ADDITIONAL HELPFUL DEVICES FROM THE P. W. HANICKE FACILITY

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This is a continuation of a series of notes on new devices. Notes Nos. 1, 2, 3 and 4, appeared in the June 1959 issue of this Journal, pages 39-43.

Number 5

This illustration portrays a very special ankle mechanism. Its purpose is multifold.

No. 1. It is a flexible spring type toe lift.

No. 2. It is a flexible calcaneous brake.

No. 3. It is a forward stop (rigid to prevent calcaneus).

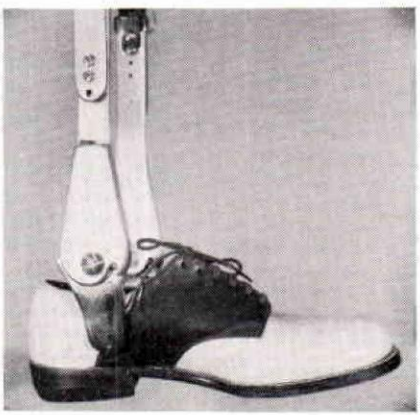
No. 4. It is a rigid back stop to prevent equinus.

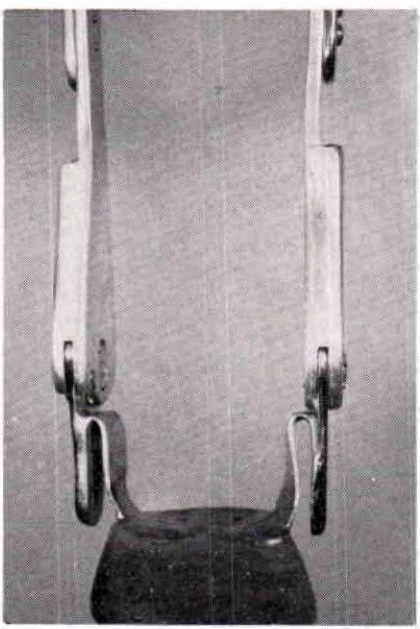
No. 5 It is a timing device to control leg and body movement following heel strike.

No. 6 It is a timing device during forward motion of leg or foot controlling push off.

It is used for flail ankle musculature. It can be compared to the heel and forward bumper mechanism of an artificial foot, except that the entire mechanism had to be built around the outside of the patient's leg and also engineered to conform to the anatomical location of the patient's ankle joint. This particular ankle mechanism has been tested and used with exceptionally gratifying results. While it may look rather large and clumsy, it will be instrumental in changing a patient's gait so completely that its rather startling appearance will be offset by the more rhythmic, smoother gait and ease of operation a patient will display.

This joint is specifically machined to obtain the proper areas for tension and leave sufficient stock of material for rigid stops. It might be compared to a double spring ankle joint. This type, however, has a much greater spring pressure or resistance





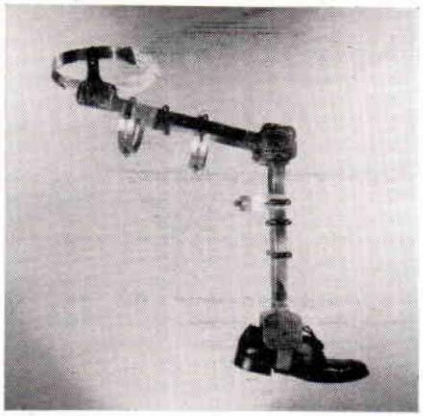
to motion. It also has larger areas posterior and anterior for a definite stop. Its use is particularly to an advantage in cases of shortening of legs due to paralysis or congenital deformity. It is used best when attached to a shoe or oxford. Occasionally it can be utilized with an inner foot plate and inner counter of leather or celastic to compensate for difference in size of feet and enable the patient to go about with mated shoes.

In conditions of a low ankle joint the stirrups can be hooked over the counter. This prevents ugly stretching of shoe and also prevents heel of foot from slipping out of shoe. At the same time, it makes it easier for the mechanic to align the joints and keep joints and stirrup areas straight and parallel. The diameter of this unit is 2″ at the center of the joint.

Number 6

This photograph illustrates a complete test brace designed for the purpose of locating ankle, knee and hip joint. The brace consists of a series of bar and plate combination members of very thin material. These members are clamped together which facilitates quick adjustments. The square sections around the area of the ankle, knee and hip are provided with very closely spaced holes, about 100 in each plate. The garter, thigh and top bands are made of thin aluminum provided with slots at medial and lateral side. These bands can be shaped readily and flattened or deepened according to requirements. The plates are held together by pointed ring screws.

The operating procedure is as follows: Measure the patient as customary. Find approximate locations of joints and record on tracing paper. Attach stirrup of test brace to shoe as usual. Assemble test brace by inserting ring screws in the holes near-



est to measurements taken. Repeat the same for knee and hip joint. Distance of joints will indicate position of various sections which are clamped together. Place entire brace on patient's leg. Use posterior and anterior webbing straps to center bars, adjust depth of garter band, thigh and hip band. When entire unit fits and meets with your expectations and to your satisfaction, you are now ready for the test. Begin by keeping knee extended. Move foot from slight dorsal to slight plantar flexion. Watch for piston action of mechanical ankle mechanism. Watch for heel slippage, tightness over instep, pressure under transverse arch. Watch for increased unwanted movement into calcaneous or equinus. Watch for pronation and supination. Do not change this brace for the present.

Place foot in neutral position with leg approximately 90 degrees to bottom of shoe. Now repeat this test at the knee. Check straps and bands above and below knee for even tension. Place finger under each component and remember the tightness of circular compression. Bend knee very gradually, watching possible movement of the various components encircling the calf and thigh. Should this combination of tensions change, it is a sign that the fulcrum is not in the proper position. Straighten leg

again. Recheck previous recordings and repeat test, flexing knee to about 90 degrees and farther back if possible. If this test shows the same interference of tensions as before, it becomes evident that knee axis is not properly located. Do not change for the present time. Now check all bands and anterior as well as posterior straps above knee and also pelvic girdle. Now test hip joint. The patient can stand up for this test. It is best to begin in such manner. Leave knee and foot in proper neutral position — knee extended. Check all points of contact and record. Now let patient bend over slowly. Watch all cuffs and pelvic girdle. It is best to observe any changes of tension without altering the brace for the present. If one finds the entire mechanism to function about 75-90 percent satisfactory, it is time to begin with the ankle joint location. This time keep knee flexed to some extent and also in 90 degrees flexion. Record present position of ring screw in ankle plates and remove. This will indicate whether screw was in proper position.

If plates should move up or down, forward or backward then it is necessary to relocate ring screws. Position of ankle joint itself without upright can be located and checked by movement of foot. Looking through holes closest to designated position of joint should show whether there is movement in various directions. Select hole in plate that appears closest to dead center of motion of ankle, insert ring screw and test again. Watch for movement of lower leg bar and garter band. After locating the mechanical ankle joint, this same procedure can be repeated for the knee joint. See that there is an even tension on straps and bands. Be sure and check position of bars. While patient is standing or lying down, bend knee carefully, watching for any interference of, or resistance to, motion at the joint area. Record present position of ring screw and remove same. Repeat motion of knee and select proper holes of both plates for the mechanical center of the knee.

As far as a perfect fit of orthopedic appliances which center about the knee is concerned, it is only important to us to find the proper fulcrum about which everything else has to rotate, without displacement of the points of anchorage of the appliance itself or interference or loss of any of the important contacts of initial pressure and counter-pressure. Repeat this same test on the hip joint. Watch for pressure of metal girdle over area of posterior superior spine, crest of ilium and anterior and superior spine. With all joints functioning as smoothly as possible, it may be an advantage to check ankle joint location especially towards anterior or posterior direction under weight bearing. This will be the most gratifying test or experiment of all because it will enable you to either make your patient walk with ease and his appliance or brace feel half its weight or ground him so that it weighs a ton in brace language and prevent the foot, especially the forefoot from leaving the ground.

Although this article may sound rather complicated and perhaps impractical, expensive and time consuming, to a good many of us who are still engaged in custom built orthopedic appliances of difficult nature, this particular mechanical aid gives us an inside view of what to expect by the time some of these rather complicated apparati are completed. It also gives us the technical foundation in a certain case should we encounter some functional difficulty and it can be recognized and eliminated more easily. While it may be assumed that most human beings are built according to standard anatomical principles — it is surprising to experience some very odd and baffling exceptions.