

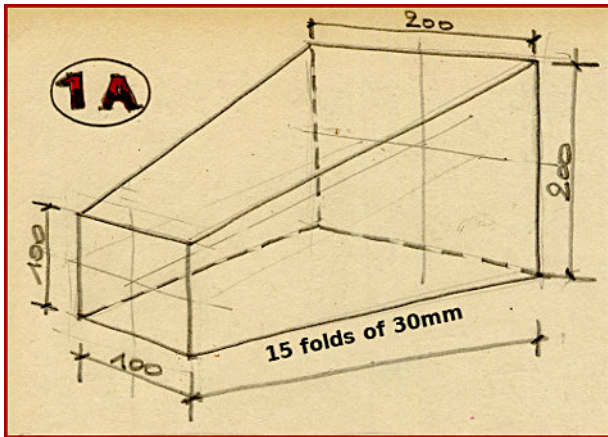
## MAKING A CAMERA BELLOWS

1. René Smets – July 2020

In September 2014, I published a first paper on how I built my [first bellows](#). In the meantime, I built many others, and of course I have adapted my method according to my experiences.

Drawings, photos and text will show you how I am currently working and how you too can build a perfect bellows. *Click on the underlined hyperlinks in the text: they lead to a number of attached pictures (backlinks under each), and to some videos (opening in a new window) showing how certain steps are carried out.* The videos can also be downloaded from the [Picto website](#).

A first picture shows the [materials & equipments](#) used to make this bellows...

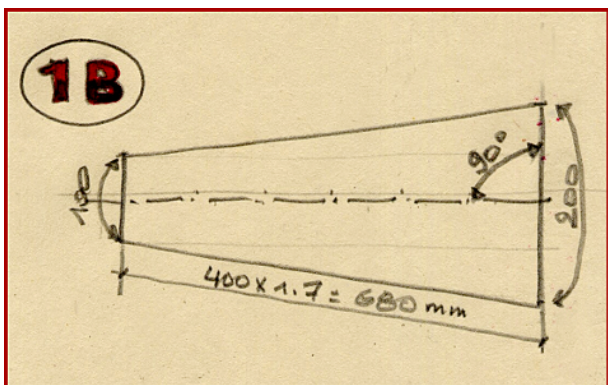


A bellows consists of [three layers](#) :

1. The inside is made of fine cotton (batiste).
2. The core is in black cardboard 300gr/m<sup>2</sup>
3. The outside is made of leatherette (the same as used for women's pants).

To begin with, we make a drawing with the dimensions of the bellows. See sketch 1A.

In our example the bellows measures 100x100 mm at the front, 200x200 mm at the back, and has 15 folds of 30 mm.



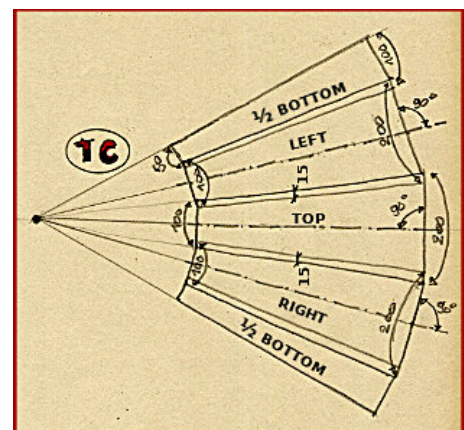
Sketch 1B:

To calculate the length of the bellows material, I multiply the maximum extension of the camera by 1.7: in this case 40 cm x 1.7 = 68 cm. (You should know of course the max. extension you want. This depends on how close to the subject you want to get, and what lenses you want to use for this).

Sketch 1C:

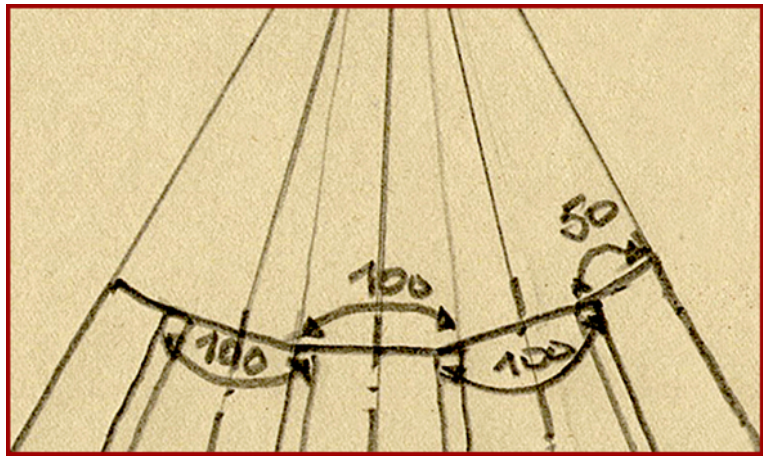
We draw the upper side of the bellows, which measures 100 mm at the front, 65 cm long and 200 mm at the back.

Now we draw the left & right sides of the bellows. ATTENTION!! there must be a 15 mm overlapping, half a fold (see sketch on next page).

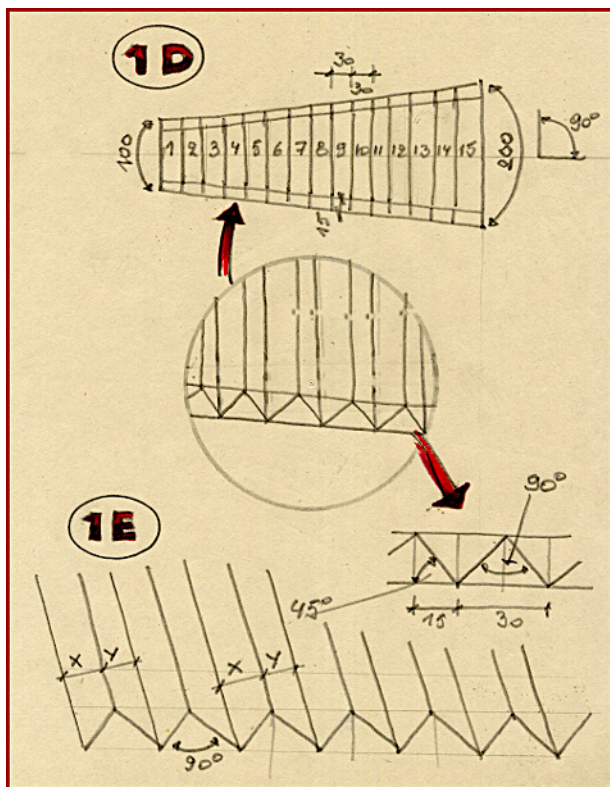


And finally we draw the two halves of the bottom side: one part on the right and one part on the left.

Note that the axes of each plane meet at a point outside the drawing.



## DRAWING THE FOLDS AND CORNERS.



### Sketch 1D :

We divide the upper side into 15 folds of 30 mm, perpendicular to the axis.

We then draw the  $90^\circ$  angles; their sides have to form a  $45^\circ$  angle with the bellows side.

We now see that one rib of the fold is narrower than the other : Y = smaller than X.

### Sketch 1E :

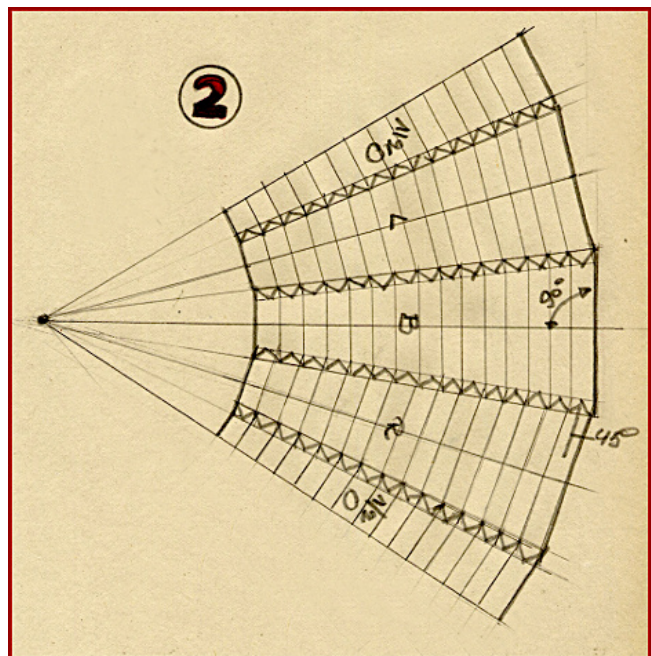
Shows the 30 mm folds of the upper face, both ribs of each fold have a different width.

### Sketch 2 :

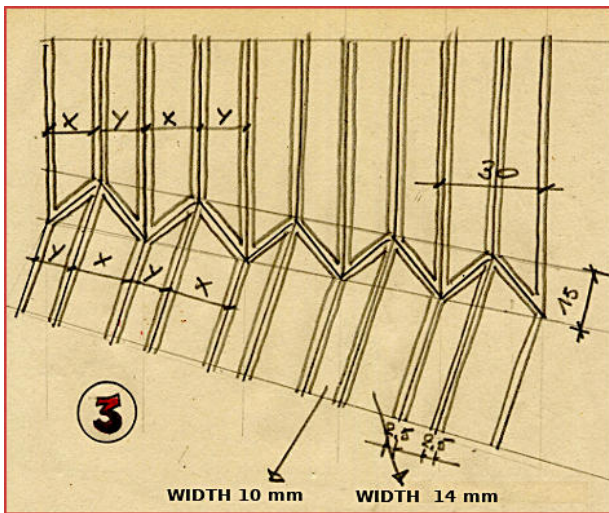
This is the drawing of the bellows faces and their 30 mm folds.

Pay attention to the following points:

1. The axes meet at one point.
2. the folds are perpendicular to the axes.
3. the corners are at  $45^\circ$  to the sides.
4. the different planes overlap each other by 15 mm (half a fold).







Sketch 3:

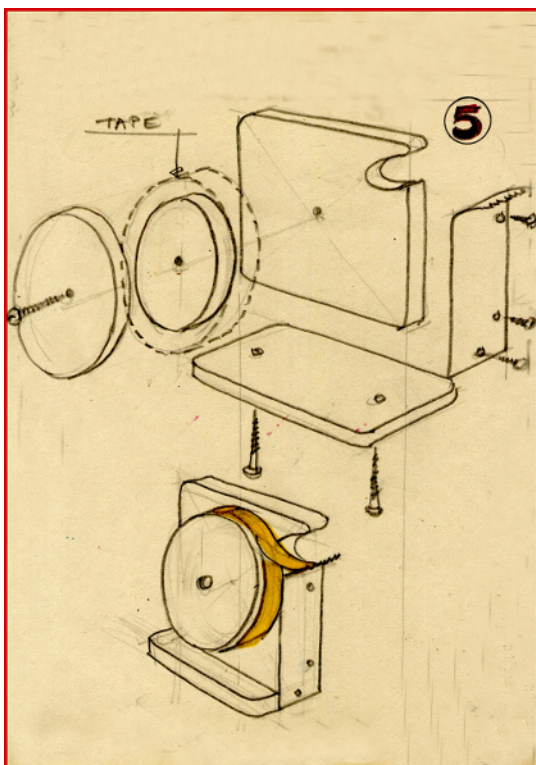
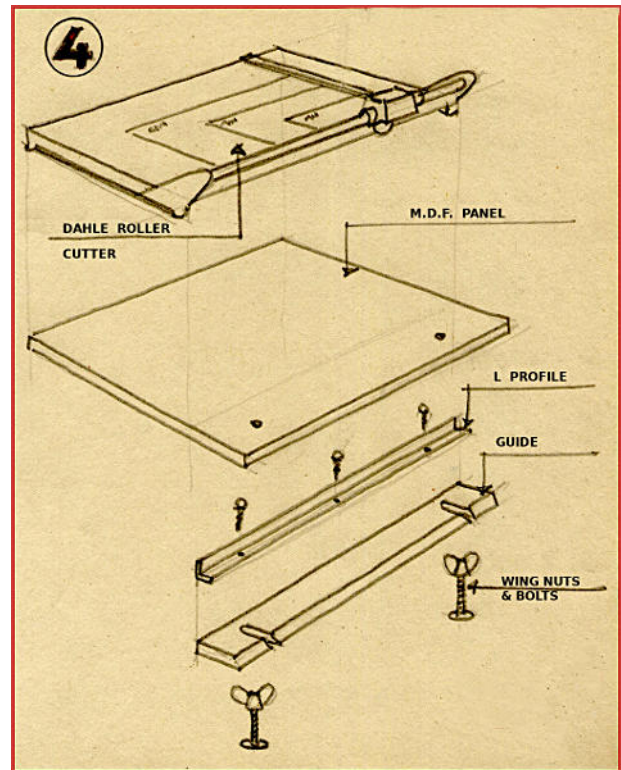
The ribs of each fold are drawn and also the corners at 45°; as you can see, there is a gap of 2.5 mm around each rib.

You can also see that the width of the two parts of a fold is different.

Sketch 4:

You can see here how I adapted my [rotary cutter](#) to make sure that the paper strips for the ribs are cut the same width. ([video 1](#))

Any remaining unevenness in the strips can be corrected by turning them alternately left and right before gluing them together.. ([video 2](#))



Sketch 5:

I made a tape dispenser to easily take pieces of tape with one hand. This is useful when fixing the strips at their intended spacing.





*Sketch 10a :*

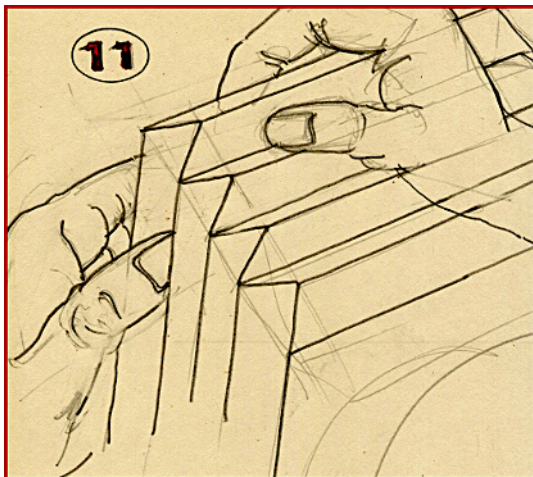
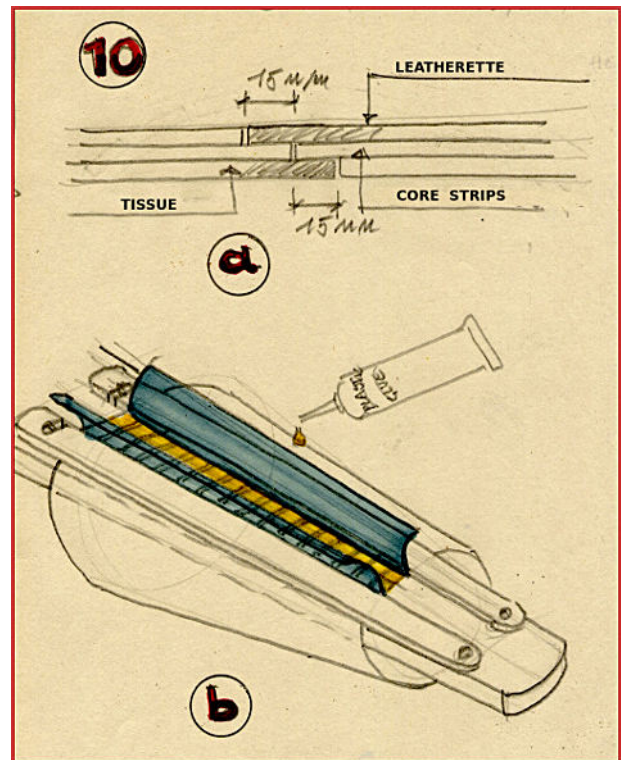
The bellows seam is made by having the textile overlapping the cardboard core by 15 mm. Same for leatherette, but in the other direction. This way, when the central strips' edges are touching each other, the seam is covered by the outer layers.

*Sketch 10b :*

The seam is made by joining and gluing together the central strips of the two half faces.

I made for this purpose a [board with two clamping slats](#) that hold the two ends of the bellows in place for gluing.

The seam is glued with PVC glue.



*Sketch 11 : ([video 5](#))*

After drying, our bellows is ready to be folded. We start with the widest side (back). The folds are formed by pressing inwards the inner folds with our thumbs, while pushing outwards the outer folds with our other fingers. Once the fold formed, we turn the bellows and move on to the next face. After a whole series of complete rotations, we end up with a last fold to get a [well-folded bellows](#).

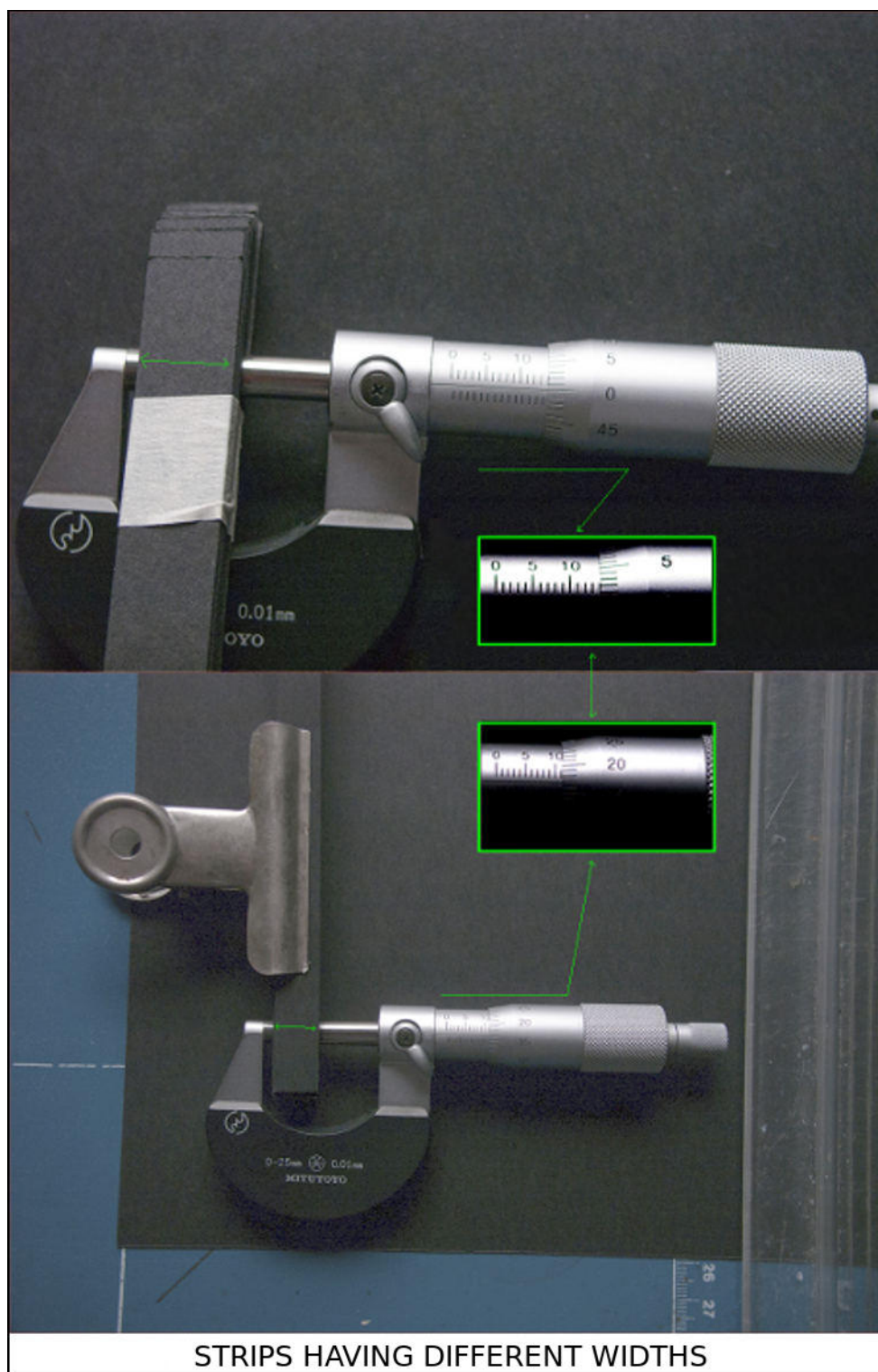
Thanks to the pre-cut shapes of the inner strips, the bellows can easily be folded, with the folds forming almost on their own.

The folded bellows is then placed under a weight overnight.

By placing [wooden panels](#) at the front and back, the bellows can be attached to the camera. My panels have a circular cut-out because I want to use this bellows for circular wet collodion plates.

The bellows thus made is [glued](#) to the panels, which will be mounted in the camera.

## ANNEXES - PICTURES



STRIPS HAVING DIFFERENT WIDTHS

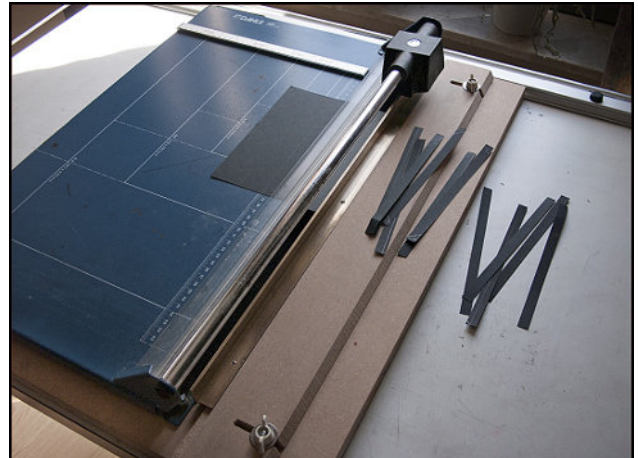
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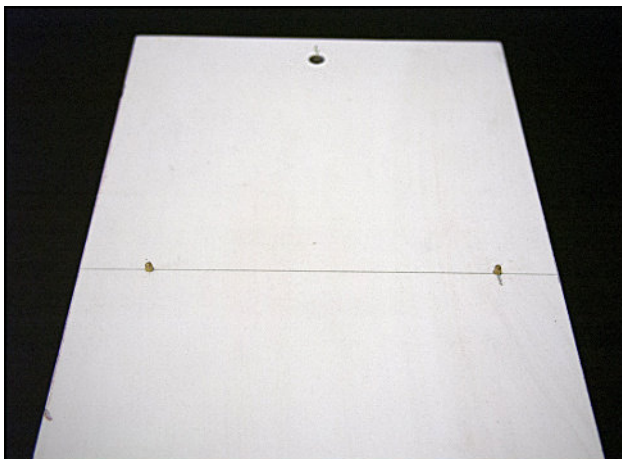
MATERIALS

[\[BACK TO TEXT\]](#)



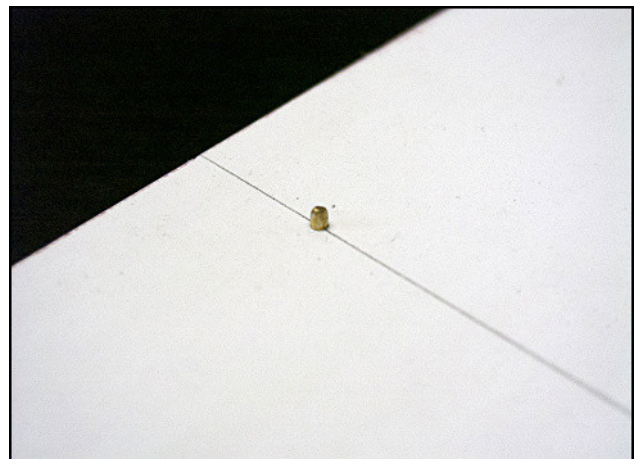
CUTTING THE STRIPS

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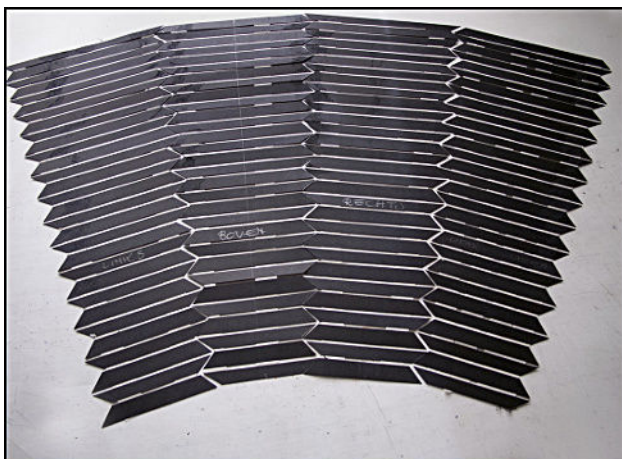
SPACING PINS

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SPACING PIN

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ASSEMBLED STRIPS

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READY FOR MOUNTING

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GLUING THE SEAM

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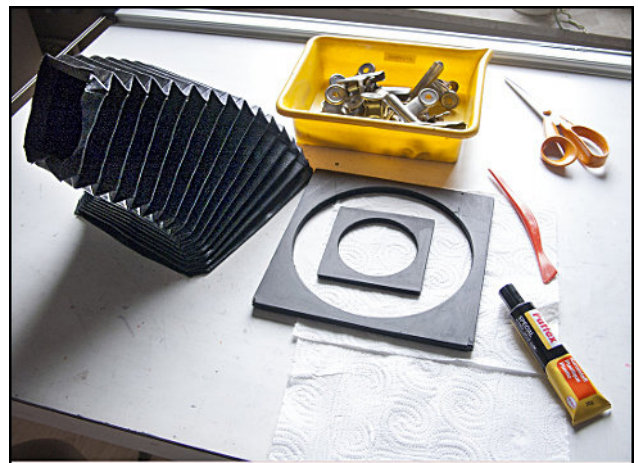
TISSUE CORNERS

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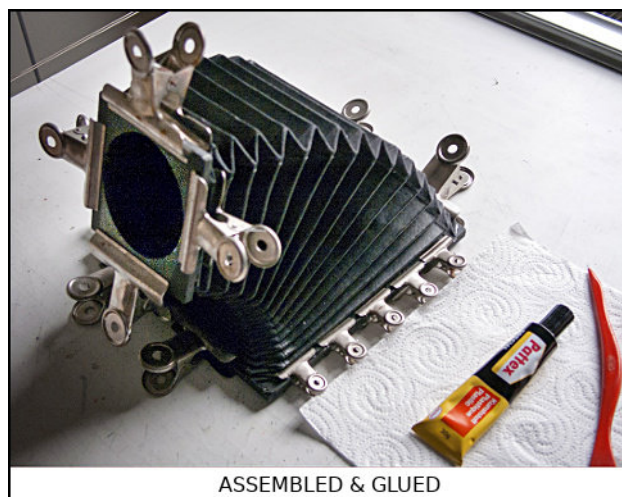
FRONT & BACK PANELS

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READY FOR GLUING

[\[BACK TO TEXT\]](#)



ASSEMBLED & GLUED

[\[BACK TO TEXT\]](#)



## MATERIALS & EQUIPMENT ....



[\[BACK TO TEXT\]](#)

1 drawing board - 2 parallel ruler- 3 square - 4 rotary cutter - 5 adhesive tape dispenser - 6 textile roller cutter - 7 cutter + scissors - 8 PVC glue - 9 spray glue - 10 board with spacers 11 - strip width guide.