

What is Jacquard Weaving?

Belinda Rose, Online Guild

This article is about the distinguishing features of a Jacquard loom. Before I write about Jacquard looms, I want to define a loom as a tensioning device. Weaving looms come in all shapes and sizes: tapestry frames and looms, inkle, rigid heddle looms, table and floor looms, dobby and Jacquard looms. The principal distinguishing element between looms is how the weaver raises warp threads to make a shed through which to pass an interlacing weft to weave fabric. (For more information on weave terminology and looms see the Weave Glossary, p.19 of this *Journal*).

Table looms have heddles arranged on frames called shafts, controlled by levers. Shaft looms generally have between four and sixteen shafts. All threads pass through a heddle on one shaft or another, and through one heddle only. The weaver uses levers to raise one or more shafts, which in turn raises the set of threads controlled by each shaft. The more shafts available, the more design options available to the weaver.

Treadle and dobby looms

To gain a little extra speed we can replace the levers on a table loom with treadles and use our feet to raise the shafts, while our hands handle the weft yarn in the shuttle.

Weaving on a four-shaft treadle loom, we set up the treadles thoughtfully to use all 14 combinations available. If we want to weave all 14 combinations in one piece of fabric, it is easily done even on a counterbalanced treadle loom, although there is a reduced shed where three shafts work against one. The more shafts we add to our loom, the more complex the choices we can make in our weaving. If we thread a four-shaft loom with two different two-thread blocks (as in figure 1), we can weave all sorts of interesting textures, such as honeycomb. However, we cannot weave the twill shown in figure 2. We can thread a loom with eight shafts to be able to weave both honeycomb and twill (as in figures 3 and 4).

As more shafts bring flexibility in design, they also bring restrictions. An eight-shaft loom has 254 combinations of lifts. The more treadles we have to use, the trickier it becomes to select the correct treadle and even remember the treadling sequence. Most eight-shaft looms have only 10 to 14 treadles and it takes time to re-tie treadles to weave different combinations of lifts.

So, it's time to meet the dobby loom – a mechanical lifting device with either a system of lags (or bars) with pegs and holes, or a compudobby box attached to a computer which can do all the shaft selection for you. One or two treadles work the dobby system which replaces the set of multiple treadles. The weaver can change the sequence of lifts in the set of pegs in the lags, or in the computer file, and uses the single or pair of treadles to weave through a sequence of lifts. No more sitting under a loom tying and retying treadles to shafts!

Dobby looms can lift a combination of shafts on the loom. The number of treadles on a shaft loom limits the weaver, while the dobby opens up a world of lifting possibilities.

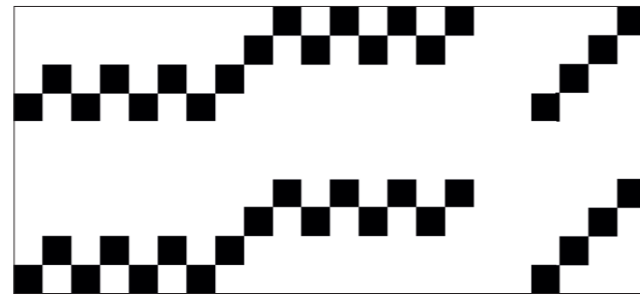


Fig. 1

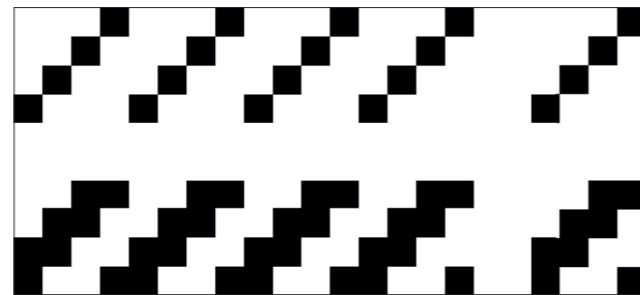


Fig. 2

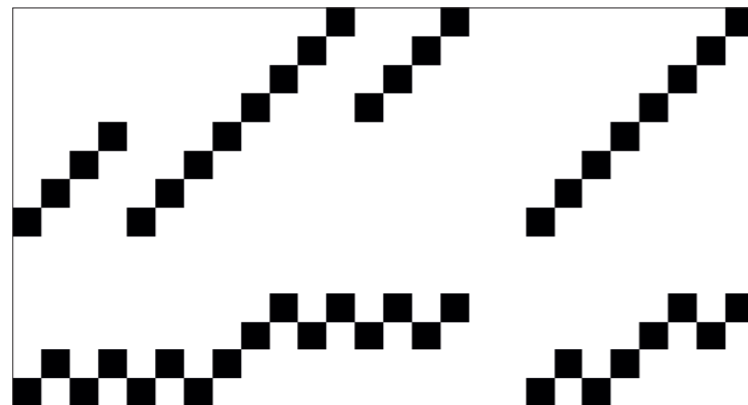


Fig 3

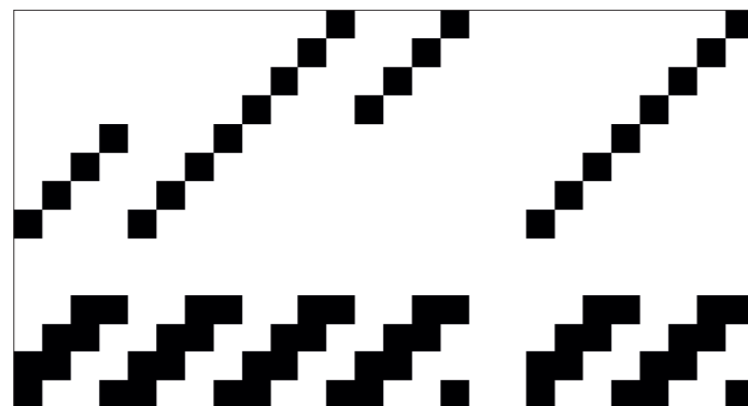


Fig 4

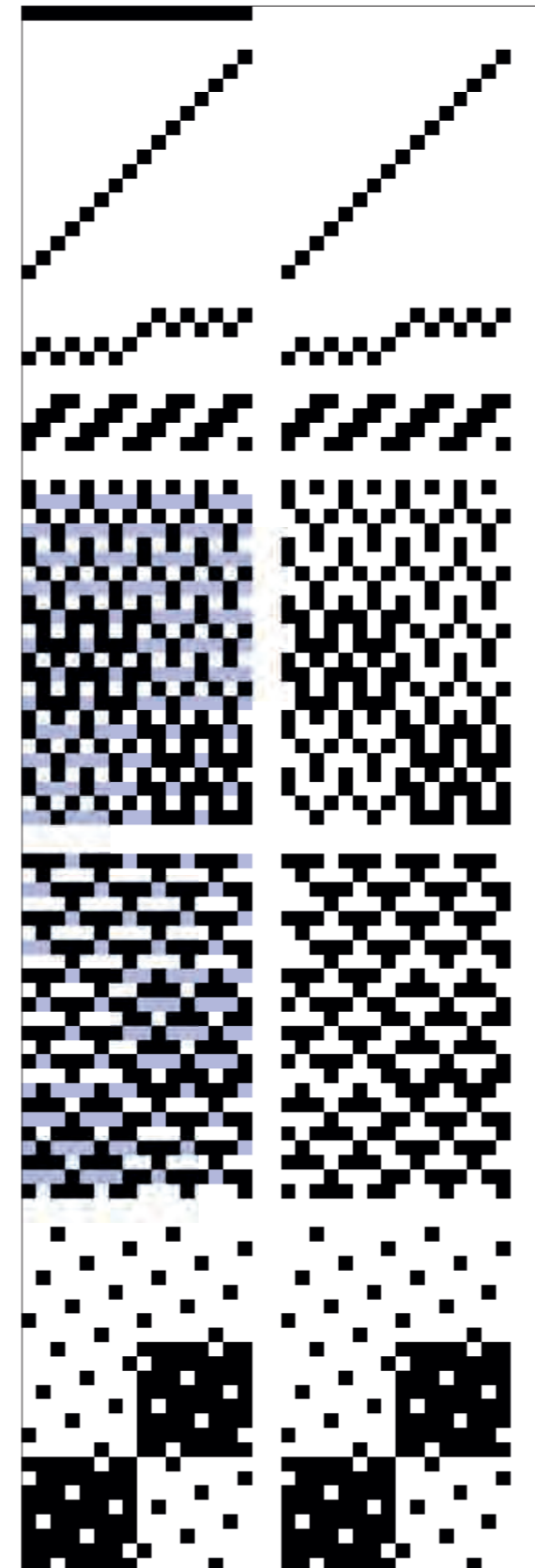


Fig 5: From top: honeycomb, 2/2 twill, summer and winter, taquete, 8 end satin

On to Jacquard weaving

Now enters the Jacquard loom, which instead of lifting shafts lifts individual threads, and thus is able to produce a variety of complex figured fabrics all on the same set-up, without regard to a specific number of shafts being available. A weaver can weave plain weave pieces on rigid heddle, two-shaft looms, 16-shaft looms, and indeed a Jacquard loom.

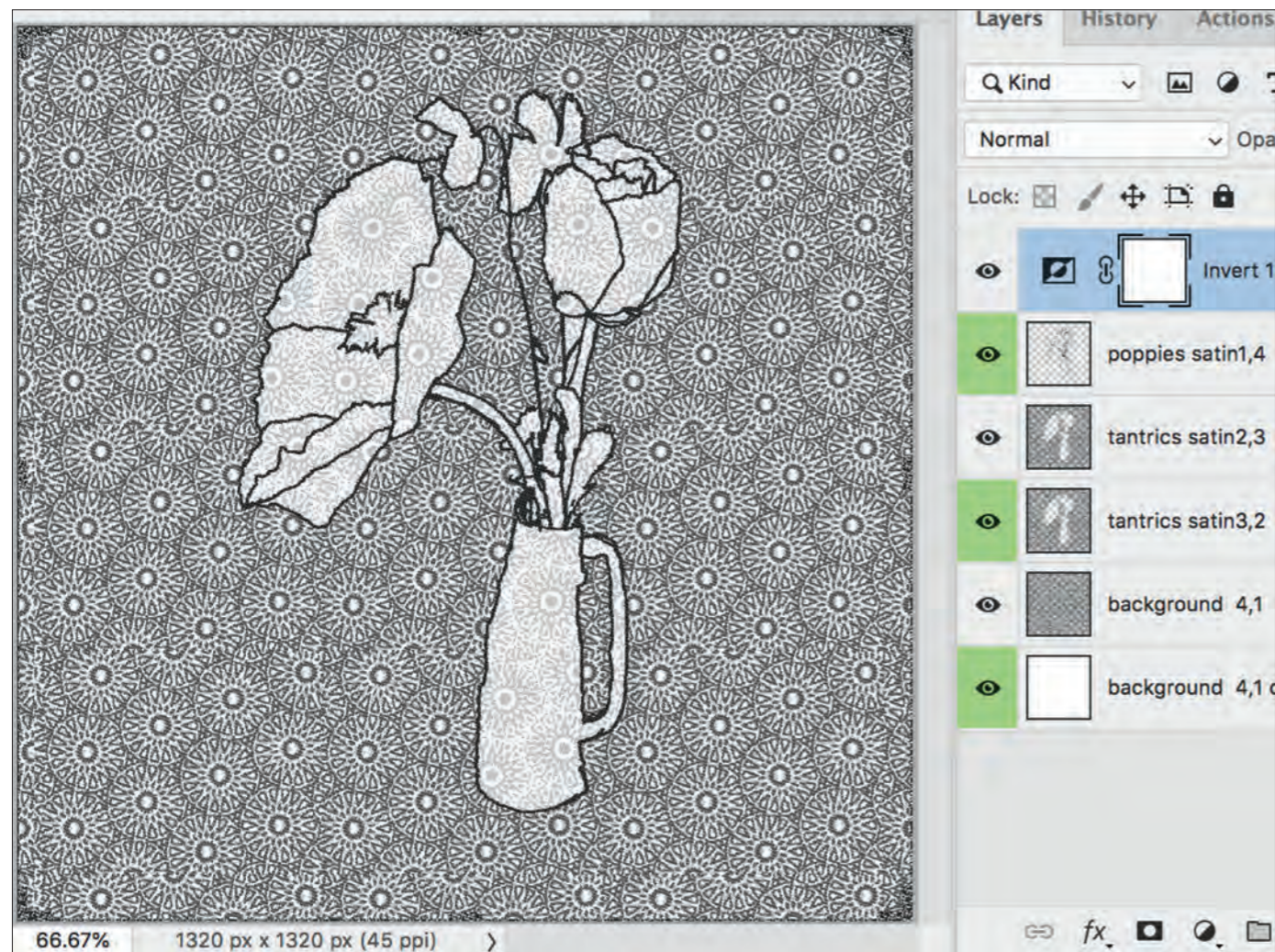
A traditional Jacquard loom has a lifting device, a Jacquard head, which sits on top of the loom, making the loom rather tall. Do watch the V&A's wonderful video at <https://tinyurl.com/v-a-jacquard-video/> to see exactly how the lifting device works.

In the studio I weave on a TC2 electric digital Jacquard handloom, using a foot pedal like a sewing machine pedal, to engage pistons and valves with a blower to create a vacuum which raises individual heddles pneumatically. Yes, heddles! There are no shafts on a Jacquard loom. Each heddle is controlled individually. Put another way, you could think of every warp thread as having a shaft all to itself. Threading is sequential from the first thread to the last thread across the warp, straight threading, no block threading at all. I design the weaving sequence in advance in Adobe Photoshop, making each design into a black and white bitmap file for the TC2 loom to interpret. I change the sheds by pressing the foot pedal treadle and can

All images and photos: Belinda Rose



The TC2 electrical digital Jacquard loom



Poppy design work



Poppy: Woven fabric for garment.
Warp: white 2/12 mercerised cotton.
Weft: turquoise 2/16 mercerised cotton.
Weave: 5-end satins

weave plain weave, twill and fancy figured designs without rearranging any threading. In having straight threading right across the warp, the digital Jacquard differs from traditional Jacquard looms which have repeat structures built into harnesses or shafts.

Imagine a 16-shaft loom threaded with super thick warp yarn, sett at 4 ends to the inch (1 end to the cm). The fabric will be 4 inches (10cm) wide. The threads are all threaded in a straight line on adjacent shafts as in figure 5. Plain weave, honeycomb, twill, summer and winter, taquete and satin are weave-able without rethreading at all. It is operating exactly like a Jacquard loom with an exceedingly narrow warp making quite a chunky fabric.

The TC2 is described by the manufacturer, Digital Weaving Norway, as a prototyping and sampling loom. TC stands for thread controller. The heddles in my loom are mounted in a fixed position in modules currently giving a weaving width of 28in at 45epi. I can vary the sett by up to 10% by re-denting in the reed, or by dropping ends out of the warp. Think of our notional 16-shaft Jacquard style loom. Weave without ever raising, say shafts 4, 8, 12 and 16, and you have thinned the sett to 3epi instead of 4epi. I could also rearrange the modules to make the basic sett denser over a narrower width.

I use Adobe Photoshop to design, change a design's scale, and apply weave structures. Switching from a two-colour damask design woven with a warp-faced 5-end twill contrasting with a weft-faced 5-end twill to an 8-end damask satin is achieved in the computer without any rethreading. The loom software simulates any shaft threading or Jacquard weave fed to it. It recognises file types such as bitmap, tiff, and WIF (weaving information files produced in shaft loom software such as Proweave).

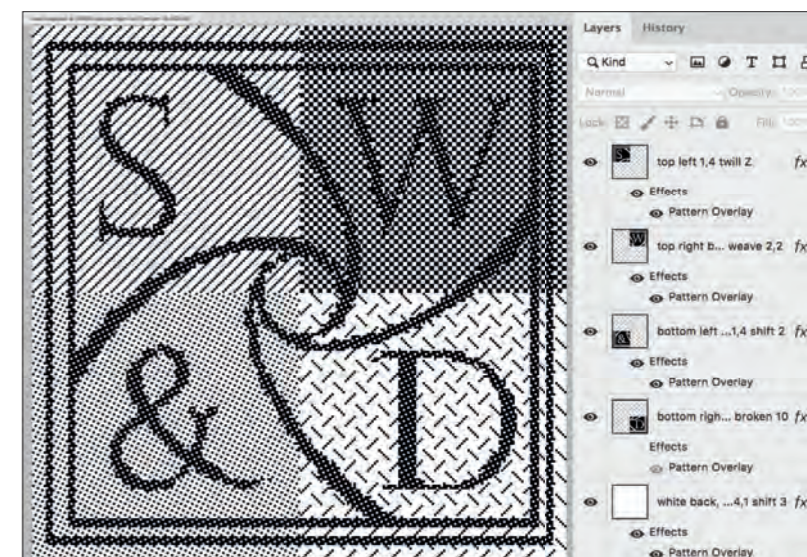
I generally design a weaving project in three stages. In the first stage I create sets of weave structures which I may want to use, such as 4-end twills or 5-end satins and save them in a library of weaves. In stage two, I work on a design designating specific areas which will have different weave effects. In stage three, I choose and apply a different weave structure to each of these areas, rather like painting by numbers. This is all done in Photoshop. As the logo example shows, I work in effect in what would be the drawdown area of a traditional weaving draft. When the design is complete, I weave a sample, noting the ratio of warp end to weft pick. Before I weave the final piece, if the sample did not weave square, I adjust the ratio of the height to width to reflect the actual weaving ratio.

Whatever ideas the Jacquard weaver is mulling over, they never consider how many shafts a design would have required. A Jacquard loom can handle complex designs involving shaft-hungry weave structures. This is the hallmark of Jacquard weaving.

Considering the relatively fixed width and sett, not all projects are suitable for weaving on my Jacquard loom. A weaver generally chooses to use the most suitable available loom for a project. I would use another loom for projects requiring significantly fewer or more than 1320 ends, or a width which doesn't fit my current TC2 configuration. Some weavers will choose to use a tapestry frame. All weavers are constrained and blessed by the grist, fibre, colour and sett of the warp yarns they have dressed their loom with.



Design for WSD logo



Design for logo with weave: Each quadrant has a different weave structure: twill, basketweave, broken twill and weft-faced satin.

Skilled weavers weave beautiful, complex designs on rigid heddle, shaft and dobby looms, not describing their work as Jacquard weaving, although much of it could be woven effectively on a Jacquard loom with the appropriate yarn grist and colour. The Jacquard loom brings the opportunity to think out of the shaft or block.

About the author: Belinda hand weaves using a wide range of techniques, from a digital TC2 Jacquard to tablet woven bands. She offers online weaving tuition for distance learning and teaches in her studio in rural Aberdeenshire in the north east of Scotland. www.belindarose.co.uk