A FOOT OPERATED OXYGEN SAVER

By Murray Bloom

PURPOSE

The purpose of this device is to turn off the gases in a small torch when using a large one, and—what is more important, to turn off the gases in the large torch when one is finished with it. These transfers can be accomplished without removing one’s hands from the work in progress, a feature of special interest to lampworkers.

The simplest way of accomplishing this is by means of electrically operated solenoid valves. Unfortunately, because of the low pressure and high flow of the fuel gas, a valve with a large orifice is needed. Just to control the fuel gas will require two off-on valves (two-way) or one three-way valve. Such valves are expensive and the cost of the required parts approaches that of a store-bought foot-operated oxygen saver ($200 and up). The inexpensive solenoid-operated pilot type valves sold by garden supply stores have very large orifices but probably they will not work because of the low fuel gas pressure. (I say probably because I have not actually tried one).

The device described here has been in use in my studio for at least ten years. It is used to transfer gas between a Bethlehem PM2-D Model B and a Bethlehem PM4-S with a straight tip which is fastened to it with a pair of gear type hose clamps.

PRINCIPLE

The device is actually an assembly of foot-operated hose pinch clamps. The method by which they operate is explained by reference to figure 1. Figure 1 shows the pinch clamps shutting off the flow in the upper pair of flexible wall tubes because of the compression springs (S) which force member (D) toward member (E). When foot pressure is applied to member (C) the springs are compressed and the elasticity of the tubing wall removes the constriction thus allowing the oxygen and fuel gas to flow to the larger torch. In addition, the lower pair of tubes is compressed between members (E) and (F), and the flow to the small torch ceases.
CONSTRUCTION

None of the dimensions are critical nor are the materials specified. I used flexible PVC tubing (e.g. Tygon) because it was available at the hardware store. I suspect that heavy wall gum rubber tubing would be better. The tubing has an O.D. of 3/8" and a wall thickness of 1/16". The whole assembly would have been smaller if members (C) and (D) had been made of 1/8" steel instead of the 1/4" aluminum which I had at hand. Do not use material less than 1/8" thick if steel, or less than 1/4" if aluminum, because it will probably bend in use.

Most hardware stores have a selection of springs from which one can select suitable compression springs. The ones I used are made of 1/16" thick steel and have an O.D. of 1/2". There are five turns and an uncompressed length of about 5/8".

Note that a piece of rod, cut from a suitable nail is brazed to the bottom of member (E). A similar feature was not needed for the upper hoses because member (D) is only 1/2" wide. The edges of this piece should be chamfered in order to prevent the tubing from being cut.

The fulcrum block was fastened to the base channel with two 10-32 screws. A 10-32 screw serves as a pivot for the foot pedal channel which has a 1/8" steel plate, 1 3/4" X 3/4", brazed to it. This plate transfers the pressure from the foot pedal to the screw heads (G) and (H).

After assembling the parts in the manner shown in the drawings, thread the hoses in the appropriate places and install metal cable clamps to hold them in position. Tighten screws (G) and (H) so that the upper hoses are pinched closed. Then tighten screws (I) and (J) so that the lower hoses are just barely compressed. Install the two nuts and bolts, (K) and (L), so that they will interfere with any downward movement of screws (I) and (J).

Install the foot pedal and check to see that, when pressure is applied to it, the lower hoses are pinched closed and the upper hoses open. If the assembly binds it may be necessary to enlarge the holes in members (D) and (E). Generally, a pilot light is not necessary, but if one is desired, connect a small needle valve so that it by-passes the pinch valve.

OPERATION

Connect the torch which is to be normally on to the lower pair of hoses. Connect the other torch to the other pair. Make certain that the oxygen and gas lines are correctly connected and have not been interchanged. Fasten all hoses to their connections with some sort of hose clamp.
Turn on the gases and determine if sufficient gas is available for the larger torch. If not, check to be sure that the upper hoses are opening completely when the foot pedal is completely depressed. If the flow is still not sufficient it will be necessary to increase the propane pressure. In most cases, this will mean replacing the usual pancake type of regulator with an adjustable one. Sporting goods stores sell such regulators, or a conventional gas regulator with the appropriate CGA fitting can be used.

Eventually the flexible tubing will lose its flexibility and will not open when the foot pedal is depressed. At that time the tubing will have to be replaced.

And finally, while on the subject of tubing, let me caution the reader. Although PVC tubing is widely used to connect torches it is not a really suitable material for this purpose because if a piece of hot glass, or even a hot tool, touches it a gas leak is very likely to be produced.

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Fig. 1

Fig. 2 Pinch Assembly