

Preliminary report card puncher construction. DRAFT!!!! Juli 2012
Rev Agust 2012

After I have built a number of different forms of ponsers I am now embarked on a cardboard prototype of a puncher.
Before I describe this case first, some basic information.

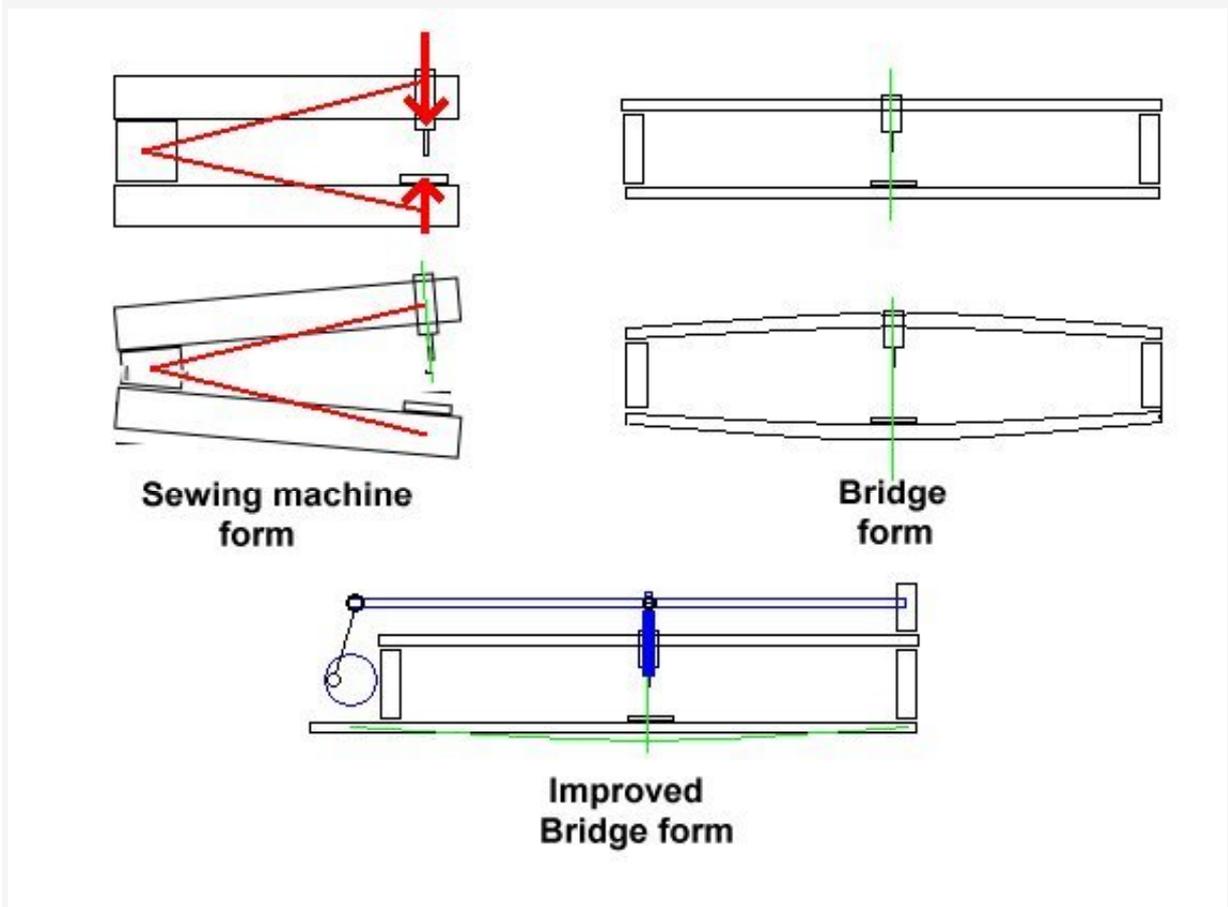
For punching cardboard books is usually a hand / foot machine used. In these machines is mostly chosen for a sewing machine model because the operator should have a clear view of his work .

This construction however poses a major drawback because the free arm should be very stable. At hand / foot machines, this is usually not a problem, because the arm is mounted on a table.

It is therefore understandable that the first computer-controlled machines are based on this concept. The heavy-duty arm was therefore immediately a problem and there are therefore usually very heavy, slow, propulsion systems needed in order to move this mass.

I initially made also my paperrol machines with this concept but I found the mass of the arm too high. I have followed a different approach which I have called bridge-concept punch.

The pictures below give in my opinion clearly why I have chosen this form.

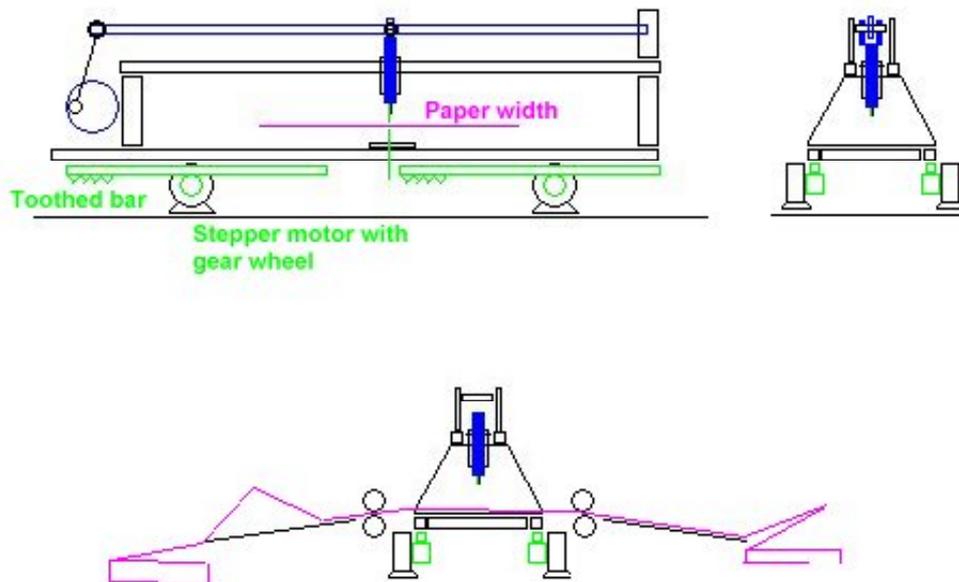


The cardboard-puncher I have gone a step further and have the drive to the Punch Pin on top of the bridge. The only place where deflection can occur now is the lower control arm and because the arrangement is symmetrical, the alignment of the pen and die does hardly not change. I have called this form the improved bridge form.

To drive the arm I now have four identical stepper motors placed on the foundation board with gearwheels. The gears engage in the four toothed bars which are attached on the bottom support beams of the arm.

The four stepper motors are connected in parallel and thus work as a unit.

This approach works well if the steppermotors are properly placed in relation to the gravity center of the arm.



On these drawings can also be seen that the span of the arm is more than twice the width of the carton. Account should also be room for conduction and such. I have used a stroke of 25 cm and made the free span 57 cm.

I use M1 toothed bars 9 x 9 x 250 Conrad No 237396-89 and 231762-89 Conrad 15T gearwheels M1. The gears have a bore of 6 mm and most stepper motors have shafts of 6.4 mm so the hubs have to be enlarged.

For the steppermotors, I use 6V 200 step with 0.75A/coil 5/6 wires. Because I work with half-steps, this gives a arm movement accuracy of 0.12 mm per step and is

generous enough. A somewhat larger gearwheel would therefore also be good and speed is also higher

The drawing also shows that I have two identical transport rollers applied. These are connected in parallel and thus the carton can be transported back and forth. This gives a lot of time profit because now the arm does not need to go to the next position after each punch. Every note is punched in its full length. See the principle on YouTube:

http://www.youtube.com/watch?v=9KZ_a8-gvu8

(This was the concept of moving the carton instead but now I use the old movement form again, i.e. the arm is moving and the carton moves forward and backwards.)

Here I use a reduction between the stepper motor and the roller giving an accuracy of 0.006 mm/step. This is high but that's to be sure that the transport forward and backwards have sufficient power. Maybe I will speed it up later.

Now the electronic management of the case.

Until now I had a free computer program that works well and is certainly sufficient for this card puncher. This combination works successfully at several users.

But that does mean that a PC is turned on while all the time the puncher is working, and that can take hours.

So I conceived of the idea to make the whole thing independently.

Meanwhile the machine has now completed the first tests and will soon go to a user for the real field test.

The control.

The basic idea for this interface was to make it usable with all standard MIDI-0 files.

I use a microprocessor that is able to read a standard MIDI-0 song from an SD card and prepares its data directly into commands for the puncher.

Obviously, there are settings to be done because each machine is different.

These settings are all on the interface to do. An LCD screen is mounted and a number of command buttons are applied

Everything works according to a menu.

First, a startup should be undertaken to let the puncher himself find the starting position and the arm control set point.

If the machine data has not yet been set before on previous times it has to be done first by choosing the machine-adjust menu. Such as the waiting time of the steppers, the punch waiting time, the punch size, the required pitch of the punch holes, etc. Data are stored.

In the following setting, the location of the various notes is recorded. The arm is moved with the control buttons in the right position and dictated what MIDI note this is.

For this purpose, for example, a mold is made or use of an earlier made book. To book the speed setting the transport rollers are moved over a 1 second distance, and this value is stored also

These parameters can also be saved and loaded by a normal serial PC connection in or out a standard modem program. I decided not to use the SD card for this in order to reduce the risk of disturbing the card content.

. The machine is now ready to proceed.

The midifiles have to be prepared for the organ as usual with basis standard programs and saved in format 0 on the SD card.(FAT formatted and max size 2 Gb)

The Midifile to be punched can now be chosen because the titles are displayed and the proces can start.

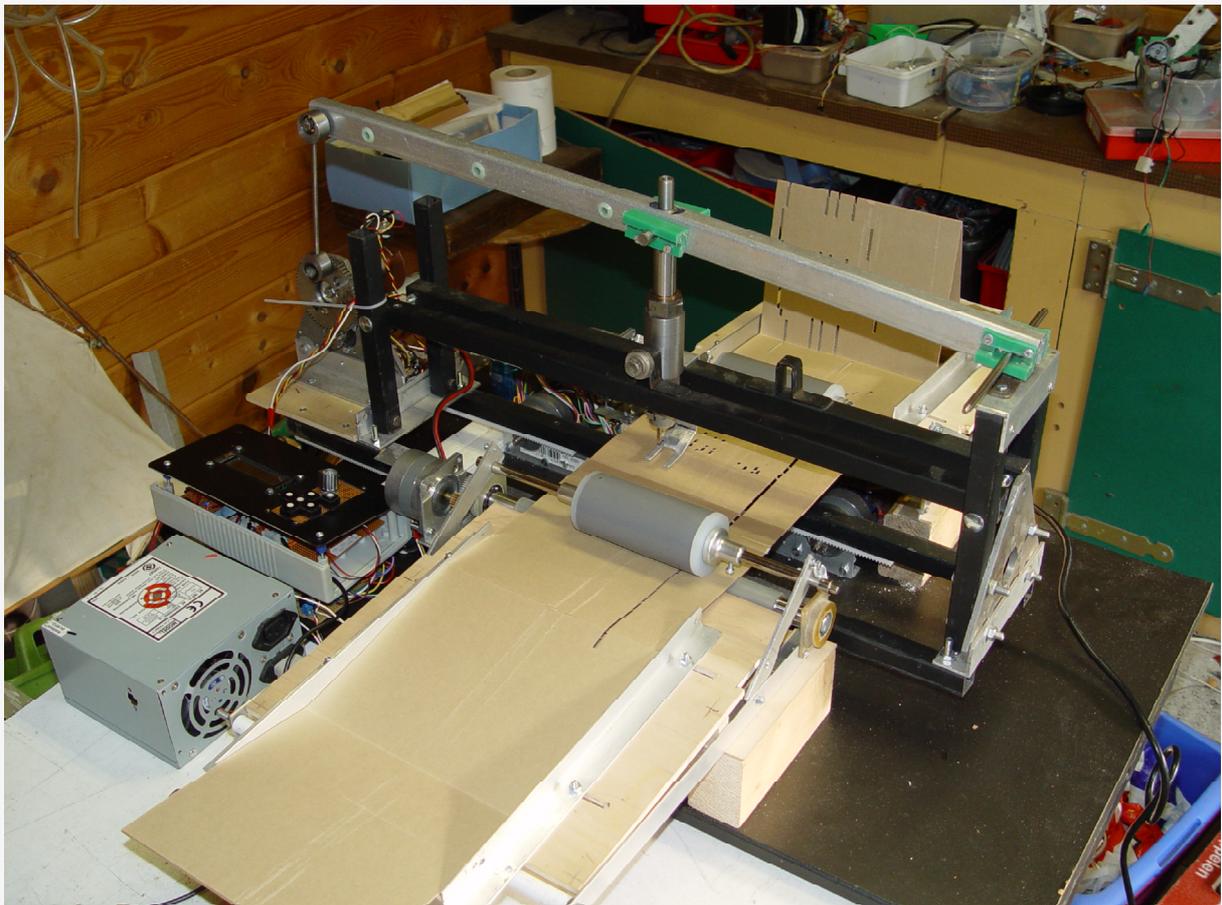
The punch can be used with a round pen as well with rectangular shapes. I have my test done with a 3x6 mm pin size and pitch is set so that a small overlap is made to achieve a contiguous slots.. Of course, with a round pin it is also possible to make the traditional paperrol form, or the now a days useds circular slots
If a fault occurs, the process can be paused and / or rebooted.

So, now I have to wait for the real tests.

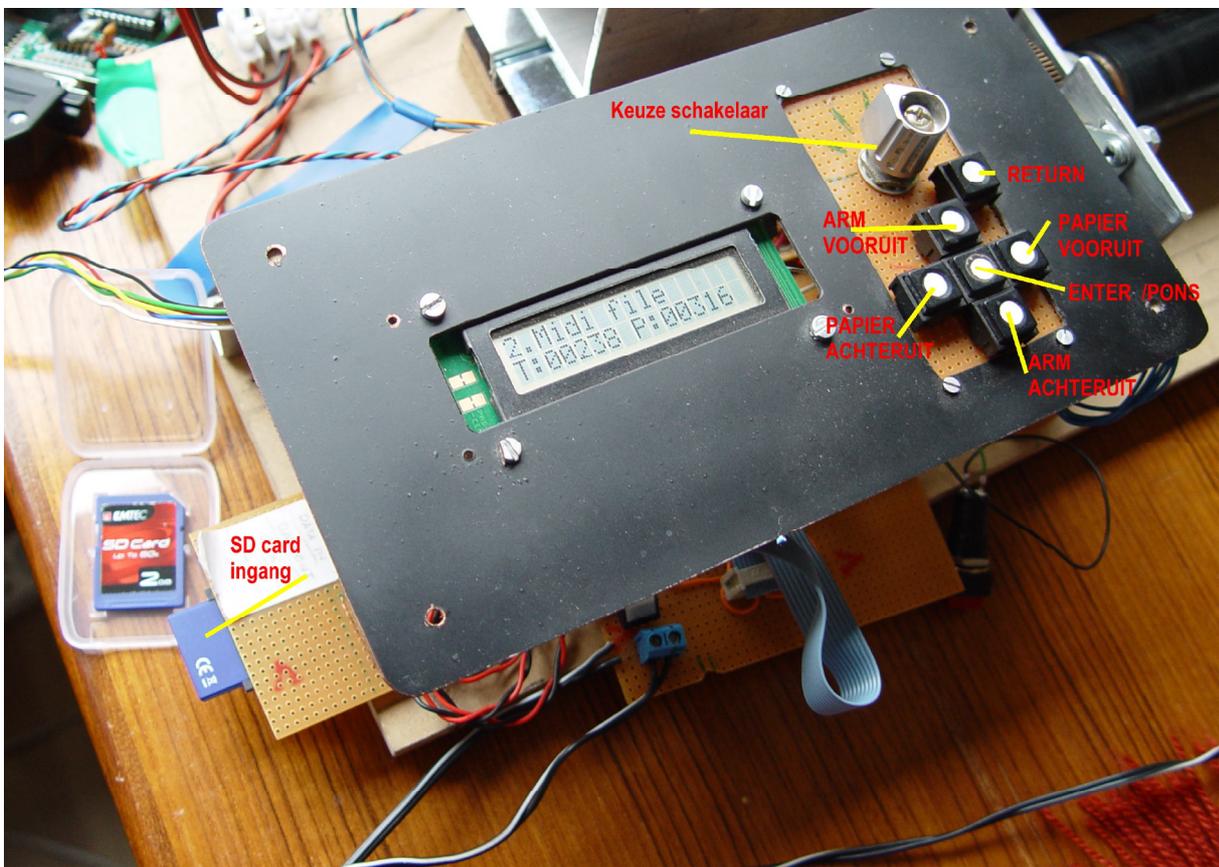
Hans van Veldhuizen juli 2012 rev aug 2012

So that all for the moment, now the pictures

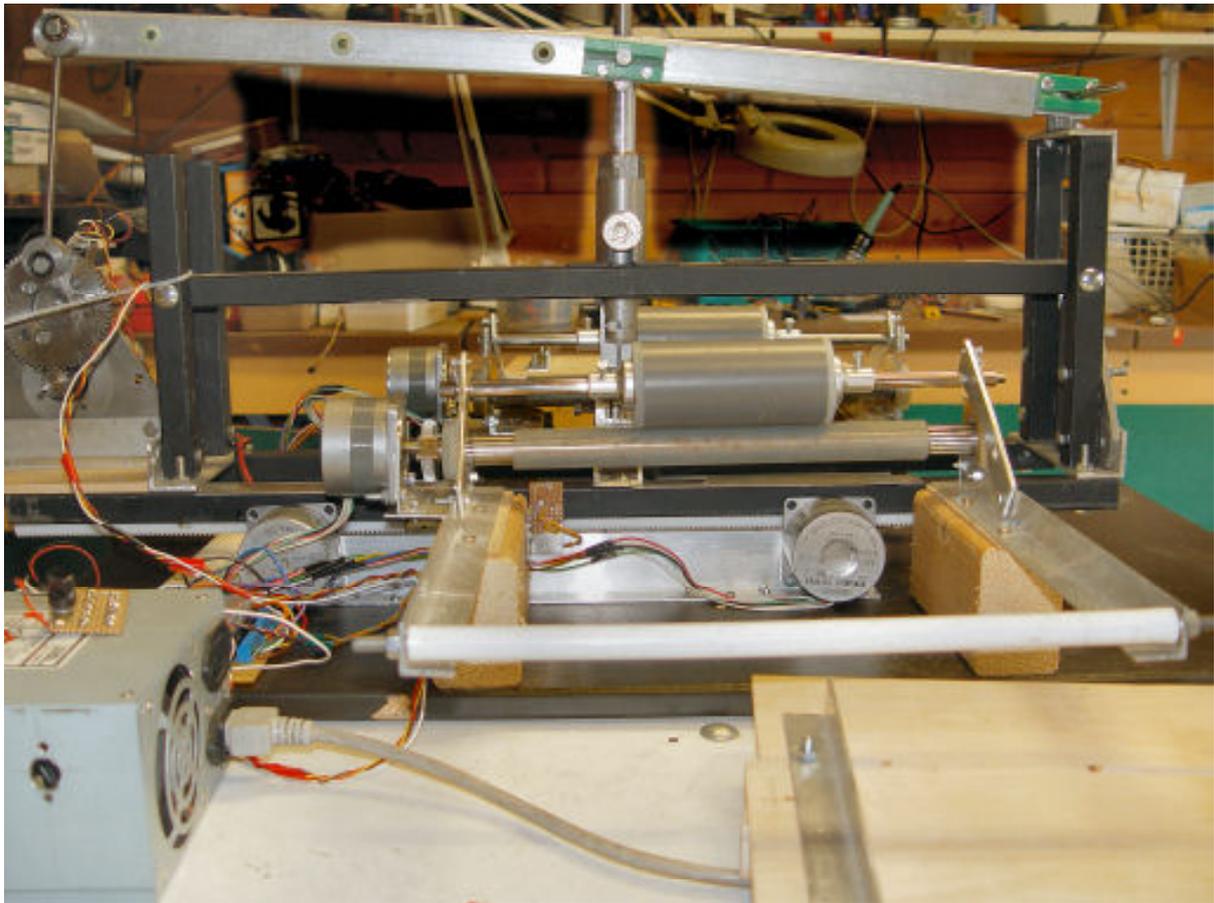
hanzeman@zeelandnet.nl

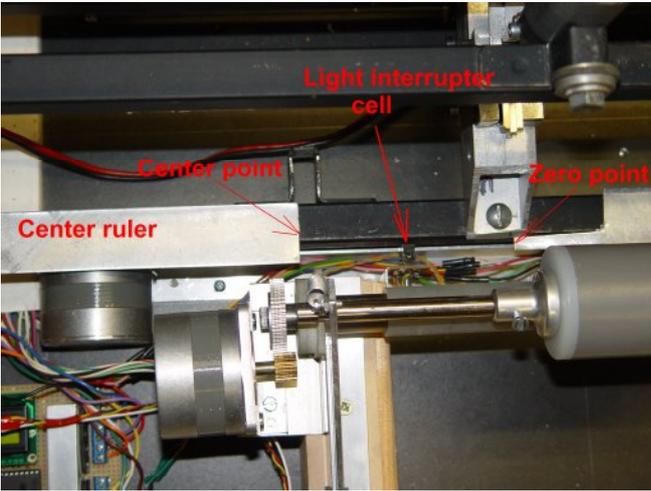
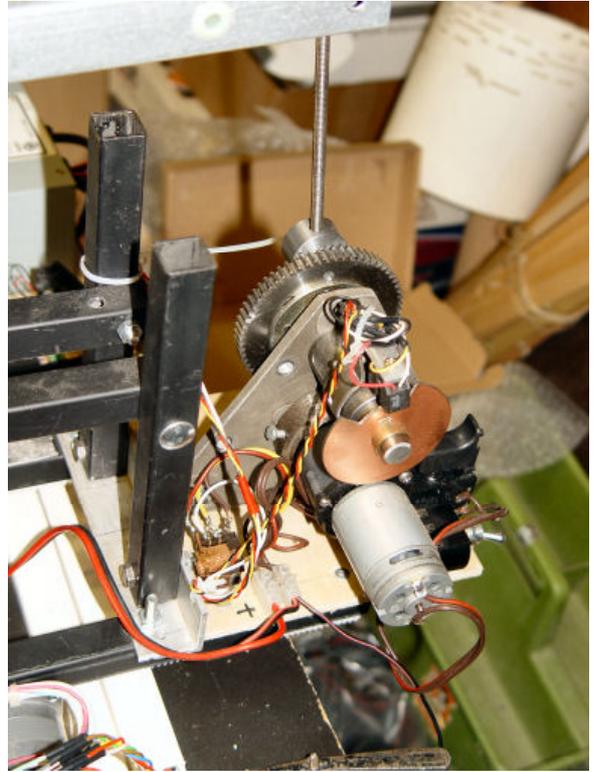
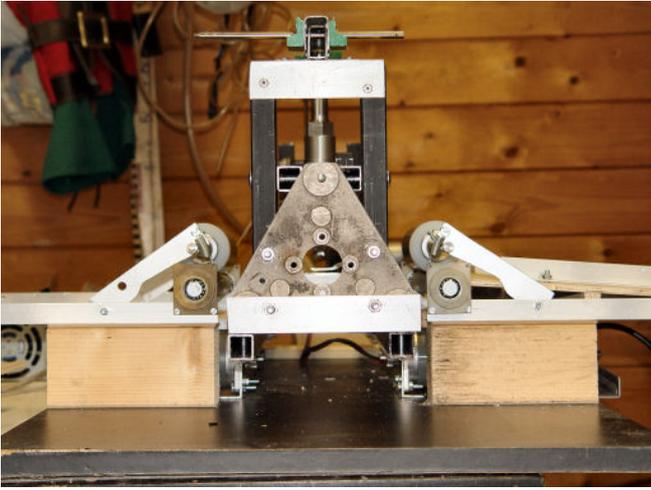


General view

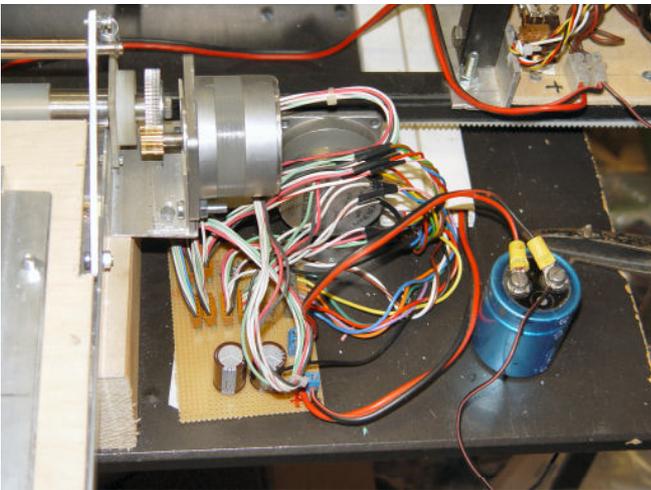
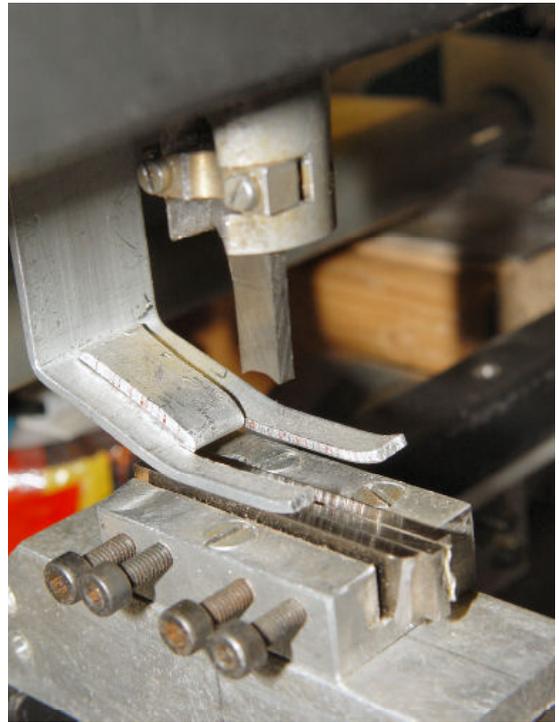


Commander unit





Paper guide removed



Some details.

The arm can be lifted in total from the transport steppers, as been done in the next pictures to see the toothbars

