

MECHANICAL CONSTRUCTION OF WAH-PEDALS / VC-PEDALS

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Construction of a Wah-pedal is not very difficult in the electronic sense; whereas the mechanical part usually is much more of a problem: how to convert the rocking of a footpedal to turn a potentiometer that acts as a voltage controller? I have seen some very sophisticated solutions for this problem published in literature, all of which seemed to suffer from the following drawbacks:

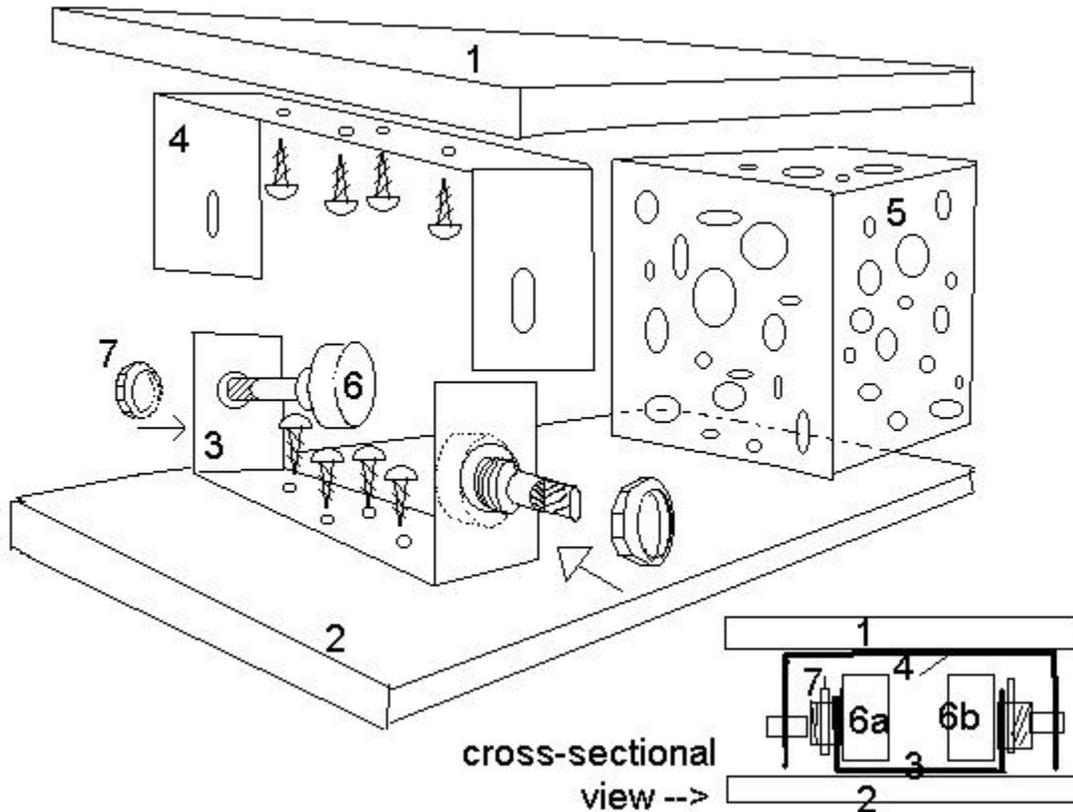
- a) vulnerable to damage (e.g., delicate mechanisms to couple the swing of the pedal to the pot)
- b) very difficult to build by yourself: you would need good skills and good tools.

I think I have found a solution that will make it much more easy to physically construct pedals that will be quite sturdy enough for experimenting with all kinds of VCA's, VCF's, VCD's etcetera at home. I think it may be possible to make versions that will be robust enough for use on stage.

Basic version

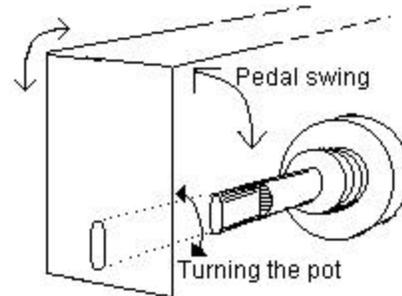
In principle, the construction proposed is based on the usage of 2 potentiometers which are driven directly by the upper part of the pedal (see figure 1). The action is conveyed to the shafts of the pots by an aluminum strip (4), which has 2 oblong holes that will fit the shafts that are to be filed off to obtain the same oblong format. So the shafts have to be converted from a perfect round shape to an oblong shape: O --> 0.

The oblong holes in the aluminum strip are obtained by drilling 2 holes (diameter approx. 2/3 of diameter of pot-axis) really close (partly overlapping), something like this: 8, with the same outward measures as the filed shaft (shaft's profile 0 is to fit in hole's profile 8). By using a small file you can clean out the hole's 8-profile to make it a 0-shaped profile).



The figure will explain the details of the rest of the construction: the top (1) and bottom (2) were made of wood (approximately the size of your foot, or somewhat smaller for more elegance). To the bottom an aluminum strip (3) is screwed, which has been bend in U-shape, with (normal, round) holes at both ends in which the pots are mounted. Aluminum strip (4) with oblong holes is also fitted in a U-shape, and should bridge over the aluminum strip (3) and the nuts (7) on the pots. The oblong holes should drive the oblong

filed shafts of the pots. I used aluminum of 2-mm thickness (20-mm width): thick enough not to lose its shape under the pressure of your foot, thin enough to have enough elasticity to "click" this U-shape over the shafts of the pots. I used a block of foam rubber so the pedal will return to its initial position, when used as a wah. If you leave this off, the pedal can be set and left at any position you like. Obviously only a small part of the potential swing of the pots is used, therefore I used 1 M pots here. Only a



small swing of these will give you a sweep from 0 ohm to something like 80 K (or more, if you are willing to move your foot at extreme angles). You can use only one pot for controlling your circuit, or you might put them in series, or parallel or use them separately to control 2 wah-circuits (see R.G. Keen's Technology of Wah-pedals). The pots mounted in the bottom aluminum strip (3) can be turned around to give you 0 ohm resistance (or any other initial value you might be interested in) in one position of the pedal's swing, before you tighten the nut to secure the pot's position. Be aware that the position of the pots is mirrored, so the clockwise contact on the first pot (A) sits next to the ccw-contact on the other pot (B) (or just use your ohmmeter to verify your wiring).

Other versions

In the second version I built, the pots were mounted in a rather flat box (made from ABS, with a lid), the shafts sticking out at the sides of the box (see figure 3). The aluminum strip (4) with the oblong holes was made to fit over the box, the top (1), made out of aluminum, fixed to the strip by some nuts and bolts. You could use an Eddystone type of box as well, I think, but I have not bothered to do so yet (it is more fun to play with them VCF's, VCA's and VCO's).

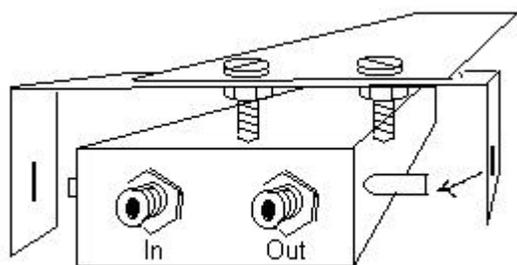


Figure 3

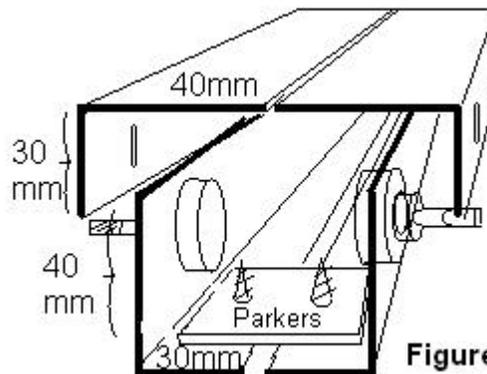


Figure 4

As there is no limit to the amount of money you can pour into this hobby of FX-building, I think most of us are very occupied with low costs (at least I am); therefore, next time around (if need arises) I will probably construct some kind of box from a L-shaped strip of aluminum: one meter long, 30mm and 40mm depth and 2mm thick (see figure 4).

Have fun!

Maarten de Huu

(R.G.'s notes)

Maarten is modest. This is the first construction that I have seen for a rocker pedal that has a chance of being made by your average garage-abusing effects maker and surviving actual use. What I think is especially insightful is Maarten's note that you don't always need the full throw of a potentiometer. That one item is what makes the difference between this and the rack-and-pinion or rotary-arm style wah's possible. If you think about it, your foot only moves 45degrees or so as it rocks. Most wah rocker mechanisms actually "amplify" this 45 degrees of motion to about 270 degrees of rotation. Maarten's very clever observation is that you don't really need all that rotation if you use a larger pot.

In adapting this to a wah circuit, you can wire it two different ways; the single-resistor-to-ground version of the wah circuit (see the Techology of Wah Pedals at GEO" because the pot in the rocker does not make a full rotation; and by wiring the second potentiometer for reverse actuation, so that as one pot increases resistance, the other decreases and the two together make up a single voltage-divider pot. Clever, Maarten, clever!

Even cleverer, Maarten realized that instead of making a bearing for the pedal rotation, a second pot makes a great second bearing, and that it might just be very useful in many circuits.

Reading this was a forehead-slapping experience for me. Dang! That's clever!

I especially like Maarten's Figure 4 version. This is the first rocker setup that I've seen that can be made entirely from a length of aluminum angle bought from the hardware store.

For those of us in the non-metric USA (which officially sanctioned the metric system back in the later 1800's but doesn't use it), remember that you can convert from millimeters to inches by dividing by 25.4. For instance, the Figure 4 measurement of 30mm is $30/25.4 = 1.181$ inches, or a bit more than $1 \frac{1}{8}$ ". $2\text{mm} = 0.075$ ", $3\text{mm} = 0.118$ " or about $\frac{1}{8}$ ".

Hey Maarten!! You ROCK!!

R.G.