

Otto Bock

2.3. 4

TECHNICAL INFORMATION

OTTO BOCK ORTHOPÄDISCHE INDUSTRIE GmbH & Co · Postf. 12 60 · D-37105 Duderstadt · Tel. (0 55 27) 8 48-0
 OTTO BOCK (A/ASIA) Pty.Ltd. · 67-69 Regent Street · AUS-Chippendale, NSW 2008 · Phone (02)6 99 68 52
 OTTO BOCK ORTHOPEDIC INDUSTRY of CANADA · 2897 Brighton Road · Oakville L6H 5S3 · Tel. (905) 8 29-20 80
 OTTO BOCK ORTHOPAEDIC (U.K.) Ltd. · 32 Parsonage Rd. · Egham, Surrey TW 20-0JW · Phone (07 84) 3 88 41
 OTTO BOCK ORTHOPEDIC INDUSTRY Inc. U.S.A. · 3000 Xenium Lane North · Minneapolis/Minnesota 55441

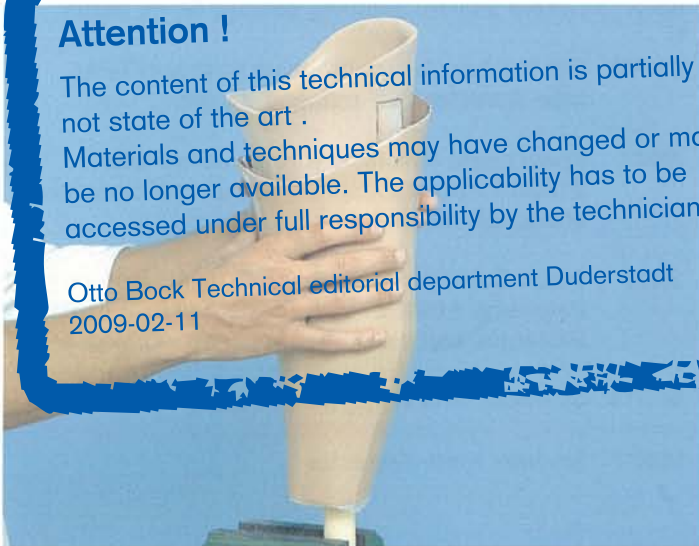


OTTO BOCK Modular Above Knee Prosthesis

Attention !

The content of this technical information is partially not state of the art .
 Materials and techniques may have changed or may be no longer available. The applicability has to be accessed under full responsibility by the technician.

Otto Bock Technical editorial department Duderstadt
 2009-02-11



Lamination of the Socket and Connection Sleeve

Fitting and Shaping the Foam Cover

1 Introduction

After trial walking has taken place (as described in TI 2.3.3) the socket, which may be plastic or wood, is laminated and finished.

Carbon fiber webbing is used to reinforce the distal area of the perlon stockinette lay-up ensuring stable knee joint attachment.

A connection sleeve for attaching the foam cover to the socket is fabricated of ORTHOCRYL Resin. This sleeve is fit

and bonded into the foam cover and then attached to the socket with screws.

Distal connection of the foam to the prosthesis is provided first by bonding a standard foot connection cap/plate to the distal end of the foam cover and then attaching it to the foot. The cosmetic foam cover thus remains a detachable component, further emphasizing the advantages of the OTTO BOCK Modular Prosthetic System.

2 Materials

- 616G12 Carbon Fiber Webbing, width: 120 cm;
weight: approximately 200 g/m²
- 623T3 Perlon Stockinette, widths: 12, 15 and 20 cm
- 617H19 ORTHOCRYL Lamination Resin 80 : 20
900 g, 4600 g and 25 kg containers
- 617H21 ORTHOCRYL Sealing Resin,
900 g, 4600 g and 25 kg containers
- 617P37 Hardener Powder for 617H19 and 617H21,
30 g and 150 g bags
- 617Z2 Pigment Paste, caucasian color,
180 g tube and 1000 g container
- 99B8 PVA Bags, dimensions: 70 × 27 × 5 cm and
130 × 26 × 5 cm
- 616F4 PVA Sheeting, widths: 76 and 130 cm;
thickness: 0.08 mm
- 636K6 Plastilin Putty, 500 g
- 616F10 Double Face PVC Tape, width: 19 mm; 55 m roll
- 627B1 Linen Adhesive Tape, widths: 19, 25 and 50 mm;
50 m roll

- 507S15 Star Washer -stainless steel-
- 501S45 Truss Head Screw -stainless steel-
- 636W17 Plastic Adhesive, 680 g container
- 636K13 Loctite 241 for securing screws, 50 ml bottle
- 21Y76 Flat Rubber Valve with Valve Seat and Tube,
tube diameters: 21 mm and 24 mm
- 3R6 Foam cover for Modular Knee Joints with
21B30 External Extension Assist, calf circumfer-
ences: 36, 40, and 44 cm
- 3R24 Foam Cover for Modular Knee Joints with Internal
Extension Assist or with 99B17 Modular Knee
Protector, calf circumferences: 36, 40, and 44 cm
- 99B14 Cosmetic Stockings -various sizes-
- 99B17 Modular Knee Protector

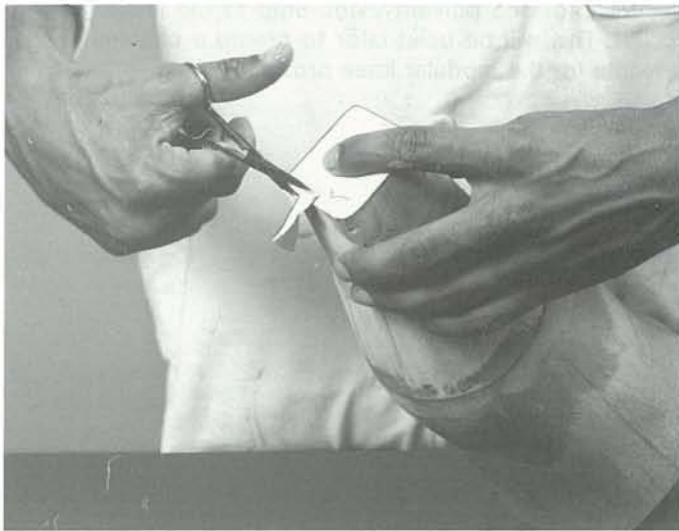
3 Socket Lamination



3.1 Lamination of a Plastic Socket

Loosen the four adjustment screws on the socket adaptor and detach the lower leg.

Seal off the valve hole with linen adhesive tape on the interior and plastilin putty on the exterior.



Fill the screw holes in the socket attachment block with plastilin putty, then cover with linen adhesive tape.

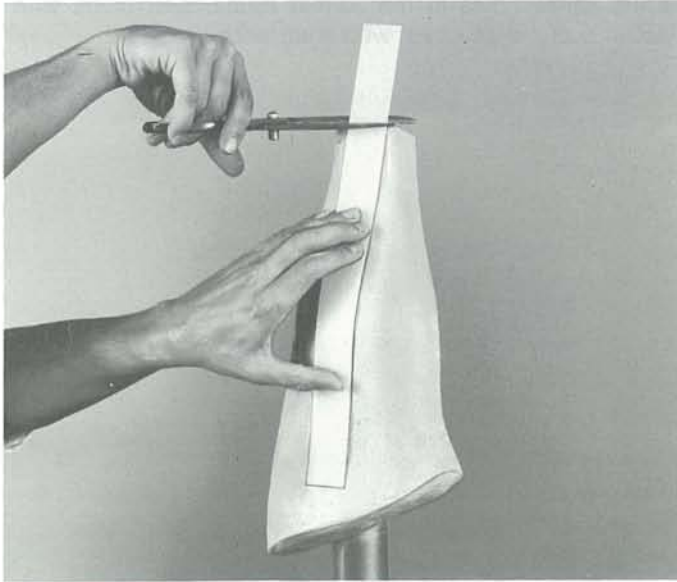


Fill the socket $\frac{3}{4}$ full of sand. Position the vacuum pipe and then anchor it in place with plaster.



Seal the PEDILEN foam, socket attachment surface and plaster with colored sealing resin. Glue in a 507S15 Star Washer for the later attachment of the 99B17 Modular Knee Protector.

Seal the surface in one continuous step using the following mixture: approx. 100 g ORTHOCRYL Sealing Resin, 2 g Pigment Paste, and 3 g Hardener Powder. Clean the brush immediately afterwards in acetone.



Cut the provided polyethylene strip to the length of the socket. This will be used later to create a channel in the laminate for the modular knee protector strap.



Two to four layers of 623T3 Perlon Stockinette are used in the socket lay-up. 616G12 Carbon Fiber Webbing is used to additionally reinforce the distal socket area.

With 616F10 Double Face Tape applied to the surface securing the edges, cut two 5 cm by 40 cm lengths of carbon fiber webbing. Apply to the socket lateral to medial and anterior to posterior as illustrated.



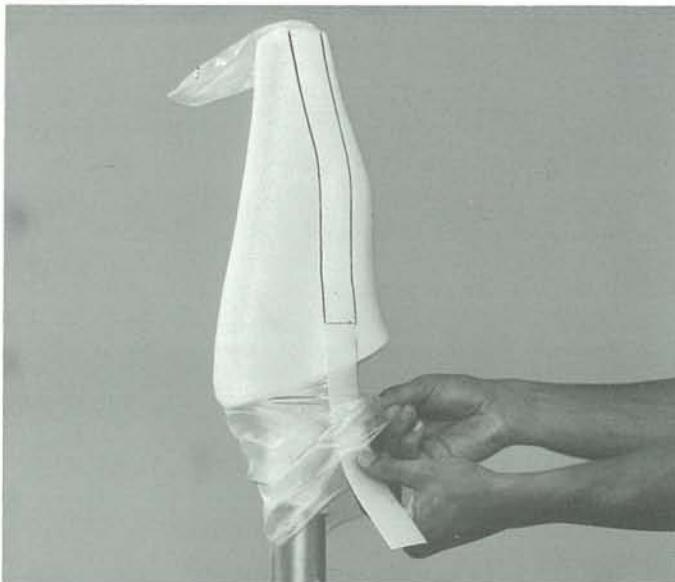
Lateral to medial and anterior to posterior.

Cut a piece of perlon stockinette double the socket length and pull half of it over the socket. Tie off the distal end and pull the remaining half back over the socket.



Cut a second double length of stockinette, turn it inside out and repeat the previous step for the second double layer of stockinette. This ensures a better final appearance of the completed laminated surface.

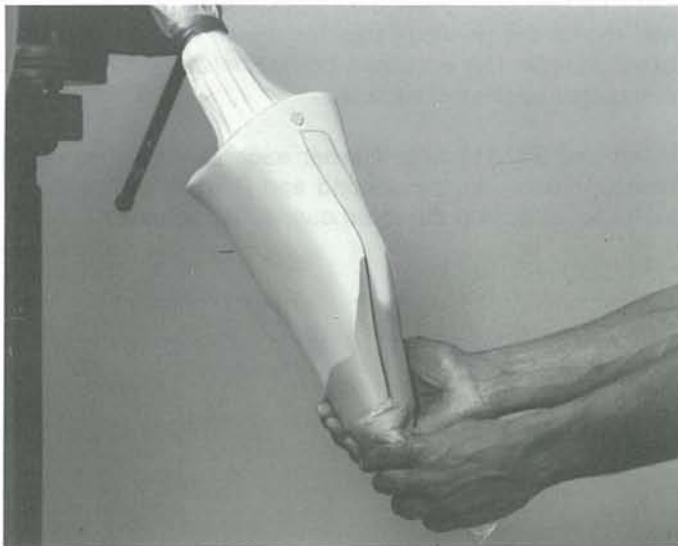
Insert one 507S15 Star Washer each at the anterior and posterior between the second and third layers of stockinette for attaching the foam connection sleeve.



Pull a moist PVA bag over the socket and insert the cut polyethylene strip between the bag and lay-up, the strip's path is outlined here for illustration purposes only.



Mix. approx. 200 g 617H19 ORTHOCRYL Lamination Resin with 4–6 grams 617Z2. Pigment Paste and 6 grams 617P37 Hardener Powder. Pour this mixture into the bag and tie it off with an air-tight seal.

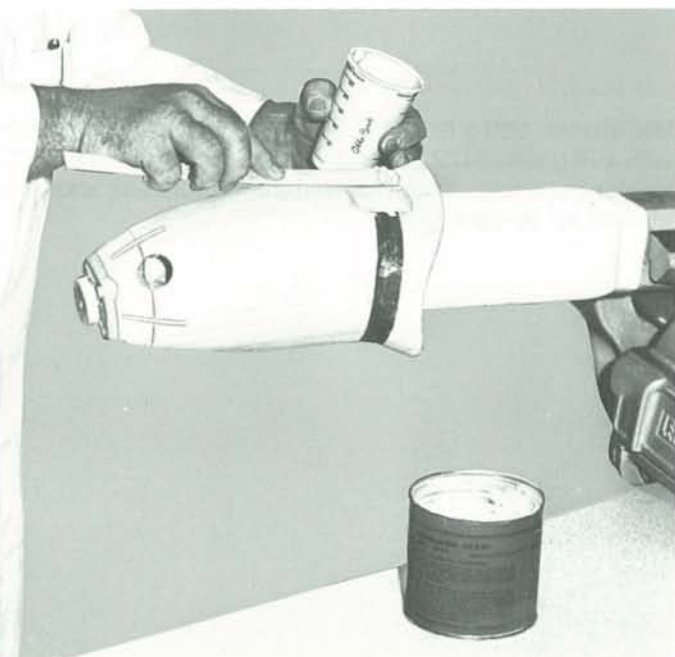


Place the socket in the vise at a downward angle of approximately 130 degrees. This will permit the trapped air to rise and escape through the vacuum pipe.

Powder the outside of the PVA bag.
After 2 to 3 minutes, open the vacuum machine valve and evenly distribute the resin through the lay-up.



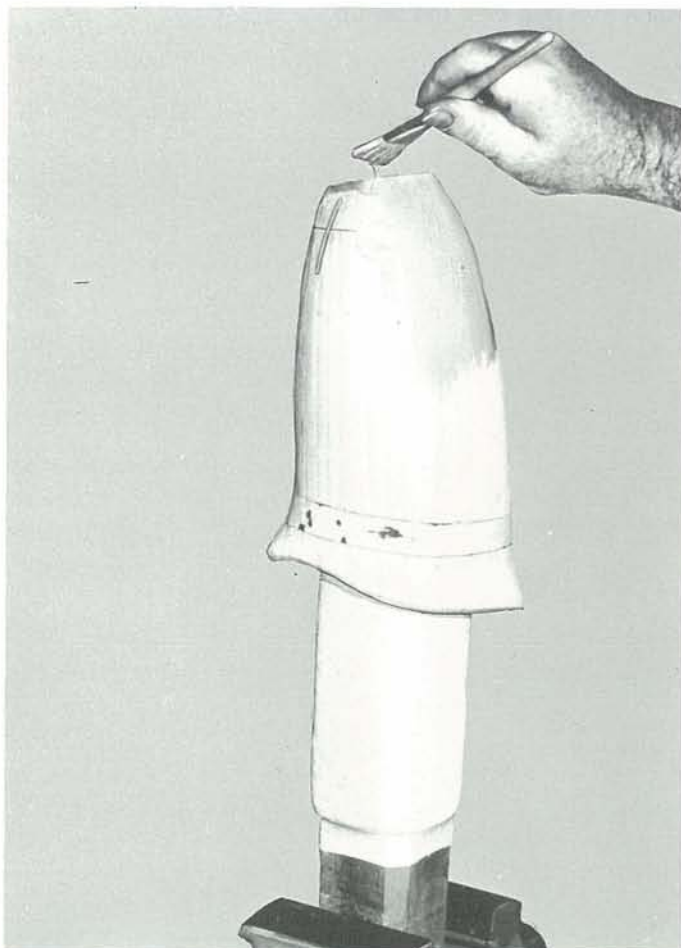
Stretch the PVA bag distally and, with the bag under tension, tie off the excess resin being careful to avoid wrinkles.



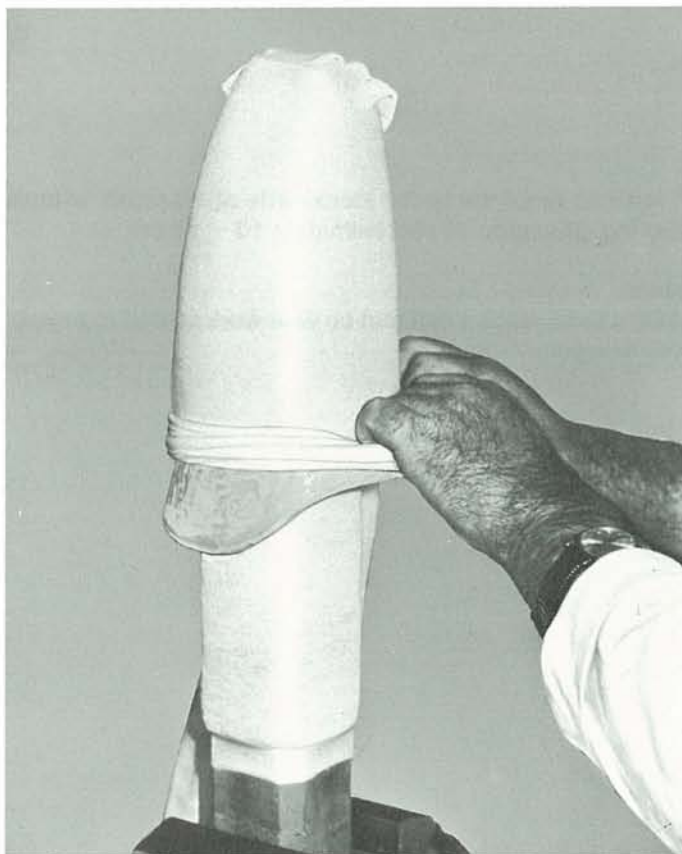
3.2 Lamination of a Wooden Socket

Wrap the proximal brim with glass fiber webbing for reinforcement and bond with sealing resin. Apply a layer of 636K9 AKEMI Putty, smooth, and sand.

Use rigid wooden splints to reinforce the joint between socket attachment block.



Seal the valve channel and all other openings with plastilin putty and cover with linen adhesive tape. Completely coat the socket surface with the sealing resin mixture.



Follow the same lay-up procedure as explained for plastic sockets starting on page 4.



Pull a PVA bag over the lay-up.



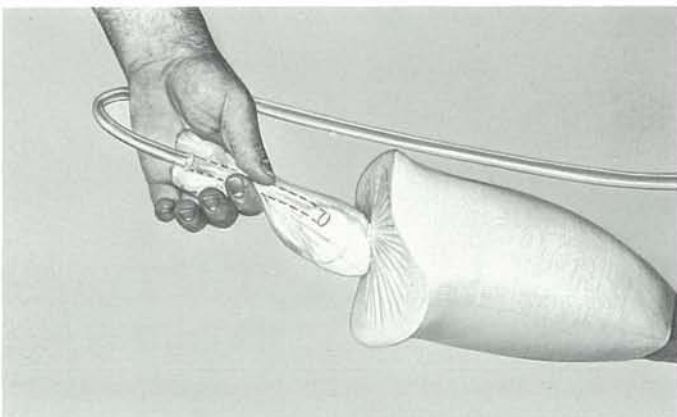
Twist and tie off the perlon stockinette at the proximal brim, leaving an excess of approximately 10 – 15 cm.

Note:

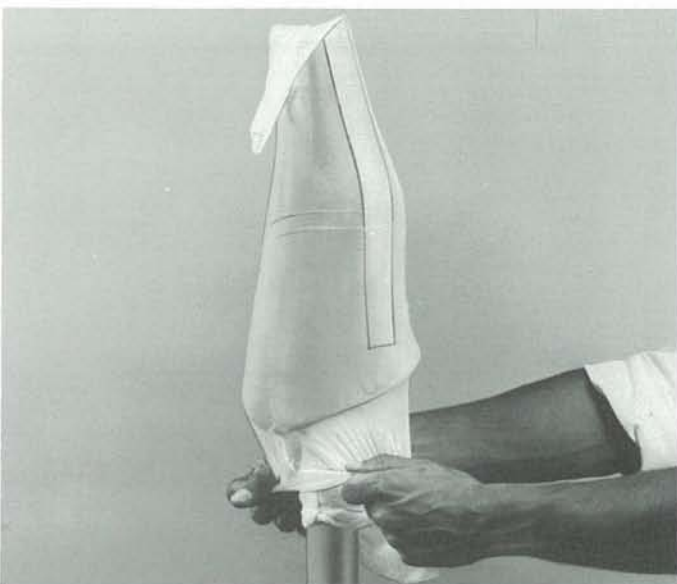
At this time, place a soft mat on your work station to protect the lay-up.



Pull the PVA bag tight and tie to the twisted perlon stockinette leaving an excess of 15 to 20 cm.



Crumple the excess perlon stockinette into a ball and pull the remaining length of PVA over it. Insert the vacuum tubing up to the perlon ball and tie off. Proceed with the lamination.



4 Fabricating the Foam Cover Connection Sleeve

Leave the PVA bag on the lamination but cut off the excess at the proximal end.

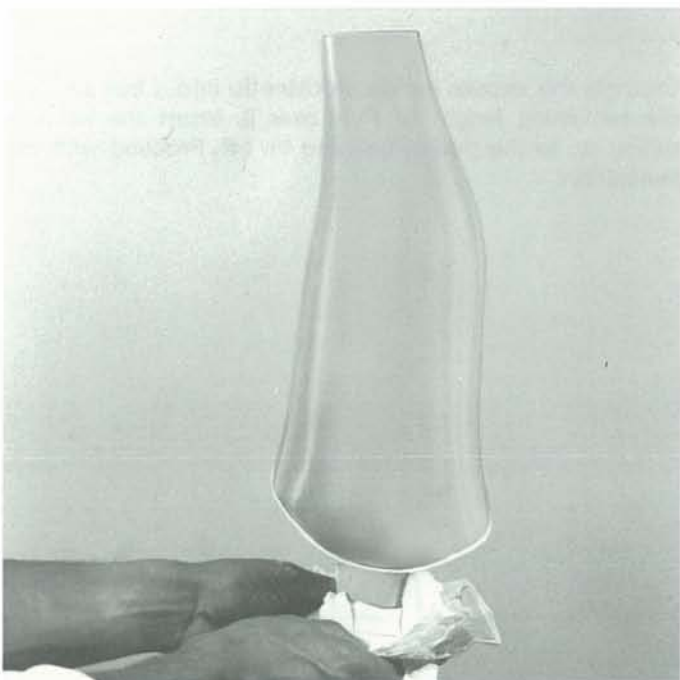
Thoroughly powder another PVA bag and pull it on. Tie off at distal end.

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Pull a triple layer of perlon stockinette over the socket as reinforcement. Pull on a PVA bag and laminate using approximately 150 g ORTHOCRYL Lamination Resin.



After the resin has cured, trim the excess material from the distal and brim areas.



Clear the holes in the laminated star washers to a diameter of 3.3 mm . . .



... and cut an M4 thread.



Remove the plaster and vacuum pipe.



Heat the lay-up around the threaded holes with a 756E2 Hot Air Gun and attach the 501S45 Truss Head Screws.



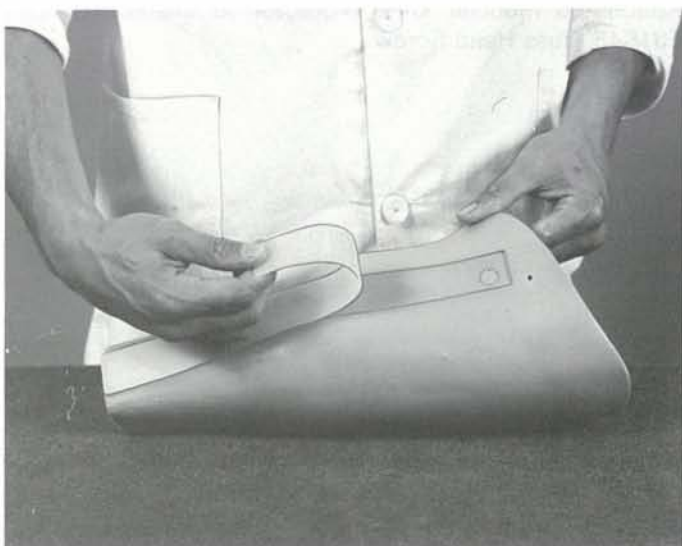
Smooth the laminate edge flush with the socket brim. Clear the distal end of the socket attachment block connection surface.



Separate the laminated connection sleeve from the socket by pressing the socket upwards with the help of a plastic mandrel.



Clear the valve opening with a 726W9 Conical Cutter.



Remove the polyethylene strip from its channel and cut a M4 thread into the washer.

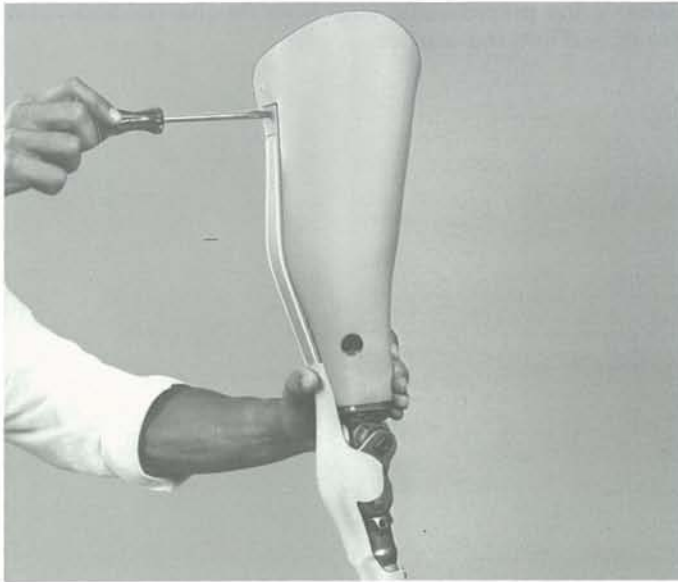


Attach the lower leg to the socket.

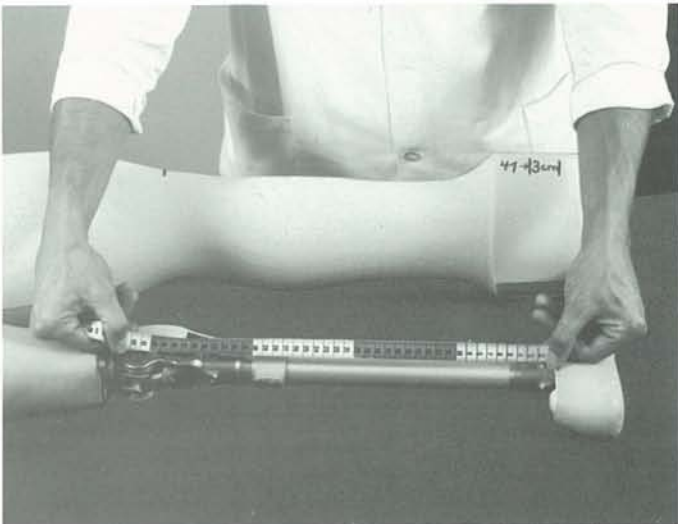


Snap the modular knee protector in place below the tube clamp adaptor. Determine the length of the elastic band (with approximately 1 cm of tension) and cut to length.

Saturate the cut end of the elastic band with sealing resin and allow it to dry clamped between two polyethylene strips. After the resin has cured, smooth the edges.



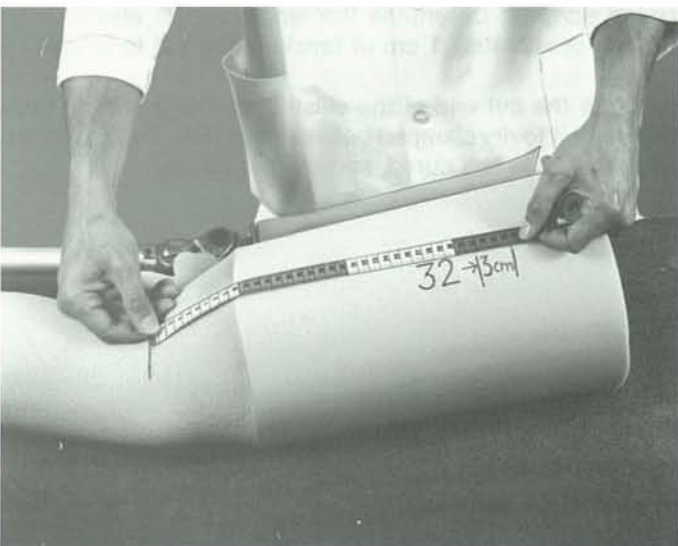
Attach the modular knee protector to the socket with 501S45 Truss Head Screw.



5 Finishing the Cosmetic Foam Cover

Mark the knee center on the foam cover.

Measure the prosthesis from its knee center to the top of the foot plate. Transfer this length plus an additional 3 cm for compression to the foam cover.



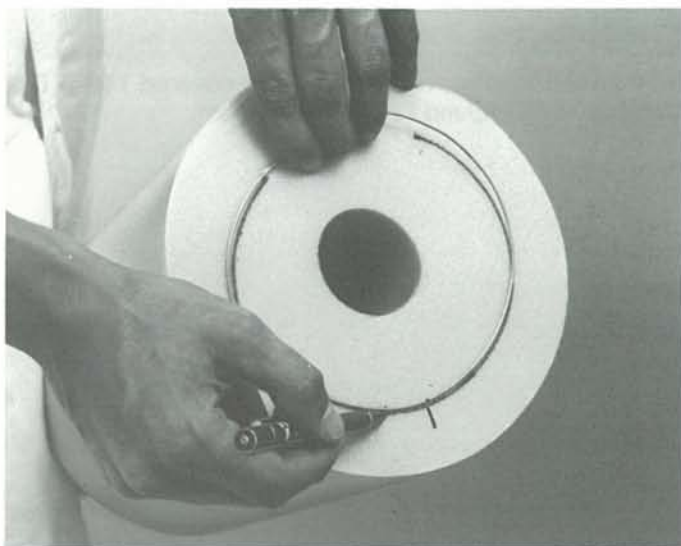
Measure the prosthesis from the knee center to the proximal brim also allowing **3 cm additional length**. Transfer this measurement to the foam cover.



Use a band saw to cut the foam cover to length, top and bottom.



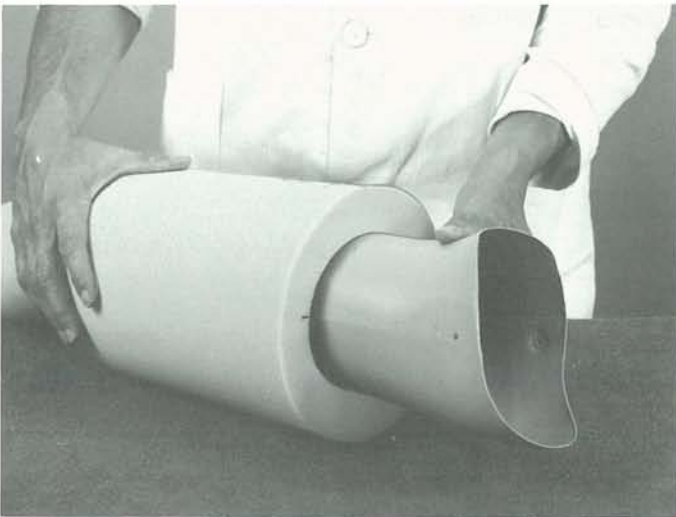
Make an aluminum wire template of the exterior brim of the connection sleeve . . .



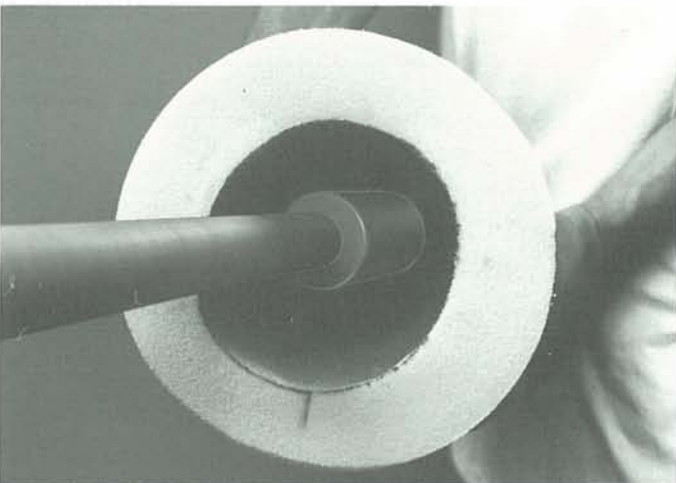
. . . and transfer its shape to the foam cover.



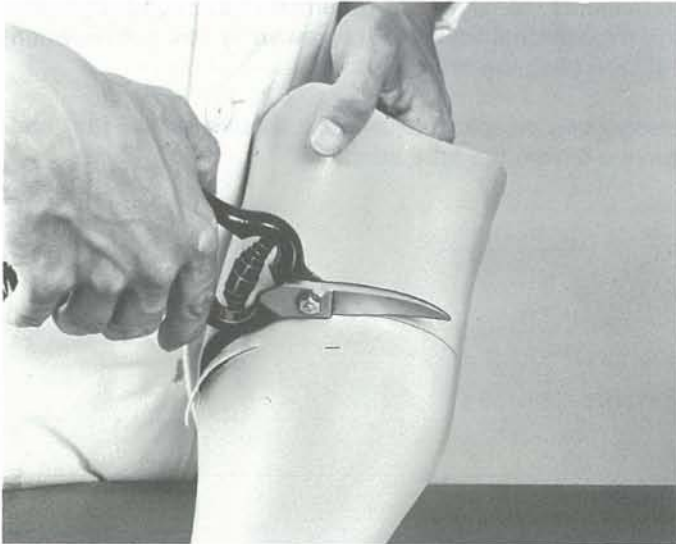
Use this outline and the shape of the socket's exterior as guidelines in hollowing out the foam cover with a rasp.



Shape the opening to the form and depth of the connection sleeve.



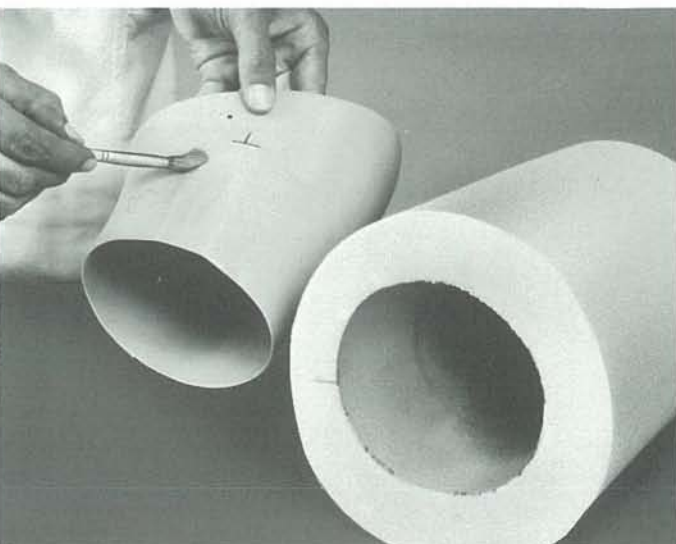
Smooth the foam opening with a grit covered 749F4 Felt Cone or 749F8 Round End Sanding Drum.



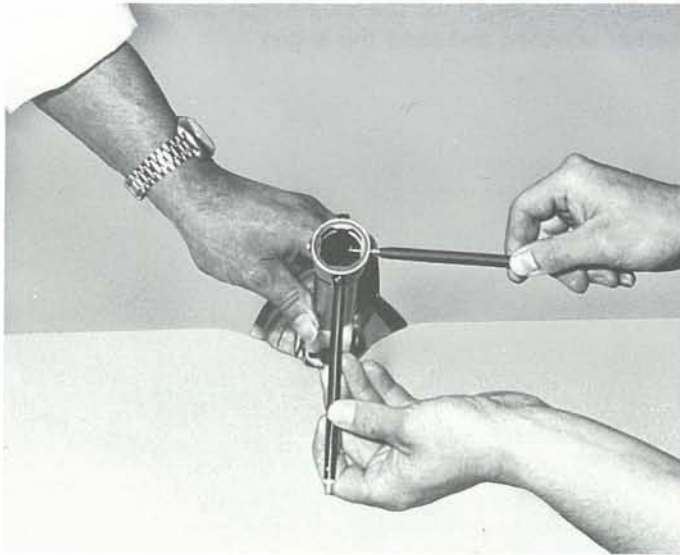
Establish the length of the connection sleeve, trim using leather scissors, and sand the edges.



Fit the connection sleeve into the foam cover and mark its position.



Apply 636W17 OTTO BOCK Plastic Adhesive both to the foam cover opening and to the connection sleeve. Quickly position the sleeve as marked in the foam cover and press together.



To maintain the alignment determined through trial fitting, only two adjacent adjustment screws may be loosened when disassembling the prosthesis.

Loosen two adjacent adjustment screws on the foot and remove it from the tube adaptor.



Slide the foam cover with connection sleeve over the modular components and socket.



Attach the connection sleeve to the socket with 501S45 Truss Head Screws.

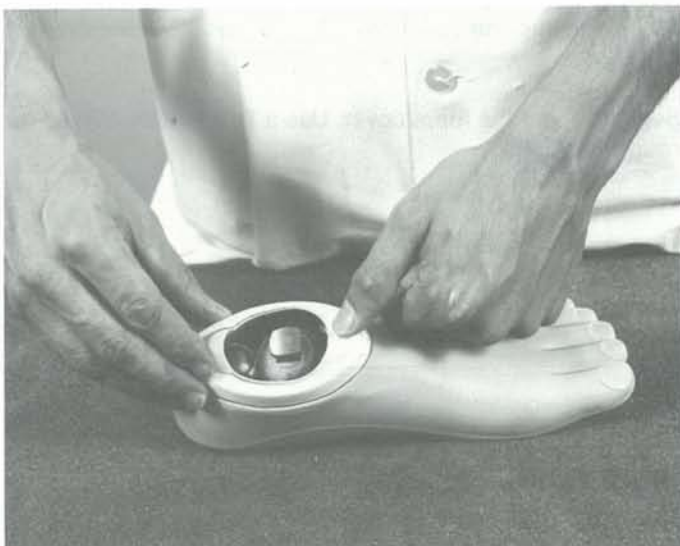
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OTTO BOCK TI 2.3.4



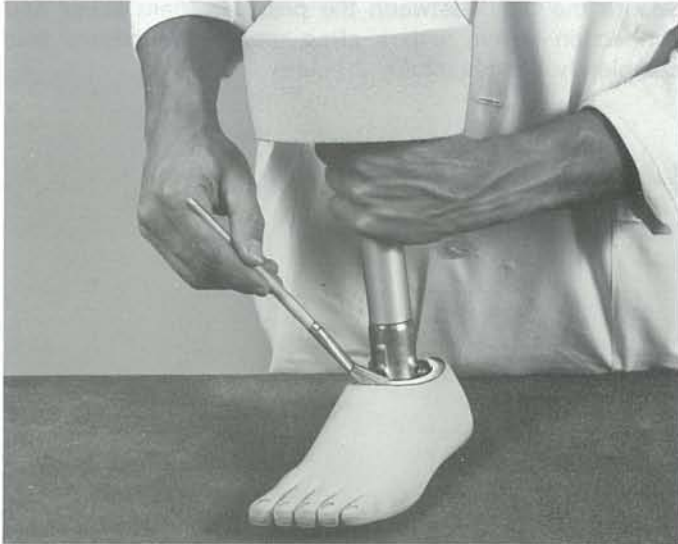
Secure the bond between the proximal foam cover and connection sleeve with a strap until the adhesive sets completely (approximately 3 hours).



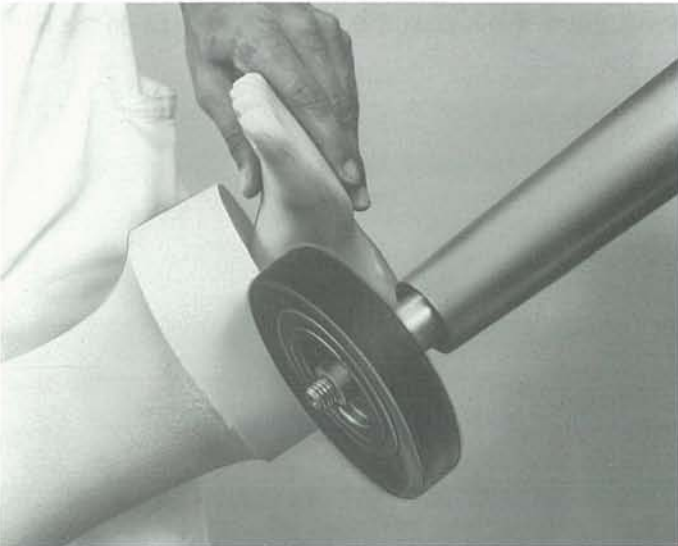
Press the foot connection cap/plate into place on the foot.



Push the foam cover proximally and reattach the foot.



Apply 636W17 OTTO BOCK Plastic Adhesive to the foam cover and connection cap/plate. Press together.



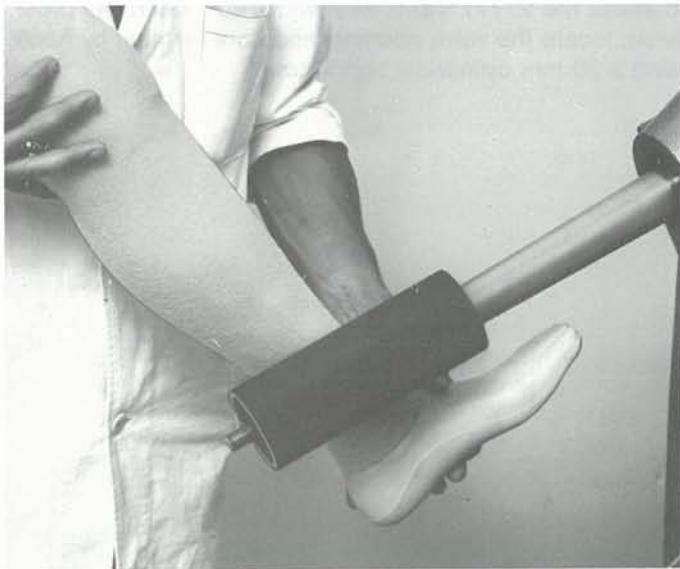
Note:

Begin shaping the foam cover only after the adhesive has set completely.

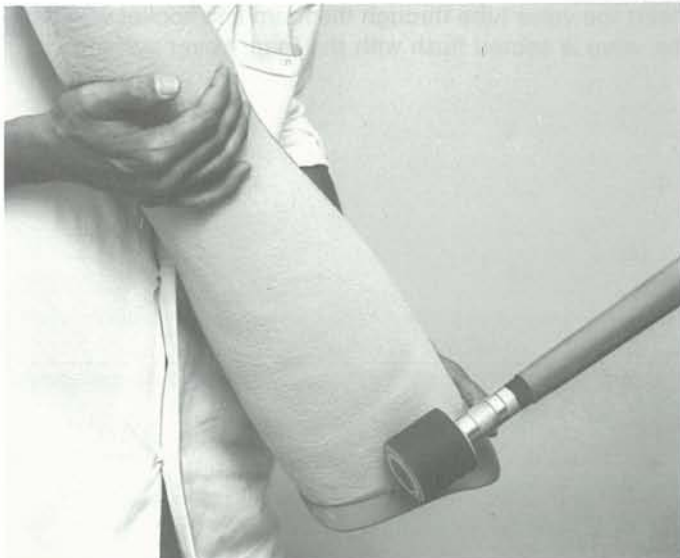
Begin shaping the foam cover. Use a 749B1 Wire Wheel for rough shaping.



Measurements and outline tracings from the patient serve as the pattern for the shape of the foam cover. Use the wire wheel to shape the foam cover 2 cm larger in dimension than the individual's actual measurements.



Shape the cover according to measurements and contours with a 749F6 Sanding Drum.



Use a 749Z4 Habermann Sanding Drum to blend the transitions.

The 749F8 Round End Sanding Drum and 749F7 Foam Grinding Wheel are useful for fine sanding.



If necessary, finish sanding the surface by hand using 60 grit sandpaper.



To install the 21Y77 Valve Seat with Tube, bend the prosthesis, locate the valve opening, and bore through by hand using a 20 mm cylindrical boring tool.



Insert the valve tube through the foam and socket wall until the valve is seated flush with the foam cover surface.



The end of the tube must be flush with the interior of the socket and sealed air-tight. Mark any excess protruding into the socket's interior.



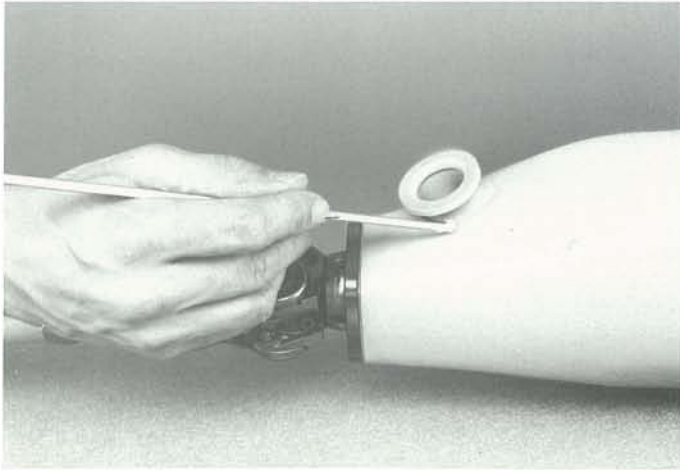
Cut the tube to length.



Reinsert the valve seat with tube checking for length and position. Bond it in place in the socket's interior with a mixture of sealing resin and talcum powder.



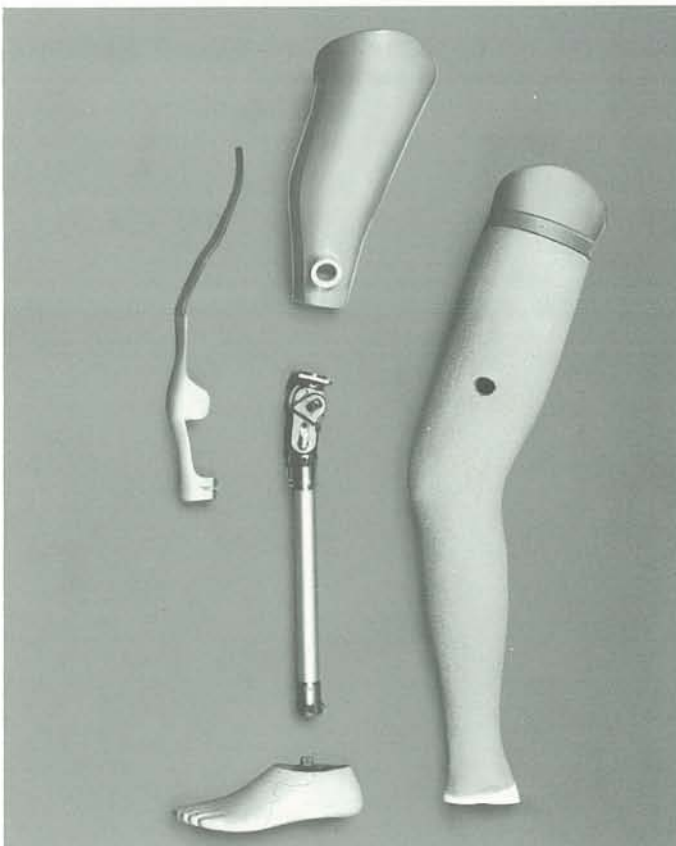
Detach the foot by unscrewing two adjacent adjustment screws and remove the foam cover.



Bond the valve seat with tube to the exterior socket wall with sealing resin.



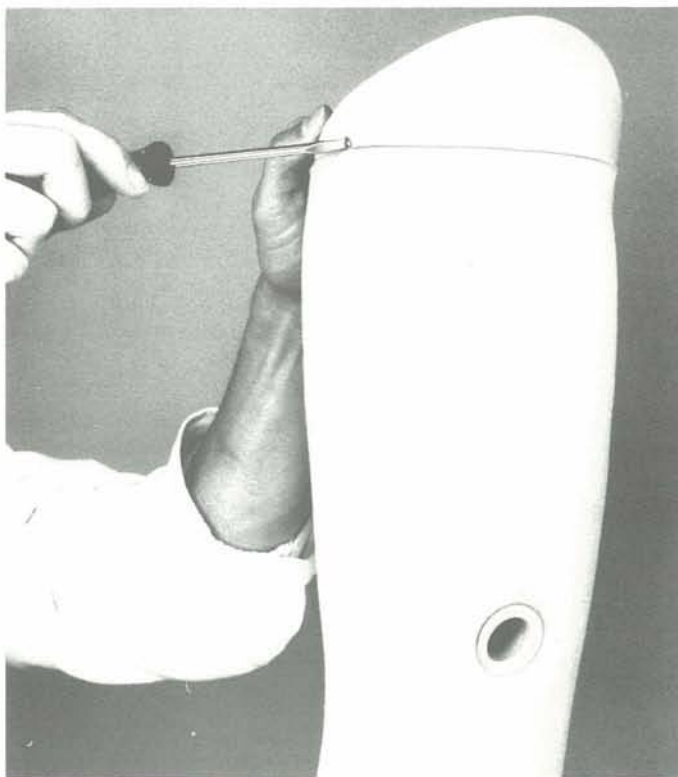
Once the resin has set, smooth the interior seams with a 749F8 Round End Sanding Drum.



Above Knee Modular Component Groups Ready for Final Assembly.



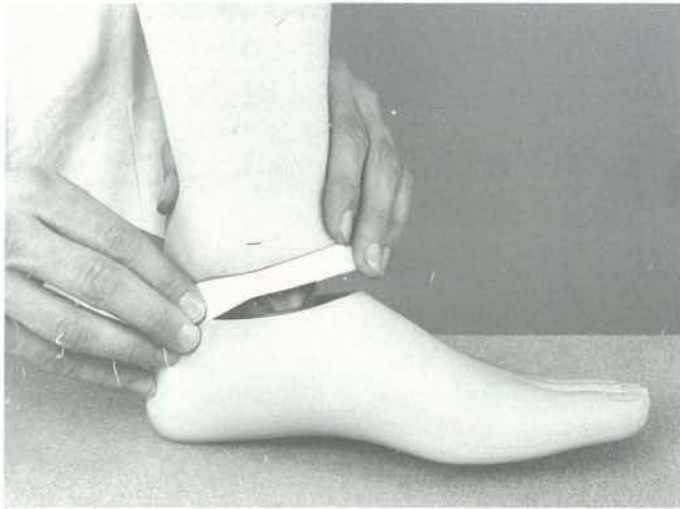
Secure all tube clamp adaptor screws with 636K13 Loctite.



Powder the inside of the foam cover and slide it proximally over the tube. Attach the connection sleeve to the prosthetic socket with screws.



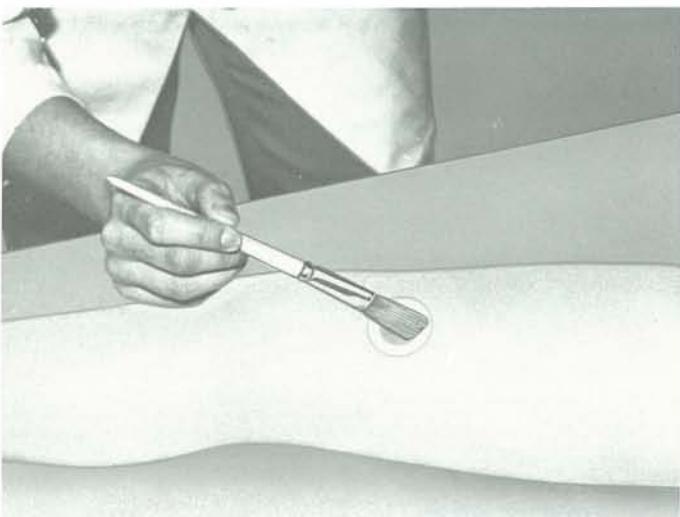
Reinstall the foot, tighten the set screws and secure with Loctite.



Slide the foam cover distally and press the connection cap/plate in place on the foot.



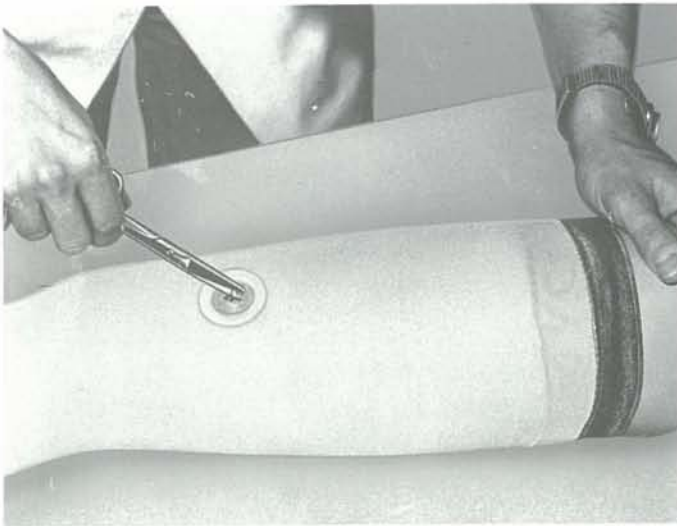
Slip the foam cover over the valve seat and pull on the cosmetic stocking.



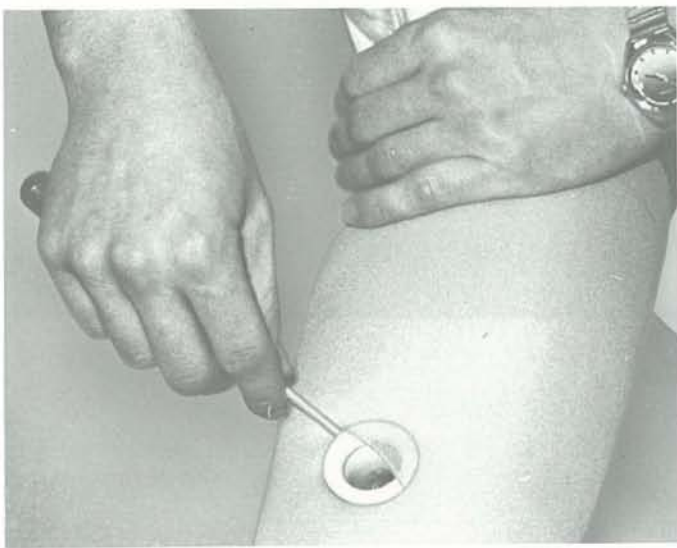
Apply 636W17 Plastic Adhesive to the stocking in the area corresponding to the valve opening.

Note:

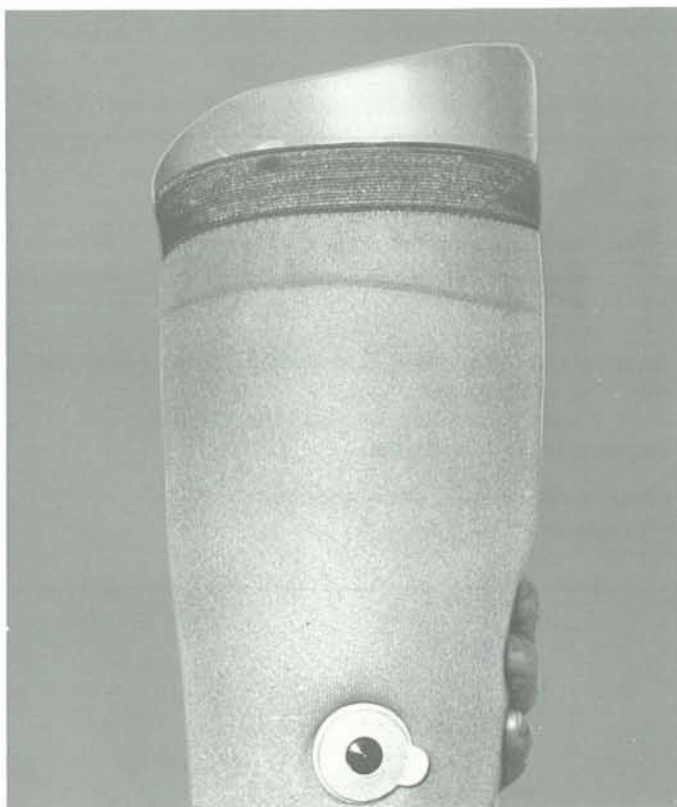
Do not allow the stocking to bond to the valve.



After the glued area has dried, cut an opening for the valve.



Next, tuck the edges of the stocking hole under the valve seat with a screwdriver.

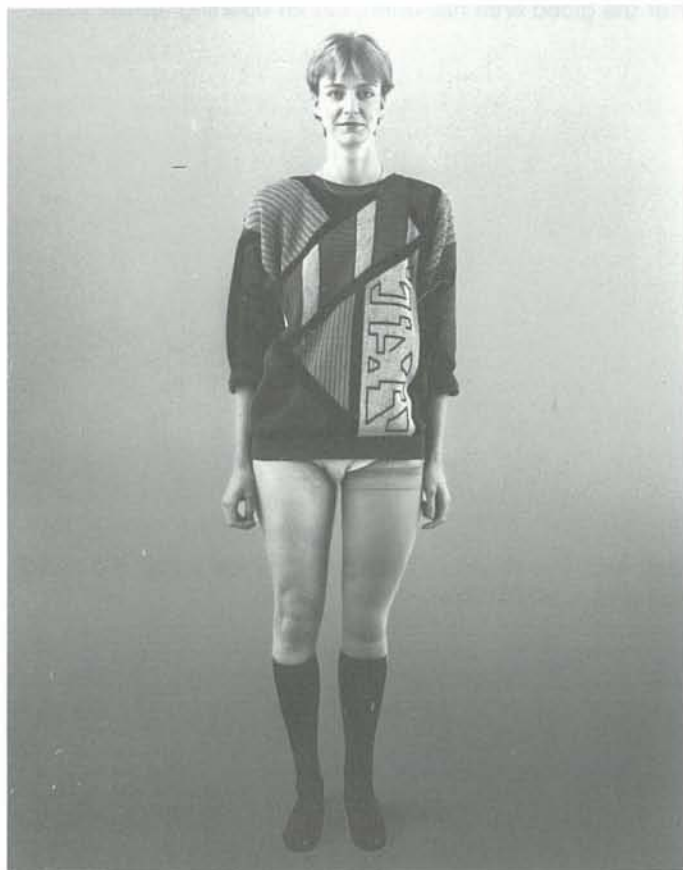


Finished valve assembly with exterior access.

Both foam cover and perlon stocking may be removed at any time.

Protective Measures

When processing foam and plastic lamination systems, make sure that rooms and workplaces are well ventilated. For further information about safety requirements regarding storage, processing and handling as well as personal protective measures, please refer to the DIN Safety Data Sheets.



The above knee prosthesis pictured has the valve placed medially, as requested by the patient. The second cosmetic stocking which covers the valve must be pulled down when donning and doffing the prosthesis.



Walking



Shaping the foam cover is also available on video color film. The systems are:
VHS, Betamax, U-matic $\frac{3}{4}$ " and Video 2000.
Running time: 14 minutes

Lending fee or sales price and timing:
on request.

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