NEW CONSTANT FRICTION WRIST UNIT

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The introduction of the Northrop Model C manual friction wrist unit over 10 years ago was a significant forward step in the development of functional upper extremity prostheses. This unit permitted the amputee to adjust the position of rotation of his terminal device to suit the particular task at hand. Frictional resistance to rotation of the terminal device, thus aiding in holding the set position of rotation, was provided by means of the compression of a rubber washer. The rubber washer was compressed or squeezed, in effect, between the back of the terminal device and the face of the wrist unit. The amount of squeezing or resulting friction was a function of the amount the terminal device was threaded into the wrist unit, or in a finer sense, was a function of the amount that the terminal device was rotated. Thus, the pitch of the thread on the terminal device stud had a marked effect on the rate of increase in the amount of friction available for resistance to rotation of the terminal device.

During the years of field experience with the manual friction wrist unit there has become prevalent a demand for a friction wrist unit of the manual type that would provide constant friction throughout the range of rotation of the terminal device. Constant friction providing resistance to rotation would make the prosthesis much more useful to the wearer, provided that the level of friction could be adjusted to suit each individual wearer. Also, the friction level should be capable of adjustment to a sufficient degree to resist rotation of the terminal device under the action of moments introduced by the control cable system or by the task being performed with the terminal device. Any manual constant friction wrist unit would of necessity be required to function with the standard ½-20 terminal device thread.

Sierra Engineering Co. becoming aware of the need of a constant friction wrist unit, assigned the project of developing a suitable unit to its prosthetics engineering group. Many factors must be considered in the design of a prosthetic component, particularly a component to operate at the distal end of an upper extremity prosthesis. Maximum strength with minimum weight; thoroughly reliable performance with the least complicated mechanical design; and the capability of performing consistently for many thousands of cycles, are fundamental goals of good mechanical design. They served as foundations for evaluating various ideas in the thinking stage of the constant friction design project. Many ideas were considered. One of the earliest, for example, was to use the approach of finding material for a mechanism which would provide a flatter spring rate than the rubber washer used in the current manual friction wrist units. This suggested a system of mechanical springs of some sort. Stacks of Belleville springs were one method considered. It soon became apparent that within the space available, mechanical springs or rubber springs would not provide the necessary constant friction due to the axial travel of the terminal device stud caused by the rotation of the threaded portions.

As the idea of providing friction to resist rotation is, in a sense, the idea of a brake, it seemed logical that the full length of the terminal device stud itself could be considered as a brake drum. Thus, if a brake shoe were applied to the external threaded surfaces of the terminal device stud, perhaps suitable constant frictional resistance could be developed within the allowable design spaces. This concept showed promise and resulted in the testing of various brake shoe materials against the threaded surfaces of the terminal device stud. Of the various materials tested, nylon showed the most suitable characteristics because of its toughness, resistance to wear, machinability and reasonably constant performance with respect to changes in ambient temperature.

Laboratory prototypes of a constant friction wrist unit employing a nylon plug bearing against the threaded surfaces of the terminal device were constructed and tested in Sierra's engineering laboratory. The tests showed promising results. Further refinements were made to the units with respect to the area of nylon in contact with the terminal device stud and the manner in which pressure was applied to the nylon to maintain or adjust the level of friction, all of which contributed to an even smoother action and a more lightwight unit.

Subsequently, several units were fabricated and placed on amputees used in Sierra's test program. The results and reaction from this phase of the development were most encouraging. Production units were fabricated and submitted to the Prosthetic Research Board Transition Program. The child size unit was selected for the first production because of the greater need for constancy of friction by young children who are limited in strength and because the Sierra No. 280 quick disconnect constant friction unit is capable of serving most adult cases.

The results of the PRB tests and evaluations indicated the child size constant friction wrist unit would perform in a satisfactory manner as a component of the prosthetic system. Many valuable suggestions were received from the testing agencies resulting in improvements in the performance of the unit.

The photograph accompanying this article shows the unit alongside a 25-cent piece to give a rough comparison of size. The general physical specifications of the unit are as follows:

1. Outside diameter: 1¼".
2. Laminating distance: ¾".
3. Body material: new high strength aluminum alloy.
4. Insert material: nylon—mechanical grade (extensively used for bearings).
5. Finish: bright anodize.
6. Torque adjustment: by means of a ⅜-32 slotted head set screw.
7. Weight: .6 of an ounce.
8. Essentially constant torque through at least 180° of rotation.

From these basic specifications, it can be seen that a shorter laminating allowance is required than that required in most other wrist units, thus resulting in more effective and useful prosthetic proportions where cases involving long BE stumps are involved. The constant friction design permits full engagement of all the terminal device threads, as compared with only partial engagement in the present manual friction wrist units. The nylon insert will last, in most cases, for the life of the prosthesis and will require very little adjustment. An initial adjustment after some use, or "run-in," will be required. After this, the torque or constant friction setting will remain essentially constant for the life of the unit.

New Wrist Unit.

The small outside diameter of 1¼" was designed for use with the No. 1 size child hand, thus preventing crimping of the cable housing exit and bulging at the wrist. Thus, the unit will be very compatible for larger sized hands and other hook-type terminal devices incorporating operating levers or "thumbs." The unit is light in weight in keeping with modern light weight upper extremity prostheses. The friction adjustment is such that the terminal device may be screwed in and out without changing the original torque setting. The constancy of torque through a complete revolution of the terminal device is a great asset to the young child, particularly when low torque settings are required. The friction level can be set so that no accidental revolving occurs when the terminal device is opened.

Although the nylon insert is extremely tough and will wear indefinitely, should replacement be required for some reasons, this can be done in the field. All that is required is a ½-20 bolt and a bench vise. The nylon cannot harm the threads of any terminal device and thus contributes greatly to the life of the terminal device stud.

Laminating instructions for installing the Sierra constant friction wrist unit in a plastic prosthesis are essentially the same as those used in applying the conventional manual friction wrist unit to the lay-up. There are some steps that should be followed carefully in order to make the installation successful with a minimum of effort. The following laminating instructions should be followed:

1. Remove set screw and apply silicone grease to the threads liberally.
2. Screw the set screw to lightly contact bottom.
3. Fill slot in screw with wax to keep out resin.
4. Place unit on end of build-up of forearm with the set screw on the radial-volar side to make it easy for adjustment by the amputee and to keep dirt out during use.
5. Tie off stockinet and laminate in normal manner.*

* After room temperature cure (if promoter is used), using a sharp pointed knife, cut out the laminate immediately above the set screw position. Trim neatly and remove the wax from the slot in the head of the set screw so it will not discolor the area during melt-out.

6. Caution: Do not heat cure above 240° F. as the nylon insert softens and may lose its pressure against the walls of the casing. Remember that nylon, although extremely tough and strong at normal temperature, is thermoplastic, that is, it will melt at elevated temperature.
7. After the wax has melted out and the laminate cooled, a ½-20 tap may be carefully run through to clear the threads of wax. Lubrication may be applied but the residual wax provides some lubrication of its own. Screw in the terminal device and adjust the torque, completing the installation.

The Sierra constant friction child size wrist unit is now available for shipment from factory stock. Production units of the adult size are being prepared for submission to the PRB testing agencies. Availability of the larger sizes will be announced following completion of testing and evaluation.

OALMA MEMBERS PICK NEW DIRECTORS

New OALMA Board to be Installed at Miami Beach

Each year members of OALMA by written ballot, choose eleven of their number to serve as Regional Directors of the Orthopedic Appliance and Limb Manufacturers Association. The eleven Regional Directors with the National President, First and Second Vice Presidents and Secretary-Treasurer, constitute the official governing body of the Association.

This year in the balloting for the term 1958-1959, these eleven were chosen and will be installed at the OALMA session in Miami Beach October 27:

Region I: Karl W. Buschenfeldt of Stoughton, Massachusetts, to represent the New England States.

Region II: Fred Eschen of New York City to represent New York and New Jersey.

Region III: Basil Peters of Philadelphia, representing Pennsylvania, Delaware, Maryland, the District of Columbia and Virginia.

Region IV: George H. Lambert of Snell's, Baton Rouge, Louisiana, representing the area roughly of the old Confederacy (North and South Carolina, Tennessee, Kentucky, Mississippi, Alabama, Georgia, Florida and that part of Louisiana east of the Mississippi River, including Baton Rouge and New Orleans.)

Region V: Charles W. Rosenquist of Columbus, Ohio, to serve the states of Ohio, Michigan and West Virginia.

Region VI: Richard G. Bidwell of Milwaukee, representing the states of Wisconsin, Illinois, Indiana and Eastern Missouri.

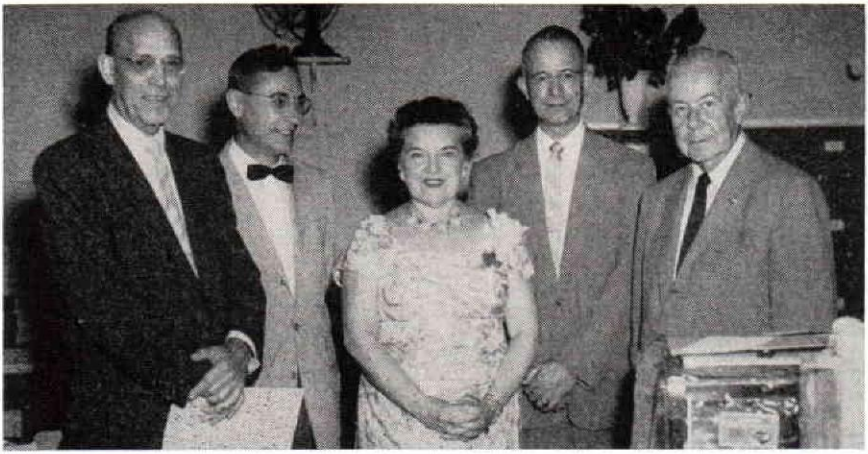
Region VII: Ted W. Smith of the Isle Company and Knit-Rite Company, Kansas City, Missouri, representing the great Middle West Region (Minnesota, Iowa, Western Missouri, North and South Dakota, Nebraska, Kansas, Wyoming and Colorado).

Region VIII: David C. McGraw, of Snell's, Shreveport, Louisiana, representing Texas, Oklahoma, Western Louisiana, Arkansas and New Mexico.

Region IX: Fred Quisenberry of Alpha Orthopedic Appliance Company, Los Angeles, reelected to represent Southern California and Arizona.

Region X: Herbert J. Hart, of Hittenberger's, Oakland, reelected to represent Northern California, Nevada, Utah and Hawaii.

Region XI: William E. Brownfield of Boise, Idaho, representing Washington, Oregon, Idaho and Montana.



L. to R.: Dr. P. A. Walford, Deputy Chief Medical Director; Dr. L. A. Zink, Assistant Chief Medical Director for Operations; Mrs. Stearn; Mr. J. D. Johnson, Chief Purchase and Contracts Division; Mr. R. E. Adkins, Excutive Officer in the Chief Medical Directors Office. The above photograph was made at the reception honoring Mrs. Stearn on her retirement after more than forty years of service with the Veterans Administration.

MRS. STEARN RETIRES

Mrs. Adenia Stearn, Chief of Service Contracts Section of the Veterans Administration, is retiring at the end of August after more than forty years of service. Members of her staff, friends and colleagues joined in a reception in her honor held at the Veterans Administration headquarters building in Washington August 8.

In a message of greetings Mrs. Stearn wrote as follows:

"To My Friends in OALMA:

After forty years in the Government service I am retiring at the end of August, 1958. During the years of my service I have had the privilege of working with so many of you. Through research, study, trial and error we have strived to procure for the veteran the very best, the most improved artificial limbs or their accessories obtainable. This we have done with your help at prices which we believe to be fair and equitable to the government and at a profit which we hope has been fair and equitable to you.

And so as I say goodbye, I want to extend to each and everyone of you my sincere thanks for your patience and forbearance, your assistance and co-operation in our joint effort to continually strive to improve the Prosthetics Program for the benefit of the veteran and the ultimate benefit to us all.

I wish you the best of luck in the future and if ever I can be of any assistance to you it would be a privilege and a pleasure to serve you. Very sincerely yours, *Adenia Stearn.*"

Dr. Robert E. Stewart, Director of the Prosthetic and Sensory Aids Service, paid tribute to Mrs. Stearn in these words:

"The Prosthetic and Sensory Aids Service will miss Mrs. Adenia Stearn. Her devotion to the principles of good contractual management will always be remembered by all of us here. Her loyalty to the Prosthetic and Sensory Aids Service and her untiring efforts to assist us in providing the best prosthetic devices for veterans have been instrumental in enabling us to function successfully over the years. We