wrapped with fiberglass netting 19 utilizing the "hand-lapped" construction described above. Bands 20 are positioned adjacent to each 22 of body 12 and are set in body 12 to partially or wholly encircle sides of body 12 (dotted lines) such that mount 18 is offset from an axis longitudinally extending through body 12. Thus, with plastic-coated fiberglass webbing wrapped around anchor band 20 and set in body 12 as described, a tough, durable anchoring is provided for mount 18. On the other side of mount 18 is a receptacle 24 having opposed, elongated receiving lugs 26 and 28 (Figs. 1 and 2). Lugs 26 and 28 each are constructed with inner facing walls 30 and 32 (Fig. 2), respectively, with opposed grooves 34 and 36 cut in facing walls 30 and 32. Bolts 38 serve to lock effector 16 in place and are threaded into threaded openings 44 (only one shown in Fig. 3) in lower sides of lugs 26 and 28, with openings 44 communicating as shown with grooves 34 and 36.

For removably mounting effector 16 in mount 18 and referring to Fig. 2, a quick disconnect means having opposed upper edges 46 and 48 of effector 16 are each provided with elongated, outwardly-extending opposed rails or flanges 50 and 52 which slidably engage grooves 34 and 36 of lugs 26 and 28. Bolts 38, when tightened,
bear on bottoms 54 and 56 of rails or flanges 50 and 52, clamping effector 16 in place in receptacle 24.

Effector 16 is further configured with spaced downwardly-extending supports or support arms 60 and 62, which are formed on and extend from upper edges of band 48, respectively. Supports 60 and 62 are provided with aligned C-shaped slots 64 and 66 positioned in supports 60 and 62 such that the open region of slots 64 and 66 faces forward of body 12. Supports 60 and 62 serve to receive weight or other forces applied to effector 16 when a horizontal, tubular member is held in slots 64 and 66.

For generally providing gripped engagement with a tubular handle or object positioned in slots 64 and 66, a pair of opposed, upper and lower half C-shaped clamping or gripping members 68 and 70 are pivotally mounted as shown between supports 60 and 62. Gripping members 68 and 70 pivot around pins 72 and 74 located as shown near the closed ends of slots 64 and 66, which pins extend through supports 60 and 62 and the respective gripping member. Additionally, gripping members 68 and 70 extend circularly past edges 76 and 78 (FIG. 3) of slots 64 and 66 in supports 60 and 62. Alternatively, one or the other of gripping members 68 and 70 may be fixed in place or be integral with supports 60 and 62, with the other gripping member disposed in pivoting relation between supports 60 and 62. Ends 80 and 82 of gripping members 68 and 70 define a gap 84 through which a tubular object is forced into slots 64 and 66. For providing gripped engagement with a bar or tube, the outer periphery of gripping members 68 and 70 are provided with a groove or recess 88 (FIGS. 2 and 3) within which a C-shaped spring 90 is fitted. Spring 90 serves to bias gripping members 68 and 70 together in closed relation with respect to gap 84, loosely holding or gripping a bar in slots 64 and 66. If desired, frictional or protective pads (not shown) may be placed along inner surfaces of slots 64 and 66 and gripping members 68 and 70 to effect a frictional engagement of a bar or when it is desired not to mar surfaces of the bar. Additionally, the degree of gripping forces exerted by the gripping members may be adjusted by adding additional springs or changing the spring in gripping members 68 and 70 to a stiffer or less stiff spring.

In use, the wearer of the prosthetic device forces a bar or tubular handle, such as the bar on a chainsaw, into gap 84, forcing gripping members 68 and 70 to pivot slightly against spring 90 and admit the bar into slots 64 and 66 of supports 60 and 62. The bar may then be lifted or pushed by the user, with weight associated with the bar, such as a chainsaw, bearing on or against supports 60 and 62. To release the bar, the user forces the bar outward through gap 84 defined by gripping members 68 and 70.

Having thus described our invention and the manner of its use, it is apparent that incidental modifications may be made thereto which fairly fall within the scope of the following appended claims, wherein we claim:

1. A prosthetic device for a below-the-elbow amputee that will allow the amputee to lift and manipulate horizontally disposed bars and tubes comprising:
   a generally hollow body having an open end disposed to receive a stump of a forearm of the amputee;
   a mounting assembly anchored in an opposite end of said body and having a receptacle on one side, said receptacle being offset from an axis extending through said body; and
   an effector disposed for removable mounting in said receptacle, said effector comprising:
   a pair of support means each defining a C-shaped slot, with an open region of said slot facing forward of said body in a plane along said axis for receiving lifting or pushing forces applied to said bar,
   gripping means including at least one semicircular gripping member positioned between said pair of support means and partially encircling the open region of said slot at one end, defining a gap therein, and disposed for pivotal movement at an opposite end near a closed end of said slot for holding said bar in said slot, and
   biasing means coupled to said gripping member for biasing said gripping member toward said slot, for holding said bar within said slot, whereby as said bar is forced into said gap, said gripping member being urged away from said slot, allowing passage of said bar into or out of said slot.

2. A prosthetic limb as set forth in claim 1 wherein one end of said mounting assembly is provided with opposed semi-circular bands rigidly set by hand lapped construction in sides proximate said opposite end of said body.

3. A prosthetic limb a set forth in claim 1 wherein said effector comprises a pair of opposed, outwardly-extending rails on said effector, and said mounting assembly is provided with opposed, downwardly-extending lugs having inner facing walls, with an aligned groove in each of said facing walls, for receiving said rails, and locking bolts threadably engaging threaded openings in lower sides of said lugs, said openings in communicating relation with said grooves, clamping against said rails and holding said effector in place.

4. A prosthetic limb as set forth in claim 1 wherein said biasing means comprises a semi-circular left spring disposed in a peripheral groove in said gripping member for biasing said gripping member toward said slot.

5. A prosthetic limb as set forth in claim 1 wherein said gripping means comprises a pair of opposed, semi-circular gripping members pivotally mounted between said support members, each pivotally mounted at one end near said closed end of said slot.

6. A prosthetic limb for a below-the-elbow amputee which will allow the amputee to lift and manipulate horizontally disposed bars and tubes comprising:
   a generally hollow body having an open end disposed to fit over the stump of a forearm of the wearer;
   a mount anchored in an opposite end of said body, said mount having a receptacle offset from an axe extending through said body; and
   an effector disposed for removable mounting in said receptacle, said effector comprising:
   support means for applying lifting and pushing forces to a bar, said support means having a C-shaped slot for receiving said bar, with an open region of said slot facing forward of said body,
   at least one semi-circular gripping member having one end disposed for partially encircling an open end of said slot and defining a gap therein and pivotally mounted at an opposite end near a closed end of said slot, for holding a bar in said slot, and
   biasing means connected to said gripping member for biasing said gripping member toward said slot and against said bar.
7. A prosthetic limb as set forth in claim 6 wherein said mount comprises a circular band set in said opposite end of said body.
8. A prosthetic mount as set forth in claim 7 wherein said effector comprises opposed, outwardly-extending rails, and said receptacle is provided with opposed lugs having facing surfaces, with opposed grooves in said facing surfaces for receiving said rails.
9. A prosthetic limb as set forth in claim 8 wherein said gripping member comprises a pair of opposed, semi-circular gripping members pivotally mounted at one end near a closed end of said slot.
10. A prosthetic limb as set forth in claim 9 wherein said biasing means comprises a C-shaped leaf spring fitted around an outer periphery of said gripping members.
11. A prosthetic limb as set forth in claim 10 comprising a locking bolt threadably engaging a threaded opening in at least one of said lugs, said opening communicating with one of said grooves, for bearing against one of said rails and locking said effector in said lugs.
12. A prosthetic device for a below-the-elbow amputee that will allow the amputee to lift and manipulate bar-like members, comprising:
a cuff having a closed end and an open end disposed for receiving the stump of a forearm of the amputee;
a support member carried adjacent to said closed end of said cuff and provided with opposed spaced faces, each having a groove therein;
an effector assembly including gripping means for peripherally engaging said bar-like member for gripped engagement therewith; and
quick disconnect means secured to said effector assembly comprising a pair of opposed flanges, each disposed for slidably engaging one of said lugs and means for securing each said flange in each said groove.
13. A prosthetic device as set forth in claim 12 wherein said gripping means includes a pair of opposed clamping members and biasing means for biasing said clamping members into and out of said gripping means thereon, each said support arm depending from a said flange of said quick disconnect means.