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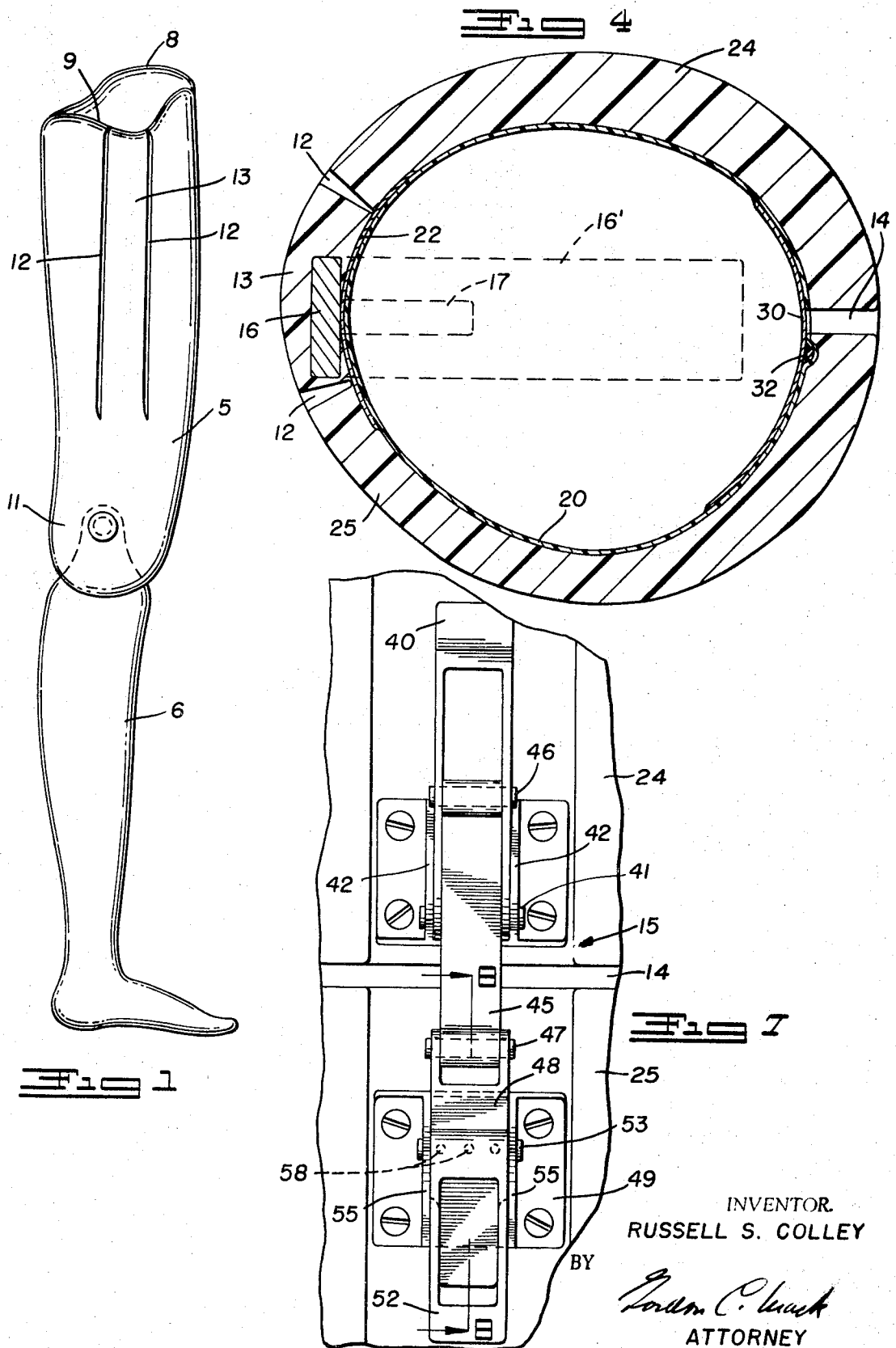
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3,545,009

AMPUTEE SOCKET

Filed Nov. 20, 1968

3 Sheets-Sheet 1



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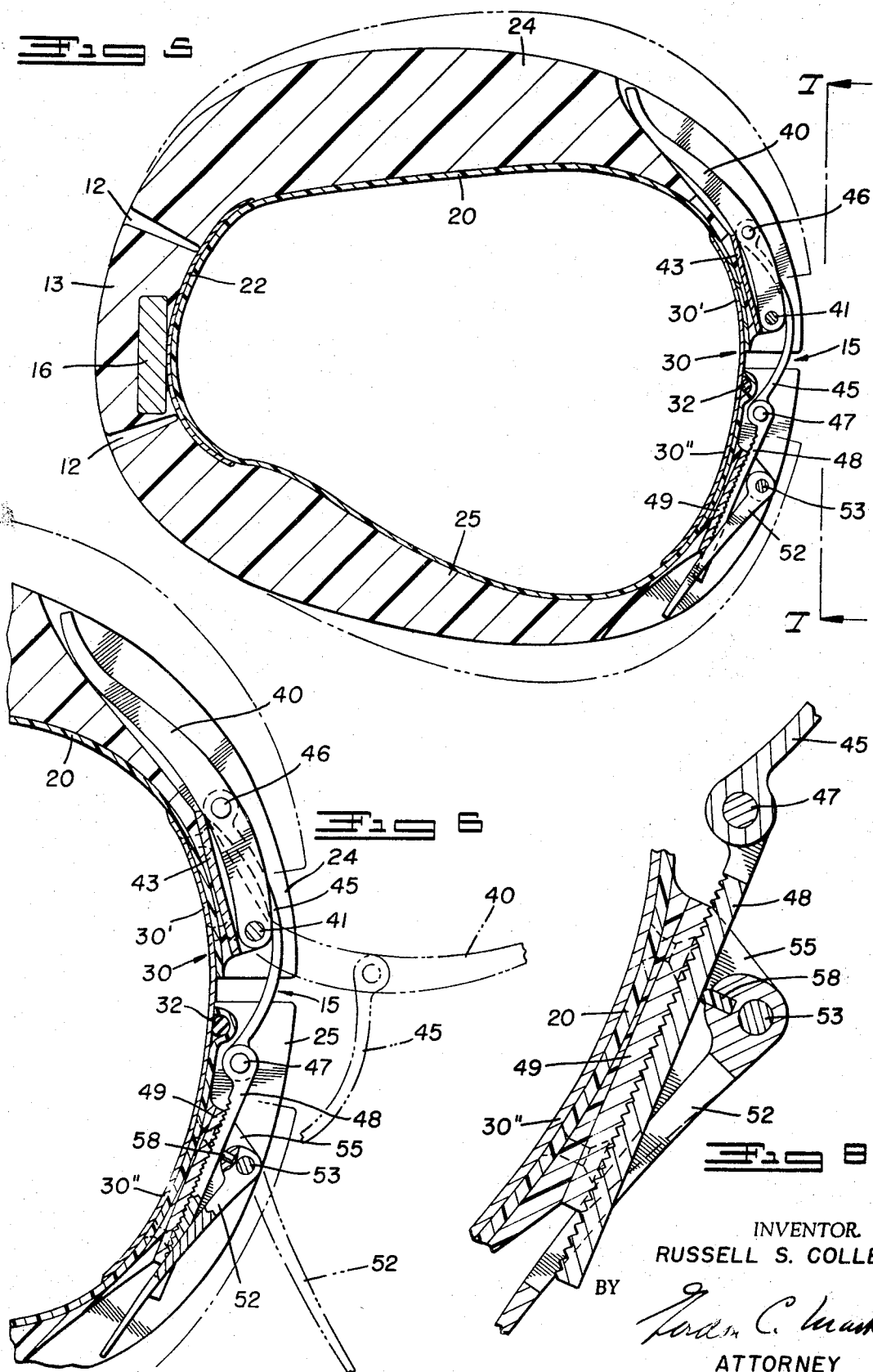
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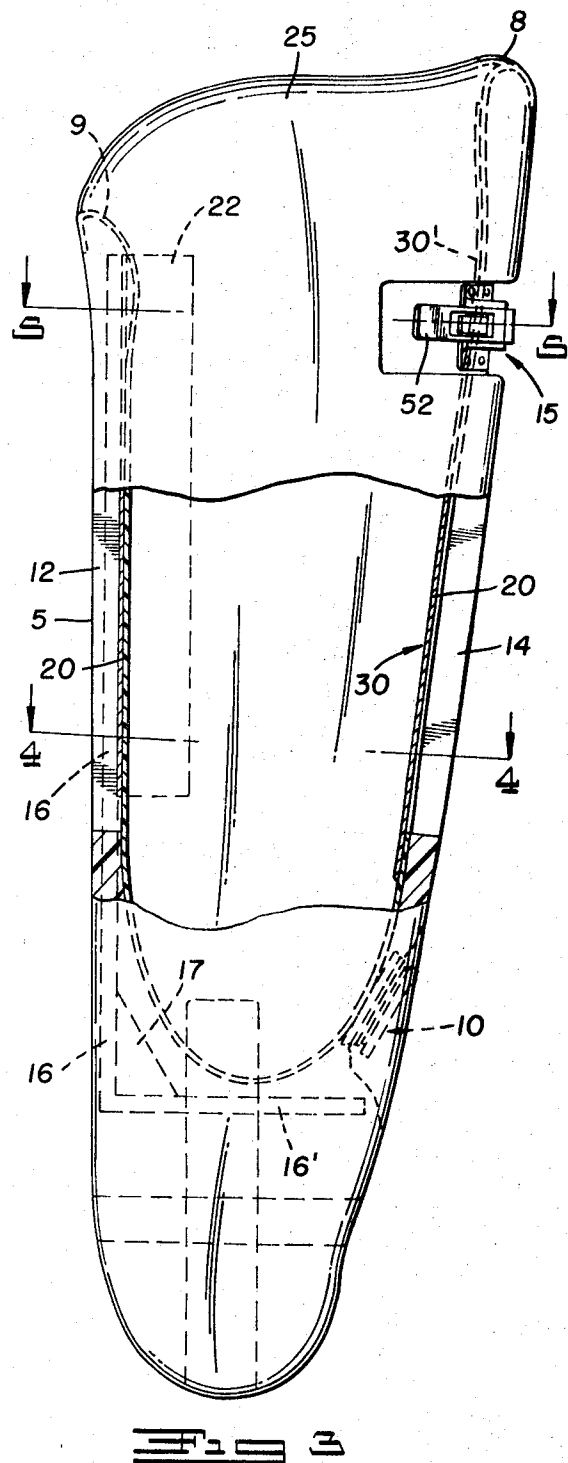
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AMPUTEE SOCKET

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6 Claims

ABSTRACT OF THE DISCLOSURE

A socket for an amputee is provided with a slot which extends to the upper edge operated by a clamp, preferably a clamp with a variable bite so that the cavity within the socket can be adjusted to the size of a stump, and if the clamp has a variable bite the size of the socket can be varied from time to time without removal from the stump.

This invention relates to a socket for an amputee. Although it will be described more particularly in connection with a socket for a person whose leg has been amputated above the knee, a socket such as disclosed can be used by one whose leg has been amputated below the knee, or one whose arm has been amputated above or below the elbow.

The upper portion of the socket is slit, and it is provided with a clamp, preferably one having a variable bite, so that the cavity within the socket can be readily enlarged for insertion of the amputated limb, and can then be closed. The advantage of using a clamp with a variable bite is that the diameter of the cavity can be adjusted, even after the amputated limb is positioned in it, by varying the extent to which the slit is closed.

In applying a socket, an amputee slips one end of a long cloth sleeve over the amputated limb, and feeds the other end into the socket and through a valved opening near the base of the socket. Then, as his limb is fitted into the socket, the sleeve is removed through the opening, and the valve is closed. The tight fit of the socket around the limb seals the limb in the socket and it is held there by negative pressure. The procedure may be followed with the socket of this invention, but under the proper circumstances the sleeve may be omitted.

The present sockets are uncomfortable because the diameter of the limb is not constant. Heat enlarges it; cold contracts it. Furthermore, the use of the limb may cause the diameter of the limb to vary, because, for example, a foot increases in diameter after walking or standing a long time, and the diameter is usually greater at night than in the morning. An advantage of the socket of this invention is that its diameter can easily be increased or decreased without removing it from the limb.

The invention is further described in connection with the accompanying drawings, in which—

FIG. 1 is a side view of a socket for a leg amputated above the knee, with a lower artificial leg pivotally attached;

FIG. 2 is a side view of the socket taken from the inner side;

FIG. 3 is a front view of the socket on line 3—3 of FIG. 2;

FIG. 4 is a section through the socket on line 4—4 of FIG. 3;

FIG. 5 is a section through the socket at the clamp on line 5—5 of FIG. 3;

FIG. 6 is an enlarged partial view of the same, showing movable parts of the clamp in the open position, in dotted lines;

FIG. 7 is an enlarged view of the front of the clamp on line 7—7 of FIG. 5; and

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FIG. 8 is an enlarged view of the adjustment mechanism of the clamp.

The socket 5 is fitted with a removable lower leg 6 in any usual manner. The socket may be of any suitable composition such as wood or plastic or a plastic reinforced with fiberglass, etc. there is nothing novel about the general shape of the socket, the upper edge 8 being higher than the edge 9 to fit tight under the crotch. The removable valve 10 (FIG. 3) is of any usual design. The socket is depressed at 11 to accommodate the upper portion of the lower limb.

Slots 12 are provided on one side of the socket to separate the sides of the rigid segment 13 from the rest of the socket, the bottom of segment 13 being integral with the socket. The slot 14 on the other side of the socket permits the parts of the upper portion of the socket to be separated and brought together by the clamp 15 in order to change the size of the cavity within the socket. The socket must be rigid or the amputee cannot manipulate it readily. He cannot walk easily if it is loose on a leg, and he cannot move his hand accurately if it is loose on an arm. The segment 13 is therefore reinforced with a metal bar 16 which includes the angular extension 16'. This bar 16 extends through segment 13 into the balance of the socket. The angle of the extension 16' is held constant by the plate 17 which is adhered to the bar 16.

The inner surface of the socket is completely covered with an innerlining 20, usually formed of plastic and fiberglass. This lining must be nontoxic and must maintain the negative pressure within the socket. Under this coating 20 is a hinge plate 22, usually metal such as stainless steel, which is adhered to the bar 16, the segment 13 and the front and back portions 24 and 25 of the socket. Opposite the plate 22 is the sheet of stainless steel or the like 30 which lies over the lining 20.

The portion 30' is adhered to the lining, and the portion 30'' slides over the lining as the clamp is opened and closed. The stump forces this plate 30 outward to maintain negative pressure within the socket. As the slot 14 is widened and narrowed, the elastomeric O-rod 32 maintains a seal between the plate 30 and the lining 20 so as to maintain negative pressure in the socket. It extends below the bottom of slot 14.

The clamp 15 is a toggle-type clamp of variable bite. It is operated by lever 40 pivoted at 41 to projections 42 (FIG. 7) on the base plate 43 which is adhered to the socket. The connecting link 45 is pivoted at one end by pivot 46 to lever 40 and at the other end by pivot 47 to the adjustment arm 48 which is corrugated on its inner surface. The portion of base plate 49 contacted by arm 48 is corrugated on its outer surface. The two sets of corrugations are evenly spaced so that these surfaces may be mated in any position, permitting the width of the slot 14 to be varied as desired by merely mating the corrugations in different positions. Cam closure lever 52 is pivoted at 53 between projections 55 on base plate 49, adhered to the socket, and nylon button 58 keeps the lever 52 and arm 48 locked in any previously selected position.

By lifting lever 40, the clamp is opened to fit the socket over the stump. After the stump is properly positioned in the socket, the clamp is closed. Lever 40 when closed returns the sides of the slot to any predetermined position. The circumference of the cavity within the socket may be varied at any time by lifting cam lever 52 and adjusting the position of the mating corrugations to control the width of the slot, and this can be done without breaking the negative pressure within the socket.

The drawing and description are illustrative.

The invention is described in connection with a socket slit in three places. It is to be understood that the invention is not limited to this particular adaptation. In a

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socket of different wall composition, a single slot, opened and closed by the clamp, may be all that is required.

The addition of a circumferential slot at or near the bottom of the longitudinal slot, on one or both sides of the longitudinal slot, is not precluded.

Any suitable means may be used for opening and closing the slot 14. It is not necessary that a clamp be used. The selected size of the cavity must be maintained rigidly.

The invention is covered in the claims which follow.

I claim:

1. In an artificial leg having a socket member for receiving the stump of an amputee, said socket comprising a generally cylindrical socket member having an open end and a closed end; longitudinal first slot means in the side of said socket member extending from the open end thereof and forming a tongue-like element integral with said socket member; and adjusting means opposite said tongue-like element for fixed control of the surface of said socket member; said adjusting means comprising other slot means, means to seal said other slot means to maintain negative internal pressure within the socket and means to vary the width of said other slot means.

2. The socket of claim 1 in which the means for controlling the circumference is a toggle clamp.

3. The socket of claim 2 in which the toggle clamp has a variable bite.

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4. In an artificial leg having a socket member for receiving the stump of an amputee, said socket comprising a generally cylindrical socket member having an open end and a closed end, slot means in the wall of said socket member extending from the open end thereof whereby the circumference of the upper end of the socket member may be varied, variable clamp means spanning the slot to effect fixed control of said circumference, and means to seal the slot means to maintain negative internal pressure within the socket.

5. The socket member of claim 4 in which the clamp is a toggle clamp with a variable bite.

6. The socket member of claim 4 which is hinged opposite the slot.

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