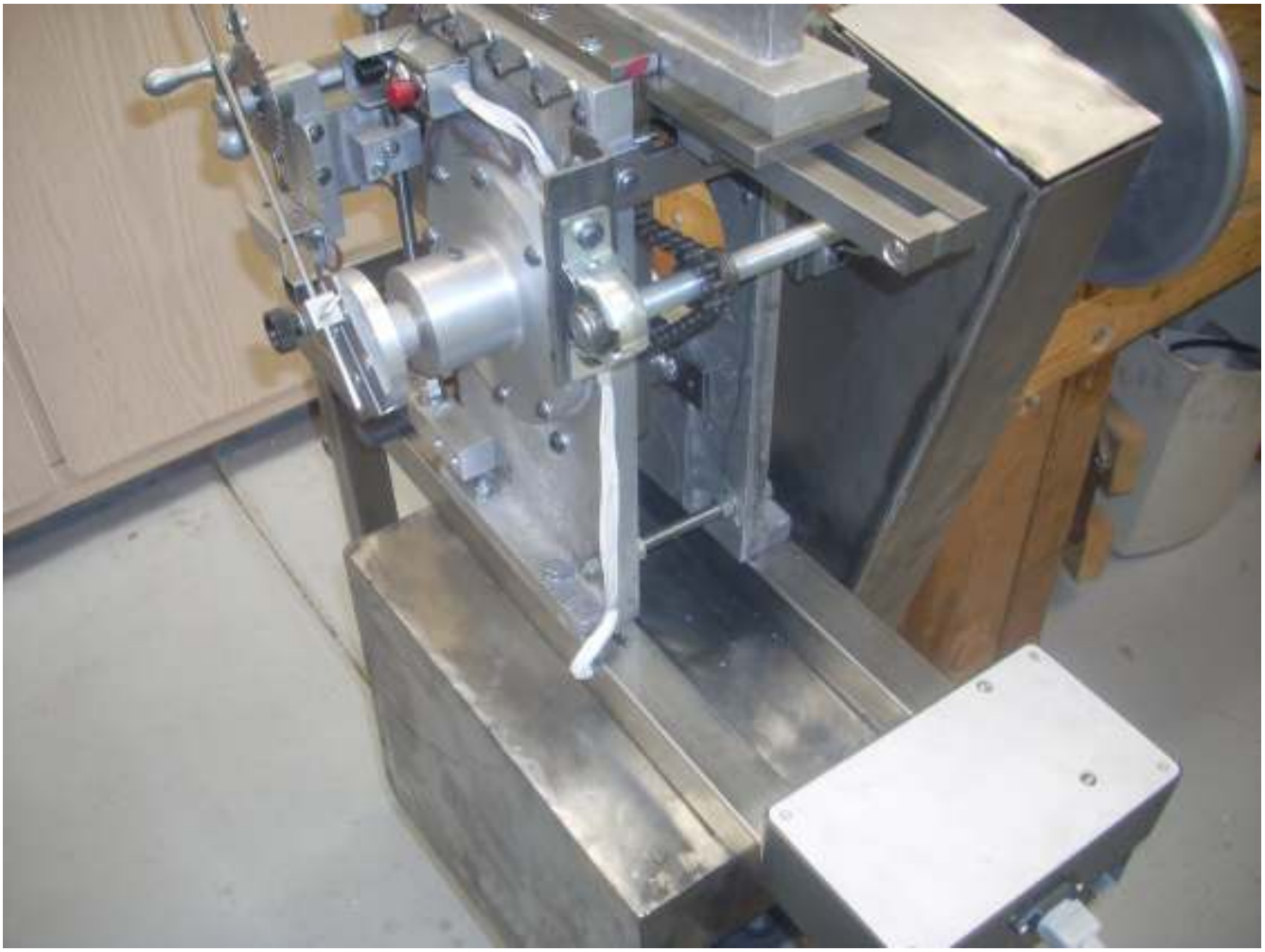
Belt Guards and Electrical Control

By R. G. Sparber

11/13/2008

It's the little stuff that takes all of the time. I've spent two weeks designing, building, redesigning, and rebuilding the belt guards and electrical control. I may have to do more on it but will show you where I am now.

You can also go onto Youtube.com and find 3 videos of this shaper working in various stages of completion. Just search for “rgsparber1”.

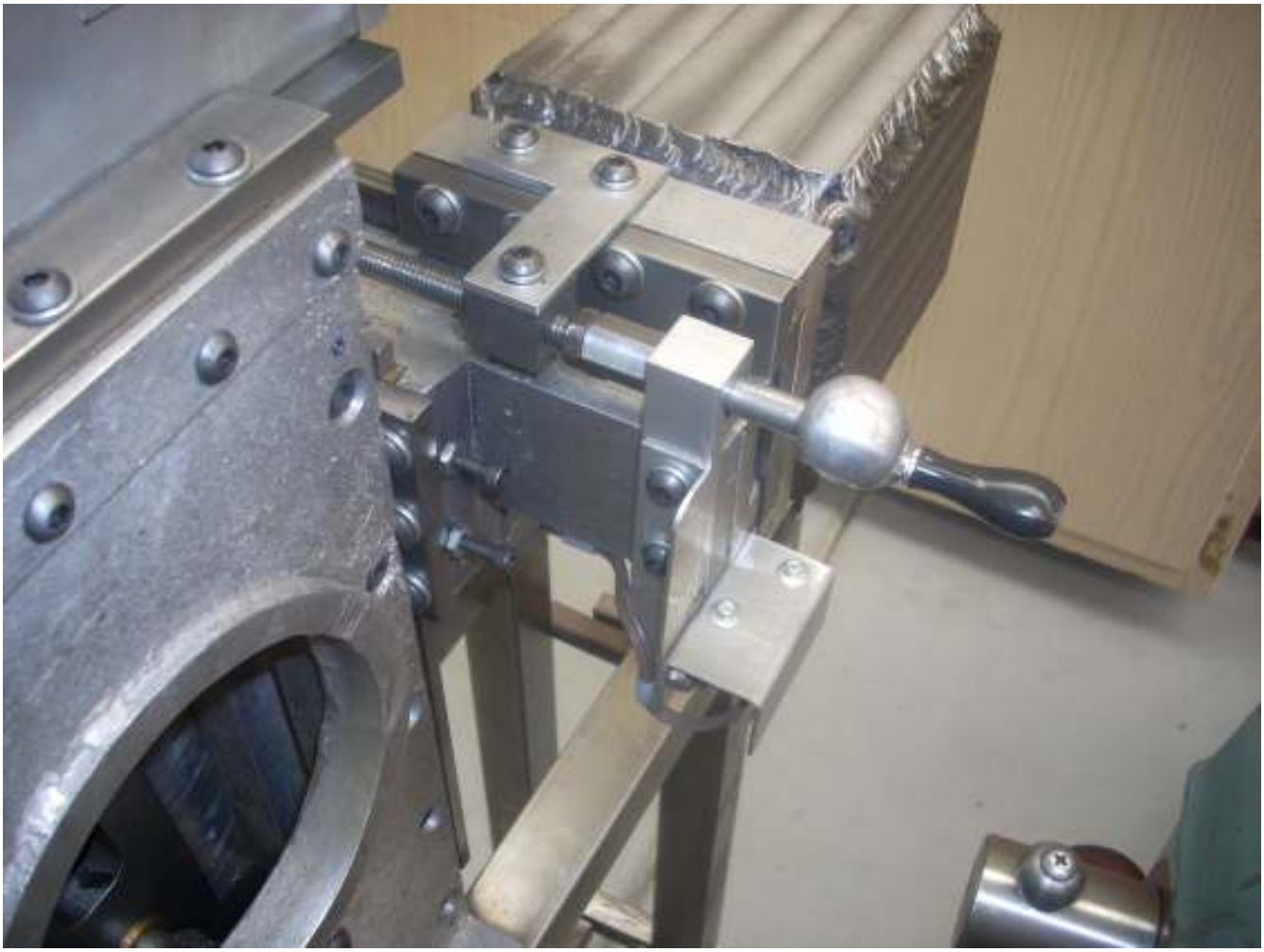


The sheet metal box below the shaper protects the motor from chips and also encloses the belt that goes from motor to jack shaft. The angled box on the right encloses the belt that goes between cone pulleys. You can also see the start and stop buttons in the upper left. The black start button is partially enclosed to minimize accidental power up. The red stop button kills power with a single jab of my finger. Power is also removed when the horizontal feed hits one of the two limit switches. The box in the bottom right contains the power control circuit.

Here is the right side limit switch. If the table moves too close to the end of its range, power is cut. This feature is most useful when using the automatic feed. I don't intend to operate the shaper without being present but have already focused too much attention on the cutter action and missed the fact that the automatic feed was slowly destroying my machine.

I can still manually crank the table into one of the hard stops but that is very obvious.

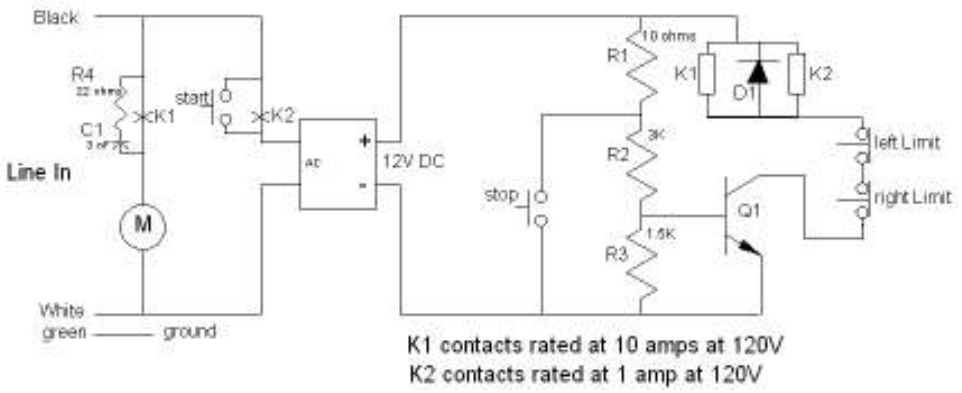
The limit switch wiring is partially exposed but this is a 12V circuit so there is no risk of receiving a shock.



This is the left limit switch as viewed from the back.

The relay box is a bit overly complex because I was using parts I had on hand except for the power relay. A key feature of this circuit is that the limit switches run on floating 12V DC. If either wire going to the limit switch shorts to ground, nothing will happen. If either wire breaks, power to the motor is removed.

One quirk of this circuit is that the stop button is a momentary on style. I had to invert its logic to make it work.



This should have been a simple circuit but in the end had a real head scratcher. Originally I didn't have R1 and the stop button was across R3. Push the stop button, turn off Q1 which removes power from the relays. No power to the relays means contacts K1 and K2 open. That should kill power to the 12V converter. It doesn't... right away. The problem is that the converter has a rather large output filter capacitor and the load does not draw much current. So if I just jab at the stop button, the motor would stop and then start back up. By moving the stop switch connections and adding R1, I am able to dump enough of the capacitor's energy to prevent a restart. It took all morning to find this simple solution.

A simpler solution would have been to use the stop button to just short out the converter. It would have worked and eliminated all resistors, transistor, and diode but was just too distasteful to me. Just ***too*** brute force.

Diode D1 prevents the inductive kick from the relays from damaging Q1. C1 and R4 form a “snubber network” that prevents an arc from forming on the relay contacts. Tis arc can cause the relay contacts to weld shut as they start to open.

Rick Sparber

rgsparber@AOL.com