

WORKING WITH VASI PUSH SWITCHES

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Two single acting VASI push switches or the VASI dual-action push-a-little, push-a-lot switch will operate a hand, elbow, or other device in two directions. These switches are very reliable, but pose a number of problems that must be understood before one attempts to use them.

ACTIVATING A VASI SWITCH.

Figure 1 shows a side view of the V143 Dual-Action Push Switch as supplied (a) and with the activator bent (b). Note that the motion of the activation lever is constrained by the fact that the thin spring can only bend along a line between the microswitches. Think of this line as the center of a circle. Then any point on the moving actuator will move on a circle with this line as the center. Figure 2 shows the fully actuated switch position. Note that the near and far points of the push button have moved along the circular arcs shown. Motion is limited to 18° by a screw that bottoms out.

Forces that move the actuator. Motion constrained by a center of rotation also constrains how forces act. For instance, at the tip of the push button a force F_T tangent to the circle will be effective in moving the actuator, while a force F_R toward or away from the center will have no effect. Arrows have been placed to show these forces. Figure 1 (b) shows how one can redirect the force by bending the push button stem. The circular motion will be the same, but the button presents its top surface better to the desired tangential force.

MAKING AND USING A TEST SWITCH.

Figure 3 shows a V143 Dual-Action Switch mounted to a piece of wood by using a bent strip of aluminum. The long handle will help to tell how the assembly is oriented when it works best. With the test switch you can plan exactly where and at what angle the switches will be placed before you take a cast for a frame socket.

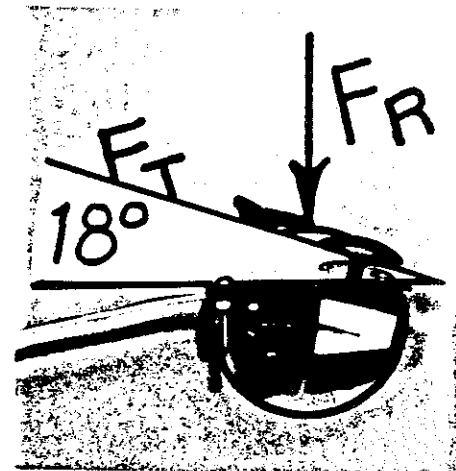
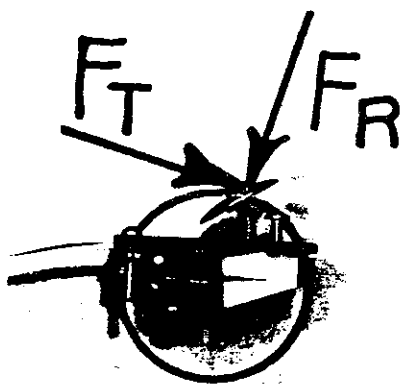
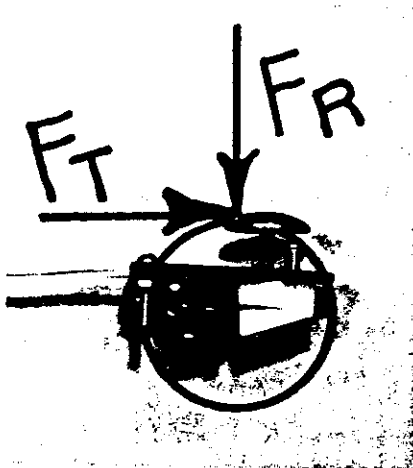


Fig 1. The Dual-Action Switch button is moved by a tangential force F_T . The force F_R goes to waste. The switch is

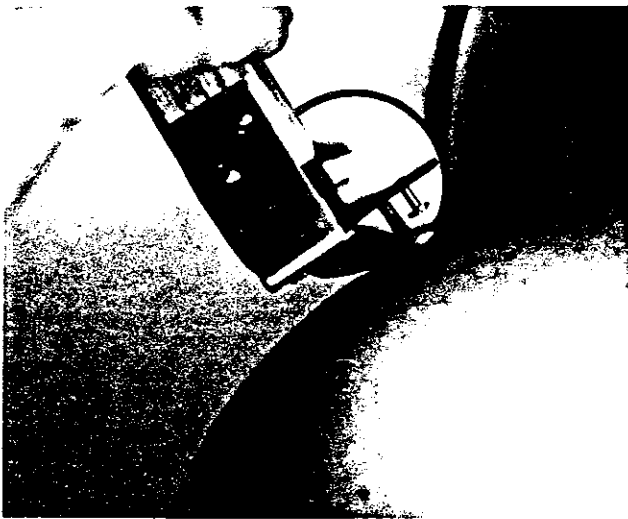
shipped as in (a) but it will work better if the actuator is bent as in (b). Long screws on the left are for mounting.

Fig 2. The Dual-Action Switch tilts 18° . The head of the actuator follows around the circle from its original position in Fig.1.

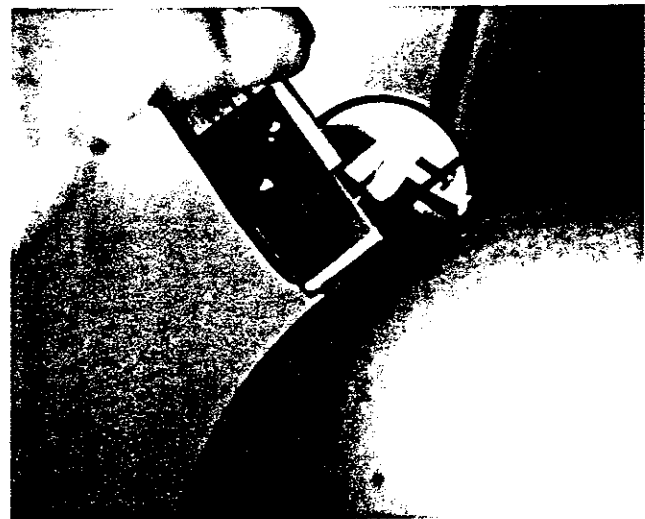
Put the subject in a straight-back chair so that shoulder motion will be uncontaminated by postural adjustment. You will use the same general procedure as for the touch pad test, only now there is an actuator which moves in a small circular arc. Keep in mind the following. First, you will later need to mount the switch. Study the plane of the mounting surface. Will it be possible to locate this surface conveniently in space on a socket extension or will a special metal outrigger be required? Second, look at how the subject interacts with the push button. Will you need to bend the head in the final installation as in Figures 3 (c) and(d)? Third, look for an orientation that maximizes pure push and minimizes shear forces. The subject will need to push 300-500 times a day for elbow activation and several thousand times for hand motion to become a good user. This action should not cause discomfort.

Sketch several views of the subject so you can record the orientation of the switch body for each of the switch locations you select. Mark the activation point on the subjects skin along with an outline of the switch body. You will want this information to appear after the cast is taken.

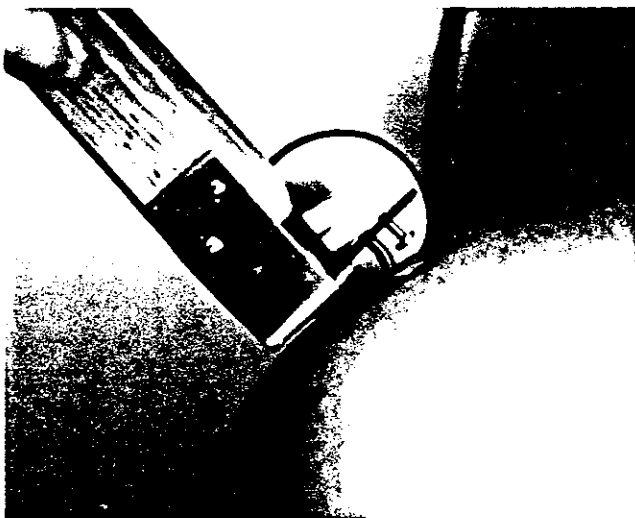
Fig.3. Four views of the Dual-Action Push Switch. The small circle is the path of the switch actuator. The large arc is the path of the acromion. Only a bent actuator (d) will be comfortable for the user.



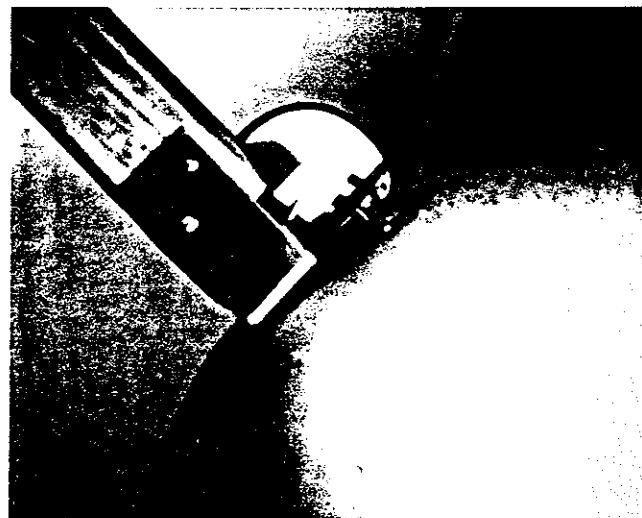
(a) Unbent actuator with shoulder neutral and no activation force.



(b) Unbent actuator with shoulder raised. The switch is activated but uncomfortable.



(c) Bent actuator with shoulder neutral and no activation force.



(d) Bent actuator with shoulder raised. Switch is activated by uniform pressure.