

Fitzarbeit büchlein The Pleatwork Book

Mastering 15th and 16th Pleatwork Techniques



Genoveva von Lübeck

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An Introduction to 15th and 16th century Pleatwork

FOR EARLY MODERN EUROPEANS, LIFE WAS NOT TOO SHORT TO FOLD THEIR UNDERWEAR.

As the “Little Ice Age” crept into 15th and 16th century Europe and access to materials increased, underwear became bigger, cozier, and, in some cases, fancier. The linen undershirt, known in the German states as a *hemd*, began to employ a larger and larger amount of fabric, which needed to be gathered and secured at the neckline and wrists. One solution was to gather the fabric into small corrugated folds, also known modernly as cartridge pleats, and then secure those pleats in place. The securing of the pleats could be both functional and decorative, and was termed *fitz-arbeit* (“pleat work”) by the Germans. An analysis of 15th and 16th century undergarment pleating and recent research reveals important fabric gathering and fold securing techniques: fabric was corrugated and secured in different manners and gathering threads, when employed, were not used as the sole means to secure the finished work.



Fig. 1: *Selbstporträt* by Albrecht Dürer in Prado (1498)

Pleating fabric was not a new technique by the late 15th century when the more voluminous undergarments began to appear. Evidence of cartridge-pleated undergarments appears in 21 of the 52 graves excavated in Birka (Hägg, 12) dating back to the 9th and 10th centuries. Pleats appear in other garments beyond this, as well, including the 13th century pleated wool fragment from Sankt Peder in Sweden (Kusmin), and the 14th century woman’s gown with a pleated front found in the Uvdal Stave Church in Norway (Guhnfeldt). Yet it isn’t until the late 1400s that we see cartridge-pleated garments appear regularly in surviving artwork and extant garments of the era.

Renaissance portraiture is marked by innovations that more realistically portray their subjects, including attention to natural light and shadows, which is very helpful in identifying and analyzing pleated undergarments. We are fortunate to now have access to extremely high resolution scans of portraits which portray very detailed pleats, including *Selbstporträt* by Albrecht Dürer in Prado (1498) in figure 1, available at a resolution of 19,047 x 24,047 pixels in Google Earth, which is over 600 ppi (300-500 ppi range is about the limits of the human eye). In addition to this, more highly-detailed paintings give us important clues, including *Bürgermeisters Jakob Meyer und seiner Gattin Dorothea Kannengießer* by Hans Holbein (1516), *Portrait of a Young Man* by Ambrosius Holbein (1518), and *Portrait of a Boy as Saint Sebastian* (1490s) by Giovanni Antonio Boltraffio.

Extant garments with pleats are few in number, but they do exist and there have been some recent, well-documented finds. Important finds include the 14 pleated textile fragments found at Lengberg Castle (Austria) in 2008, two pleated shirt fragments from Kempten (German) in 2011, and two pleated linen shirts found in Alpirsbach (Germany) in 1958. Key to this research is an article published within the past several years in *Archaeological Textiles Review*, “How to Pleat a Shirt in the 15th Century”, by Beatrix Nutz which indicates pleating sizes and methods of securing folds. Two books,

Die Ausgrabungen im Mühlberg-Ensemble Kempten (Allgäu): Metall, Holz und Textil by Rast-Eicher and Klaus from 2011 and the earlier *Texil- und Lederfunde* by Ilse Fingerlin, show extant textiles with three different techniques of securing folds. Photographs of 15th and 16th century extant garments with pleats, currently housed in museums around the world, are also helpful to a certain extent.

The purpose of this guide is to understand how the pleats in the late 15th and 16th century pleated garments were actually created and secured. While it is possible for to create a pleated garment that looks similar to those portrayed and found using modern smocking techniques, there is particular interest in the techniques employed in the 15th and 16th centuries, which includes how the folds were formed and how the folds were secured. Special attention is paid to the idea that gathering threads, when used, were later removed (or covered) and other means were employed secure the folds. To this end, I have analyzed photographs of extant garments, photographs of high-resolution paintings, and peer-reviewed archaeological journal articles, with the goal of creating a well-researched guide that can be utilized by those who wish to confidently pleat authentic 15th and 16th century style undergarments.



Dorothea Meyer by Hans Holbein (1515) in the Kunstmuseum, Öffentliche Kunstsammlung, Basel inspired my quest to learn pleatwork. I recreated her pleated hemd in 2014 (see chapter 6).



Portrait of a Young Man by Ambrosius Holbein (1518) in the Hermitage Museum, St Petersburg shows stem stitching over pleats around the neck.

Chapter 1:

Creating Folds for Pleatwork

Fabric can be manipulated into folds of a consistent size in a variety of different ways:

The FOLD Method: Corrugate the fabric upon itself at parallel and regular intervals, securing the resulting folds along the way with pins or some other means of attachment.

The PRESS Method: Compress damp and folded fabric and allow to dry.

The GATHER Method: Sew running stitch(es) and pull the thread, gathering the fabric into folds.

The HEAT Method: Fold or place the fabric into a mold of some sort, then heat at a high temperature for a moderate amount of time.

The Fold Method

Material can be pleated in a variety of ways. The most basic method, and likely the very first method our ancestors ever employed, is to simply fold the material. Let's look at the research and the actual practice of pleating material using the Fold Method.

Research: Some undergarments were pleated with the fold method, which involves doubling the material upon itself and then pressing, pinning, or stitching in place. Evidence exists to suggest that this method was employed in pleated garments based on the Castle Lengberg finds, specifically Find 273.14 (figure 2) which is a small fragment of a pleated sleeve or neckline with a bit of its trimming strip missing. The raw edge with the missing trimming strip shows indications that the linen was folded at regular intervals (Nutz, 81) and no gathering thread was found. Find 273.14's pleats were spaced three centimeters (1.2 inches) apart, however, which is very large. While one could create folds in this manner, it produces less-consistently spaced folds and would likely not have been used for shirts with very fine folds (such as those in Find 121 from Castle Lengberg, a section of pleats from a shirt sleeve cuff created in the late 15th century).

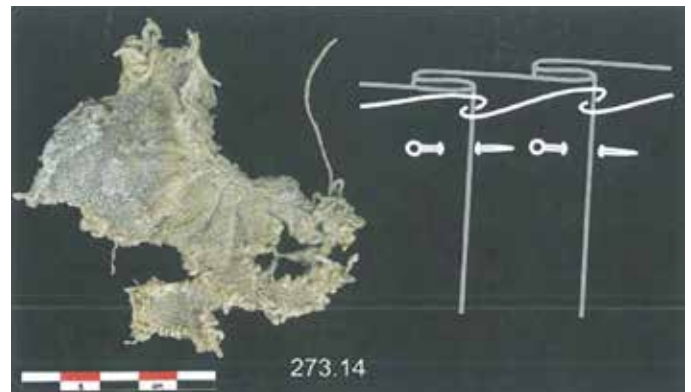


Fig. 2: Illustration of pleated fragment made with the fold method (copyright B. Nutz).

Practice: Folding fabric to make pleats is doable, but a bit cumbersome and less precise than the gather method. I don't recommend the fold method for pleats with a depth of 1/4 inch or smaller, but it works fine for larger pleats. I recommend you dampen your fabric to make it easier for it to keep the folds as you work (and this has the added advantage of keeping the folds better later because the fabric dried that way, too). Here are some pleats using the fold method:

The Press Method of Creating Pleats

No manual from the 15th or 16th centuries is known to exist that explains the press folding method of creating pleats, so it is unclear if the sempstresses of this era would have employed such a method to pleat their cloth. However, we can make some educated guesses based on the extant pleated fabric found in Castle Lengberg—specifically, Find 121 (a section of pleats from a shirt sleeve cuff created in the late 15th century, shown in figure 6 below) was found to have a sharp pleat edge which may have caused the cloth to break along the edges of the linen as it dried over time (Nutz, 81).



Fig. 6: Illustration of a pleated fragment (Find 121) from Castle Lengberg (copyright B. Nutz).

An edge sharp enough to break the linen fibers over time would likely need to be pressed into the linen with something like a smoothing or creasing tool, or perhaps a frame that tightly compressed wet fibers. One possible tool which could be used to fold the fabric is shown in the image below from the cover of *Furm oder model büchlein* (see front cover of this book), which depicts a frame with what appears to be pleated and secured (pressed or clamped) fabric. No extant frames which visually match this description are known to exist, however, so it is not clear how this tool functions (and I suspect it has an entirely different function in pleatwork—more on that later in this guide).



Fig. 3: 1/2" pleats folded and creased by hand



Fig. 4: 1/2" pleats folded and pinned



Fig. 5: 1/2" pleats folded and stitched

Tip: If you use the fold method to make your pleats, you'll probably want to iron them to keep them folded as you work on securing them. If that doesn't seem like enough, consider using white vinegar to keep your pleats folded. To do this, spray a pressing cloth with a 2:1 water/vinegar solution, iron well on the proper setting, then allow to cool. The vinegar chemically sets the folds.

Another possibility for pressing the folds into the linen may have been the wooden or marble slickenstone (similar to the one shown below), or linen smoother, which was used to smooth creases out of damp linen after it had been washed and starched. The same tool that could remove creases would have been able to add creases if the fabric was damp and folded.



Fig. 7: Slickenstone made from lignum vitae (Birmingham Museum, Accession No. 1965T669)

Recently I tried to construct a device that would press the folds into a piece of linen. It was a board made of ridges of wood, set at 45 degree angles, upon which you placed a piece of wet linen. Then a second ridged board was placed on top of the linen, perfectly matching the board below. The idea is that you would press the two boards together to create ridges in the fabric and as the linen dried the ridges would become more or less permanent folds and could then be sewn together to secure them. This experiment was a failure, however, because the tension of the fabric is so strong that it does not fold when the ridged boards are pressed into it. It's possible that if the top set of ridges was made to be

flexible that you could manipulate the fabric into the press better, but a flexible set of ridges seems a bit too unlikely for our ancestors to have fiddled with. I am still considering ideas for it, though.



Fig. 8: A failed pleater press.

Interestingly, the Egyptians liked to pleat their clothing. A finely pleated tunic is still in existence in the Louvre. It's unknown how the Egyptians pleated their cloth, but one theory is that carved, ridged boards like this one at the Museo Archeologico Nazionale (inventory 2691) may result in a pleats if wet, starched fabric is pressed onto it. It looks similar to my failed pleating press, except it is just one board, not two. Thus, I think my pleating press deserves more testing. This article on "Costume in New Kingdom Egypt" (Sasson, 1995) theorizes how Egyptians may have used this pleating press, and even comments that tests were undertaken with them.

The Gather Method of Creating Pleats

The gather method of creating pleats involves sewing evenly-spaced running stitches in parallel lines to one another and then pulling the threads to gather the material into folds (see figure 9). This method is generally accepted as the most likely method of creating small pleats in linen in renaissance Europe. The gather method allows one to precisely control how wide and deep one sets the folds, allowing for the very fine folds seen in 15th and 16th century European portraiture.



Fig. 9: A front view of parallel and even running stitches in fabric. (Illustration copyright by author)

When the threads are pulled, the fabric gathers neatly, as shown below in figure 10.



Fig. 10: A top view of the evenly-stitched thread(s) pulling and gathering the fabric. (Illustration copyright by author)

The tighter the threads are pulled, the tighter the fabric doubles upon itself, which you can see in the next illustration (figure 11).

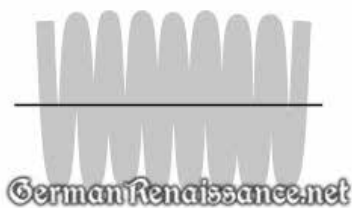


Fig. 11: A top view of the evenly-stitched thread(s) pulled tightly and the fabric folded upon itself. (Illustration copyright by author)

While it is not essential that the stitches be evenly spaced in the running stitch, it is important to note that if parallel lines of stitches are used (to create longer folds), the stitches must exactly mirror the parallel stitches below and/or above it in both size and placement in order for clean, straight folds to form when the fabric is gathered. If an uneven running stitch is employed (see fig. 6), the bulk of the fabric's folds fan out on one side of the fabric (see next three images in figures 12-14). This results in a less stable set of pleats that are later more difficult to secure.



Fig. 12: Uneven running stitches, paralleled and mirrored. (Illustration copyright by author)

When the threads are pulled, the fabric gathers on one side, as shown below in figure 13.



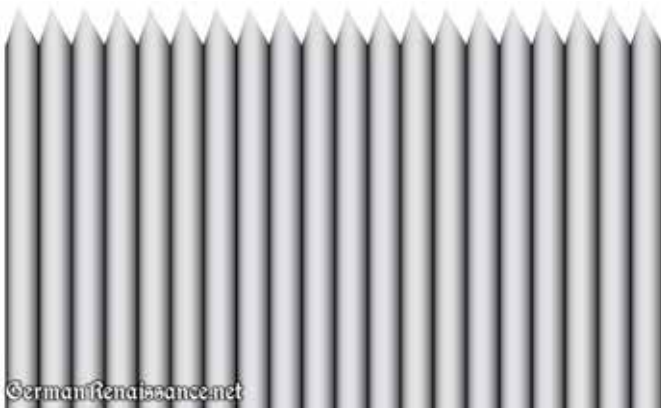
Fig. 13: A top view of the thread(s) pulling and gathering the fabric in uneven running stitches. (Illustration copyright by author)



Fig. 14: A top view of the thread pulled tightly in uneven running stitches, with the fabric folded upon itself and the bulk of the fabric fanned out on one side. (Illustration copyright by author)

While we cannot know for certain whether or not an uneven running stitch was employed in the 15th and 16th centuries, we can glean important information from Find 121 at Castle Lengberg (Nutz, 83). In

Find 121, the top of the fabric, near the pleating, is pointed, as shown in the illustration below.



*Fig. 15: Author's depiction of the pointed fabric from a pleated shirt at Castle Lengberg, based on the line drawing provided in *How to Pleat a Shirt in the 15th Century* (Nutz, 83). No photo of this pointed fabric in the extant garment has been located at the time of writing. (Illustration copyright by author)*

This may seem confusing until one considers the usage of this fabric and its context with the whole shirt. The pointed edge of the pleated fabric is encased in a fabric casing. One can theorize that the sempstress trimmed the edge of the pleated fabric before adding the casing, and if one compresses the fabric and cuts it at an angle (which is more likely to happen with the very large amount of fabric gathered in the pleats), the result is a zig-zag. The pointed edge would have also have minimized fraying. This theory was attempted with a piece of linen that has been tightly pleated and the effect was similar to Find 121 (see photo below in figure 16).

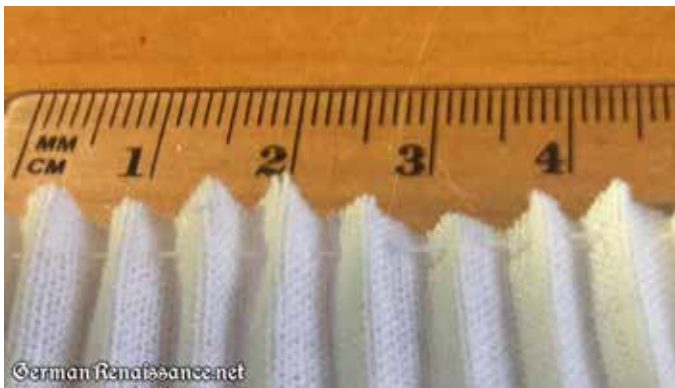


Fig. 16: Points formed after cutting the edge of pleated fabric at an angle.

While the pointed, zig-zag effect could come from a pinking tool, it does not seem likely as the points of the fabric correspond to the sharp edge of folds exactly in Find 121. What this pointed fabric could reveal is that the folds were densely and evenly folded when cutting, which would be significantly more likely with evenly-spaced stitches creating the folds than unevenly-spaced stitches. Additionally, the trimming strip attached at the top of the fabric of Find 121 employs evenly-spaced running stitches as well.

From the evidence available for Find 121 from Castle Lengberg, it is probable that a combination of the Gather Method and the Press Method of folding the fabric was historically used. The Gather Method may have been used to create the very tight and even folds, and then the Press Method may have been used to compress the folded fabric (perhaps while wet) with a slickenstone or a press to form the sharply-ridged pleats.

How to Mark the Fabric for the Gather Method

The most exact way to sew even running stitches that gather neatly is to mark your fabric first. Regardless of which method you use, always be certain your fabric is cut on the straight (warp or weft) by either pulling a thread or tearing the fabric. Here are as many different ways that I know at the time of writing:

1. **AWL PRICK:** Prick the fabric with something pointy, such as an awl, in an evenly spaced grid pattern. You can make your own grid pattern in the spacing you want, or use one of my pre-spaced grid patterns: 1 inch (very large and ideal for beginners), 3/4 inch, 1/2 inch, 1/4 inch, and 1/8 inch (the most historically-accurately size), all of which are available in appendix A.

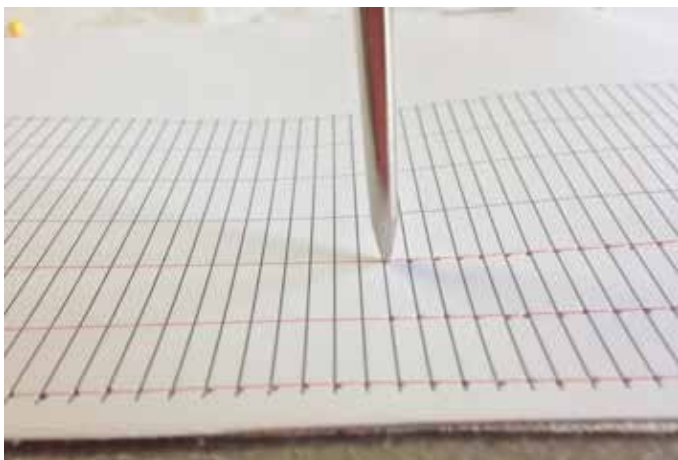


Fig. 17: Pricking fabric with an awl using a grid as a guide.



Fig. 18: The pricked fabric.

2. **TOOL PRICK:** Prick the fabric with a set of pointy things already fixed into with the grid pattern you wish. Mistress Milicent Vibbert created such a pleat marking tool from four toothpicks and a scrap piece of wood when she made her Saxon gown (view photo of her pleating tool). The advantage to this method is that no grid is needed –you can prick the first holes, and then move down the fabric setting the first set of pointy bits into the last set of holes and pricking a new set of holes. This way you can create an infinite number of evenly spaced holes. (Note: Milicent notes that her toothpicks were getting dull by the end of her project, so one may want to experiment with using tougher pointy bits, such as nails.)



Fig. 19: A pricking tool (photo copyright Grace Vibbert)

3. **PEN:** Mark the fabric with a water-soluble fabric marking pen using an evenly spaced grid, like those linked in #1, with each dot pre-punched so the tip of your pen fits through. If your fabric is thin, you can place it over a grid, which should be visible through the thin fabric, and just mark it that way. You can view a video of me marking dots for gathering here. You can also just use a ruler to mark your dots. [Note: As fabric-soluble pens did not exist in the 15th and 16th centuries, this would not be a historically accurate method.]



Fig. 20: Marking with a pen and a grid.

How to Sew the Fabric for the Gather Method

There are variety of ways to sew the running stitches so you can gather your material into pleats.

A. **MARKED:** If you marked your fabric first, sew each row of holes/dots with strong, waxed thread, pushing your needle into the first hole/dot, pushing it out the next hole to the left/dot, pushing it into the next hole on the right/dot, and so on until you reach the end of the row*. Always work from right to left. Each row should be sewn with one length of thread only. Pull on all threads at once to gather the folds. [Note: I employed this method of the Dorothea Meyer hemd — see chapter 6.]



Fig. 21: Running stitches on marked fabric.

* There is an alternate method called “picking up the dots” where you push the needle on one side of a marked hole/dot and out the other side (see figures 12, 13, and 14 earlier in the book). This method results in an uneven running stitch, which may or may not work well for you as it produces a lopsided gather that is less stable. I do not use this method in my work as I prefer more precision. I do not currently have evidence that this method was used historically, but I haven’t ruled it out, either.

B. **COUNTED:** If you didn’t mark your fabric first, you can count the threads in your linen and sew your running stitches exactly straight on the grain and an exact number of threads from one another. Be sure each row of running stitches is one length of thread and one length only. When done, pull on all threads to gather the folds.

C. **NEEDLE LENGTH:** If you didn’t mark your fabric first, you can use your needle as a measuring tool to judge the distance between running stitches — you may wish to mark your needle with a pen or a piece of tape for a consistent distance each time. Be

Tip: If you plan to use a pen to mark your fabric but do not wish to use one of the paper grids in appendix A, there are some alternatives. I have used the Darice crossstitch plastic canvas, a thick plastic formed into a grid through which you can insert the tip of a pen for marking. You can find these at craft stores. Another option are the plastic guides initially meant to be a customizable drawer divider from Ikea—they come in packs of 4 for under \$3 and the stiles are spaced at a half inch. You can find them in Ikea’s home organization area with a dull the baskets and boxes. (they’re called Höfta). (Tip contributed by Cynthia Konow Brownell.)

4. **CARBON:** Using a carbon copy paper and a grid like those linked in #1, sandwich the carbon paper between your fabric and the grid. Now press on the dots on your grid to transfer the carbon mark to your fabric. [Note: As carbon paper did not exist in the 15th and 16th centuries, this would not be a historically accurate method.]

5. **IRON ON:** Iron on dots set in a grid pattern to the wrong side of the fabric. Such dots are available for purchase from smocking supply outlets. You can also make your own dots on a laser printer (not an inkjet printer) using just regular white copy paper then use an iron to transfer them to the wrong side of the fabric (the toner will transfer to your fabric dark enough to see). Note that toner is more or less permanent, though it may fade in time. Iron on dots should be able to be washed out. [Note: As iron-on transfers and toner did not exist in the 15th and 16th centuries, this would not be a historically accurate method.]

6. **MACHINE MARK:** You can use a Bernina (930 or old 1130), or another machine with the capability, to mark your fabric. To do this, starch your fabric then run it through the machine at a long stitch length, unthreaded, with a thick needle. (Method contributed by Noel Gielegem.)

sure each row of running stitches is one length of thread and one length only. When done, pull on all threads to gather the folds.

D. EYEBALL: If you didn't mark your fabric and aren't concerned with your stitches being the same distance from one another, you can just eyeball the running stitches. It's a bit messier, but that is sometimes fine for certain things. What's most important with each subsequent and parallel row of running stitches line up with the previous rows so that when you pull the threads to gather the pleats they fold neatly.

Tip: Use a permanent pen or a bit of paint to mark your needle and use that mark as a guide for evenly-spaced stitches.

E. MACHINE SEWN: You can use a pleater to sew the running stitches for you. A pleater is a non-electrical machine with a series of needles around a drum. You feed your material into the pleater, which inserts the running stitches for you. The pleater was invented in the late 1940s. [Note: I do not have a pleater and cannot attest to its usefulness in pleatwork, though many of my friends like them but warn that a pleater isn't always easy to use and it can be difficult to line the running stitches up with the grain. And as pleaters did not exist in the 15th and 16th centuries, this would not be a historically accurate method.]



Fig. 22: Read Pleater (photo copyright Nylh)

Regardless of which method you use, the gather method usually ends up looking something like one of these photos once you have gathered and pulled your threads:



Fig. 23: 1/2" running stitch, not pulled tightly (great for securing with the honeycomb stitch)



Fig. 24: 1/2" running stitch, gathered tightly (great for securing with stem stitches or casements)



Fig. 25: 1/10" running stitch, gathered tightly (the tiniest, densest pleating)

The Heat Method of Creating Pleats

There is another modern method of creating folds into cloth, used today by couture fashion workers. They have a device called a Pleater (or Pleating Board / Pleating Press) which involves folding fabric (usually polyester) around a sort of flexible, accordion-style frame and then heated in some fashion. This doesn't seem likely to be a 15th or 16th century practice because of the frame's need to be flexible.

To test the effectiveness of a heat-set pleats in linen, I created a simple mold from two pieces of thick brown paper. The mold was simply 1/2" accordion folds (see figure 26). I then unfolded the papers, placed my dry linen in between the two pieces of paper, and refolded everything together. I secured everything together with metal clips. I then put the assembly into my kitchen oven at 350 degrees Fahrenheit for 20 minutes. The result was crisply folded linen. I left the linen out in the heat and humidity for several days and the folds did not diminish.



Fig. 25: "Baked" pleats with paper mold

It is important to note that I do not know if a technique like this would have been used pre-1600, but the more techniques I find and experiment with, the better I am able to recognize textiles and tools that might not have been considered. We know pleats were made with gathering stitches, but what other methods might have been employed? That is my mission.

Determining Fold Size in Early Modern European Pleated Undergarments

Using the dimensions of the pleats in the finds from extant garments, as well as 15th and 16th century paintings where the pleats are very finely detailed, we can determine sizes for pleats. A survey of a sampling of these items was conducted by the author of this paper (see Table 1).

From the limited data set available, we can see that pleats tended to range from 5.5 to 10 per centimeter (1-2 per millimeter), which is quite small and tight. In many ways, how tight pleats can be depends on the thickness of the fabric and the method of stabilizing pleats, which is discussed later. What is more variable (and in many cases unknown) is the amount of fabric that goes into each pleat. What is clear is that the more pleats there are, the higher the ratio of fabric to pleats. In other words, the more pleats, the wider the finished work.

"How close do I make my stitches to reproduce 15th and 16th century pleatwork?" is a common question, and this research answers that question to some degree. Based on the above chart, and hand-stitched samples and re-creations, the following formulas can be applied to pleat estimating:

$$\frac{x}{(z + (y * 2))} = \text{length of finished product [alternate notation: [(x / (z + (y * 2))) = a]}$$

$$\left(\frac{x}{a}\right) - z = \text{space between each stitch [alternate notation: [((x/a) / 2) - z = y]}$$

Where x = width of fabric (before pleating);
y = stitch size (how much fabric per fold);
z = thickness of material (measured with calipers);
and
a = finished product.

ITEM	TYPE	DATE	FOLD DENSITY (PLEATS/CM OF PLEATED FABRIC)	FOLD DEPTH	FOLD FABRIC SIZE (SIZE IN CM. OF FABRIC PER FOLD)
COLLAR (CASTLE LENGBERG; FIND 121)	EXTANT GARMENT	LATE 15 TH CENTURY	6.5 PLEATS/CM	.07 CM	1.4 CM
NILS STURE (ARNOLD, 21)	EXTANT GARMENT	1567	5.7 PLEATS/CM	.025 CM	0.5 CM
ITALIAN SMOCK (ARNOLD, 55)	EXTANT GARMENT	LATE 16 TH CENTURY	8 PLEATS/CM	.06 CM	1.2 CM
SMOCK (ARNOLD, 54)	EXTANT GARMENT	LATE 16 TH CENTURY	10 PLEATS/CM	.025 CM	0.5 CM
MARY OF HABSBURG HEMD ⁷	EXTANT GARMENT	EARLY 16 TH CENTURY	8 PLEATS/CM	.07 CM	1.39 CM
PLEATED COLLAR (ALPIRSBACH- CAT. 29)	EXTANT GARMENT	FIRST HALF OF 16 TH CENTURY	6 PLEATS/CM	UNKNOWN	UNKNOWN
TUDOR CUFF FRAGMENT ⁸	EXTANT GARMENT	16 TH CENTURY	7 PLEATS/CM	UNKNOWN	UNKNOWN
DOROTHEA KANNENGIESSER MEYER (HOLBEIN)	PAINTING	1516	ABOUT 6 PLEATS/CM	UNKNOWN	UNKNOWN
SELBPORTRAIT (DÜRER)	PAINTING	1498	ABOUT 5.5 PLEATS/ CM (VERY ROUGH ESTIMATE)	UNKNOWN	UNKNOWN

Table 1. A survey of fold density, depth, and size based on extant garments and paintings.

Finished piece example: A 300 mm piece of 0.3 mm thick fabric with stitches every 3.6 mm will yield a finished piece that is 40 mm wide. $[(300 / .3 + (3.6 * 2)) = 40 \text{ mm}]$

Stitched piece example: A 1730 mm piece of 0.4 mm thick fabric that will result in a 190 mm piece must have stitches set 4.4 mm apart. $(((1730 / 190) / 2) - .4 = 4.1 \text{ mm}]$

Fabric thickness can be measured with calipers. In tests, a fine linen/cotton (“tissue linen”) was .31 mm thick, while a heavyweight linen (“suiting”) was .59 mm thick. Find 121 from Castle Lengberg utilized a linen of 18-19 threads/cm, but it is unclear how thick this material was (linen thickness depends on many factors, including how much water was added to the pulp when the threads were made).

Chapter 2: Securing Folds for Pleatwork

Making the folds is only the first step in pleating; the folds must also be secured to avoid unfolding. The gathering threads (as shown earlier in fig. 3) are not strong enough to act as the only method of securing folds. Most of the extant garments studied to date do not show gathering threads left in the fabric at all, and those that do appear to have a gathering thread have the folds secured in another manner. For example, all of the finds from Castle Lengberg are missing any sort of visible gathering thread, however they all have other methods of securing the folds; all use a fabric trimming strip (casing) over the edge of the pleats and most use a row of stem stitching on the underside of the pleats from .5 to 2.5 cm below the strip (see fig. 126).

The Alpirsbach finds, however, include only one example of gathering or other stitches to secure the pleats to add to the stem stitching from the Castle Lengberg finds. Cat. 29, a boy's shirt, has "a slight narrowing of the wrist [that] is obtained by the smocking. The folds are staggered so that there is a honeycomb pattern." (translation from *Textil- und Lederfunde*, 800). A closer look at that honeycomb pattern of Cat. 29 reveals no gathering threads left between the folds (see fig. 27), as they would be visible across the "void" in between the honeycomb pattern and be quite unmistakable (see fig. 28).



Fig. 26. Detail of sleeve fragment with pleated wristband (Find 430.02) from Castle Lengberg. The row of stem stitching is clearly visible. Photo copyright B. Lutz.



Fig. 27. No gathering threads are visible between the folds in this Alpirsbach find (Cat. 29).



Fig. 28. Honeycomb pleating with the gathering threads left in for a visual comparison.

In the 1575-1600 extant smock that appears in Patterns of Fashion 4 (Arnold, 110-111), very tight folds are gathered into the neckline (see fig. 29). Evidence of a gathering thread left behind can be seen on the right in the figure below. Additionally, Arnold writes that two, or perhaps even three, threads were used to gather the folds and “all were left in to hold gathering smooth.” However, the folds are bound with a straight strip of linen, so the gathering threads only function to keep the channels of the folds straight.



Fig. 29: Detail from 1575-1600 Gown in the Boston Museum of Arts.

Next we turn to 15th and 16th century artwork to check for evidence of gathering threads left behind. The first, and best, resource at the time this paper was written is the Google Earth scan of Selbstporträt by Albrecht Dürer's in Prado (1498) as we are able to zoom in significantly closer than the human eye can see without assistance. At a lower resolution, Selbstporträt may appear to show evidence of gathering threads left behind (see fig. 30), but a closer look shows nothing that could even resemble a gathering thread (see fig. 3030



Fig. 30: A low-resolution image of the pleatwork on Albrecht Dürer's hemd. Note the horizontal banding in places that seems indicative of thread or tension.



Fig. 31: A high-resolution image of the pleatwork on Albrecht Dürer's hemd. The straight line banding is missing (likely a compression artifact) and now we can see that the light and shadows indicate gentle curves. Gathering threads can not be curved to be effective.

Another high-resolution image we now have access to is *Portrait of a Boy as Saint Sebastian*⁹ (1490s) by Giovanni Antonio Boltraffio which at a low resolution hints at the possibility of very obvious gathering threads (fig. 31). At a high resolution, however, these are decorative threads and could not be gathering threads because they go over the folds, not through them (fig. 32).

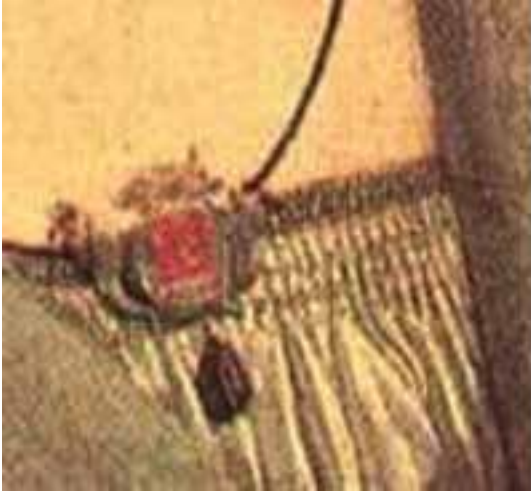


Fig. 31: A low-resolution image of the pleatwork on Portrait of a Boy as Saint Sebastian.



Fig. 32: A high-resolution image of the pleating on Portrait of a Boy as Saint Sebastian. The four bands of doubled, colored lines curve with the swell of the folds, indicating they are not gathering threads. Rather, they appear to bear more resemblance to pattern darning (discussed later in this book).

Only one portrait painted in the 15th and 16th centuries seems to hint strongly at the existence of gathering threads, and that is Dorothea from *Bürgermeisters Jakob Meyer und seiner Gattin Dorothea Kannengießer* by Hans Holbein (1516). A close look at the intricate pleating on her hemd shows parallel stitching reminiscent of the running stitches used to gather the folds, as seen in fig. 33.



Fig. 33: A high-resolution image of Dorothea's hemd shows parallel lines that appear between folds.

It is important to note that if these are indeed gathering threads, they do not extend the full circumference of the garment, as the hemd is shown crumpled and without those lines on either side of the far left and far right vertical, gold trim. It appears as though only a front panel, the one with the more extensive pleating, has these parallel stitches. Given the fact that it appears braided cords are stitched on the front panel (you can see them hanging down at the bottom), it's possible that the parallel lines are in fact stem stitches, or a backstitch, on the front side of the hemd. In several spots, it appears that the thread goes over the folds, rather than just through—it is important to remember that this is an artist's interpretation of what he sees and he may not have painted it faithfully, nor even really understood what he was seeing (fig. 34).



Fig. 34: In several spots, the threads appear to go over the folds, suggesting a stem stitch or backstitch to secure the folds.

2.1 Stem Stitch as a Method of Securing Folds

The simplest and most basic way of securing folds is to add a stem stitch from fold to fold. The stem stitch is seen on the 1567 Nils Sture shirt sleeve (Arnold, 21), as well as on all of the pleated textile fragments in the Castle Lengberg cache (Nutz, 85). In all cases this stitching was on the underside of the shirt—0.6 cm above the edge of the band on the Nils Sture shirt, and 0.5 cm to 2.5 cm above the edge casing in the Castle Lengberg finds. It is not known if the stitching was done before or after the casing was added. The stem stitches only appear in one line (no multiple, parallel lines) and effectively keep the folds straight and secure. It does not appear that the stitching was meant to be seen on the outside of the shirt as in at least one case among the Castle Lengberg finds the stem stitch is not parallel to the edge (it meanders across the fabric a bit haphazardly). In practice, it is extremely difficult to stitch the folds in a neat manner without some other means of temporarily securing the stitches, which points to either pins or gathering stitches that have been removed (or even decayed).

To affix a stem stitch to pleated fabric, you will want to sew through the top edge of each fold, with each

stitch covering two folds, passing back through the center of one fold, and back up again at the start of the next fold, staggering your stitches as shown in fig. 35. Be aware that the tighter the stitch is pulled when sewing, the tighter the folds will compress against one another. Note also that one would want to have at least one other secure anchor for the folds, be it casing enfolding the top of the fabric (most likely method used in the 15th and 16th centuries) or another stem stitch.

The stem stitch method is likely used on the underside of shirts to secure long lengths of pleats, such as those seen on Albrecht Dürer's hemd in his *Selbportrait*, on Dorothea Meyer's hemd in the *Holbein painting*, and on the numerous other paintings that depict a pleats with nothing but trim at the edge and/or in bands.



Fig. 36: Stem stitch with gold thread

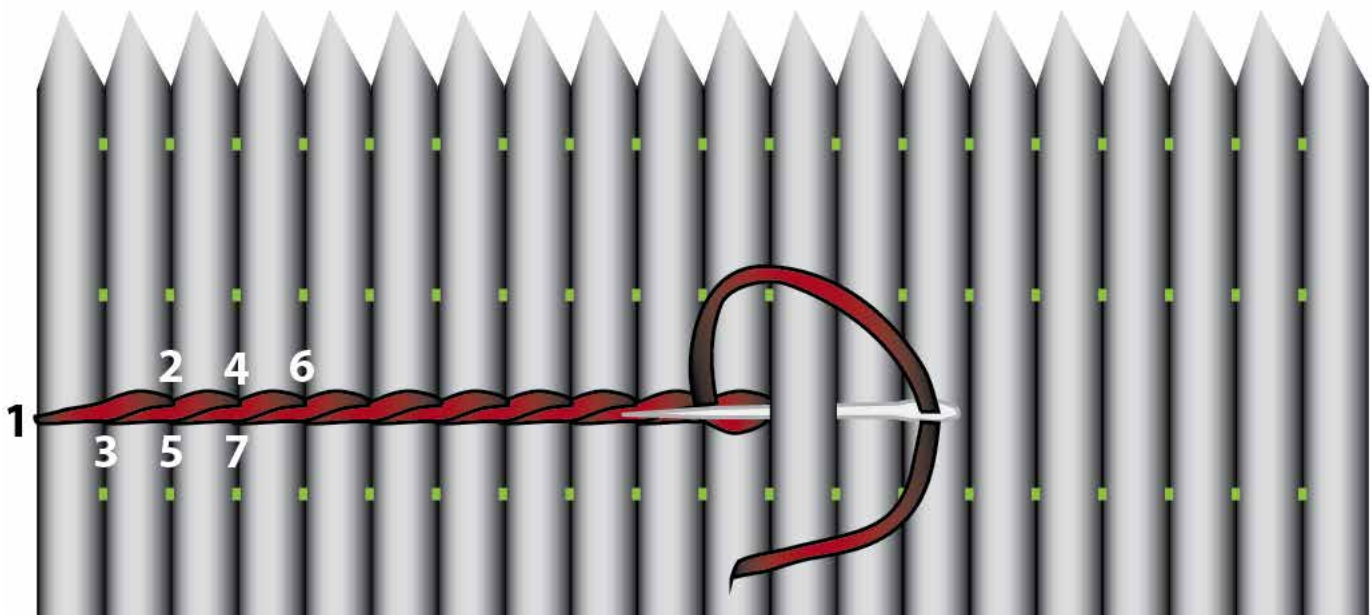


Fig. 35. Stem stitch through and over the tops of pleats to secure them. Start at 1, go in at 2, pass back through the center of the fold, then come up at 3. Repeat across the width of the fabric.

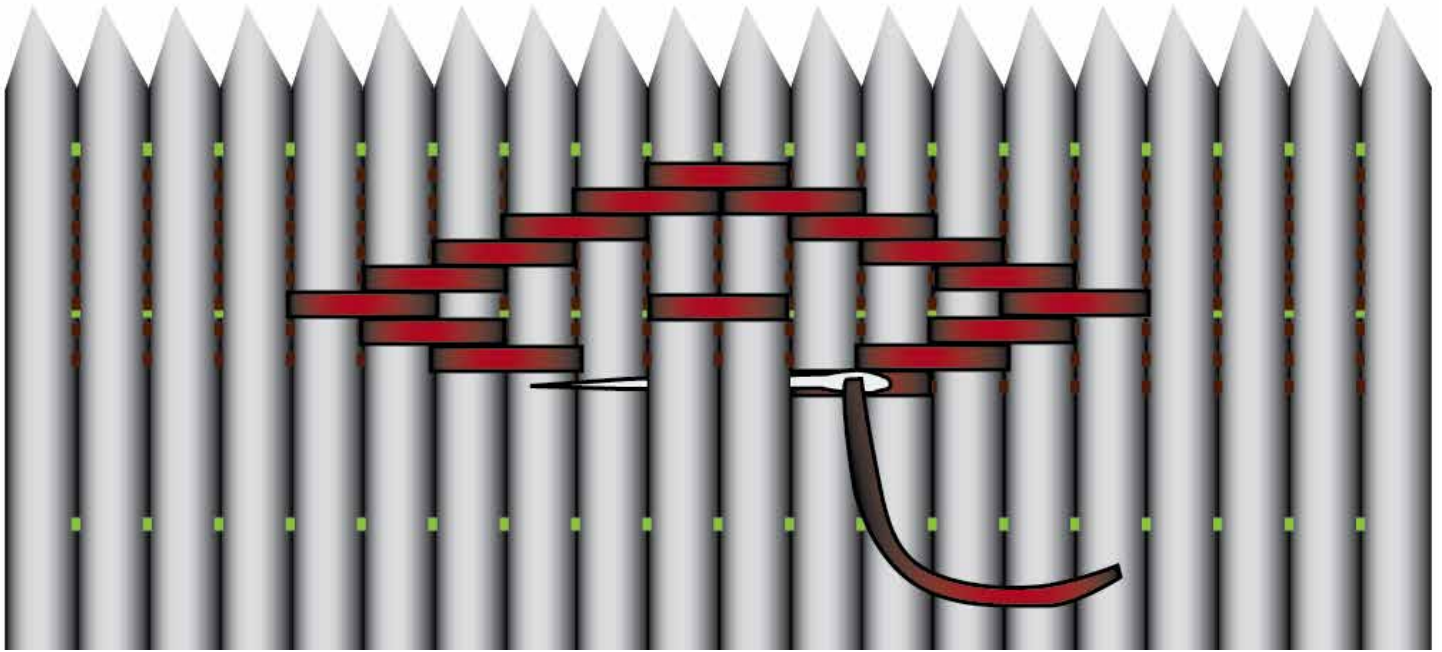
(For reference, the gathering stitches are shown here as the green between the folds.)

Illustration designed and copyrighted by author.

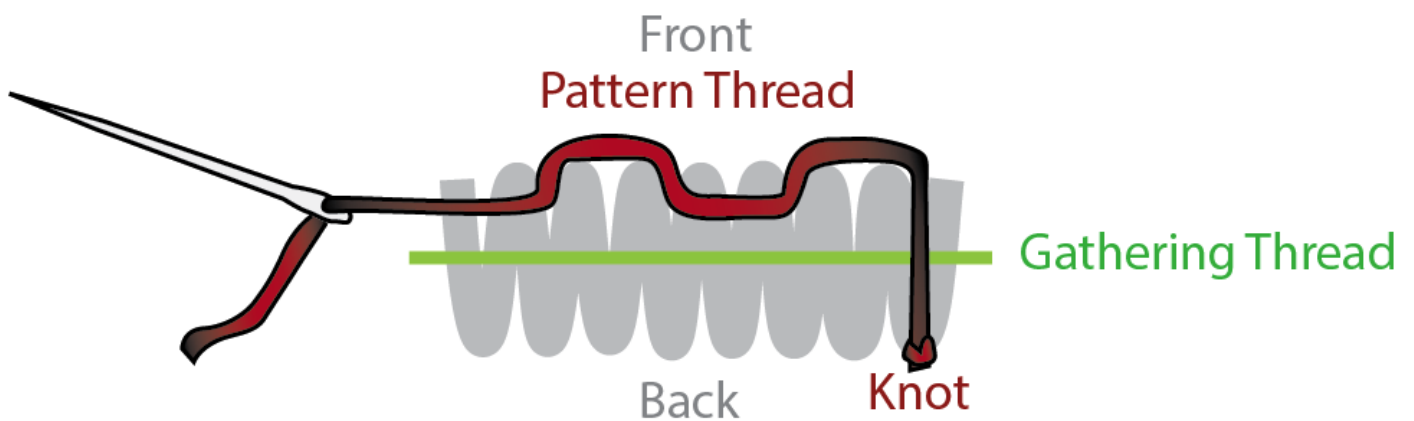
2.2 Pattern Darning Stitch as a Method of Securing Folds

Several 15th and 16th century paintings and at least two extant garments (Mary of Habsburg hemd and the Tudor cuff), show a geometric design over

the pleats. This design is achieved by stitching thread either over or through the topside of the pleats, according to the design. This is considered a counted stitch. To create the pattern, one would stitch over the fold when the thread should be seen, or stitch through the fold when the thread should not be seen. If one continues in this fashion in several rows over the folds, a pattern will emerge (see fig. 37).



*Fig. 37. Front-view pattern darning stitching over and through pleats to form a pattern.
Illustration designed and copyrighted by author*



*Figure 38. Top-view of pattern darning stitch over and through pleats to form a pattern.
Illustration designed and copyrighted by author*

The pattern darning stitch is most famously seen in the Mary of Habsburg hemd, which has a 6 cm long section of pattern darning in a silver thread over the pleats around the neckline (Ember, 133-150). Mary's hemd pattern covers 123 pleats and requires about 41 rows of stitching (see fig 39). Interestingly, a closer look at Mary's hemd shows that something may have once been sewn into the middle of the voided "X" pattern, such as a jewel or bead.



Figure 39. Detail of Mary of Habsburg's Hemd - Photo copyright Taryn East

More evidence of pattern darning is found on the late 15th to early 16th century collar fragment found in Kempten (Rast-Eicher and Tidow 2011, 322). Find 15796-1 features a diamond pattern across its pleats (see fig. 40).

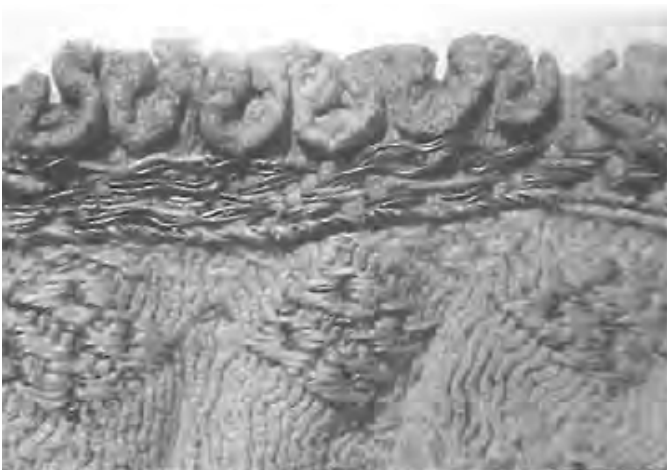


Figure 40. Pattern darning stitching on find 15796-1 from Kempten

Pattern darning is also seen on the 1516 painting of Bürgermeister Jakob Meyer by Hans Holbein (see fig. 41). Even though this is a lower resolution image than one prefers to work with, the lines of the pleats and the very distinctive pattern over the folds are clear. The pattern darn stitch worked in black is likely how blackwork-style designs appear on shirts seen in paintings.



Figure 41. Detail of Bürgermeister Jakob Meyer by Hans Holbein

The pattern darning stitch repeatedly anchors folds to one another, securing them extremely well. Of all the stitches discussed in this paper, this is the stitch that seems to best secure the folds in practice. The gathering stitches would likely have been kept in place, simply because they would not have been visible and may even have become hard to remove from the tightly compressed folds after pattern darning. It is not known if any extant garments with pattern darning retained their gathering stitches.

See chapter 7 for information on a pattern darned pleatwork shirt made by the author.

2.3 Honeycomb Stitch as a Method of Securing Folds

The honeycomb stitch secures the folds by anchoring them to one another in staggered and interlocked rows, which results in a pattern of folding that is reminiscent of a bee's honeycomb. It would be more accurate to describe this stitch as a row or grid of diamonds. The honeycomb stitch is seen in one extant garment from Alpirsbach (fig. 27).

The honeycomb stitch of securing the folds differs from the stem stitch and pattern darn stitch in two important ways. Rather than tightly compressing all the folds against one another as seen with the previous two stitches, the honeycomb stitch compresses alternating folds which results in separating other folds. This results in a wider finished product than one would see with the other two stitches used over the same number of pleats. Additionally, fabric with the honeycomb stitch can be elastic when it is stitched between alternating and staggered rows of folds as shown in fig. 43.

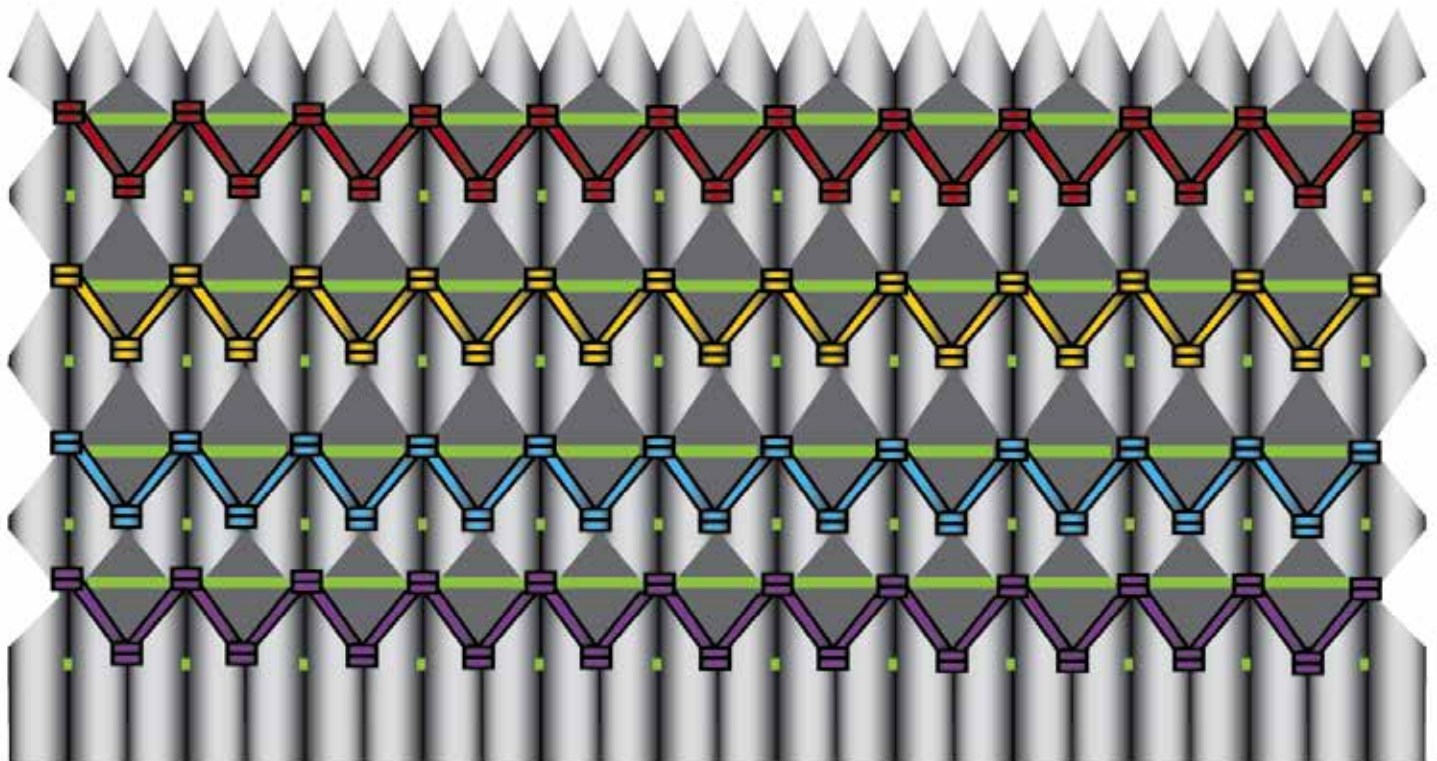


Figure 42. This front-view of honeycomb stitches shows the stitches and threads before the gathering threads have been removed. Each thread color indicates one continuous stitch, alternating between two rows, as this allows for elasticity. It should be noted that the thread that is carried between the alternating rows is actually on the back-side of the fabric. A step-by-step tutorial of this stitch is beyond the scope of this paper, but can be provided upon request. Illustration designed and copyrighted by author

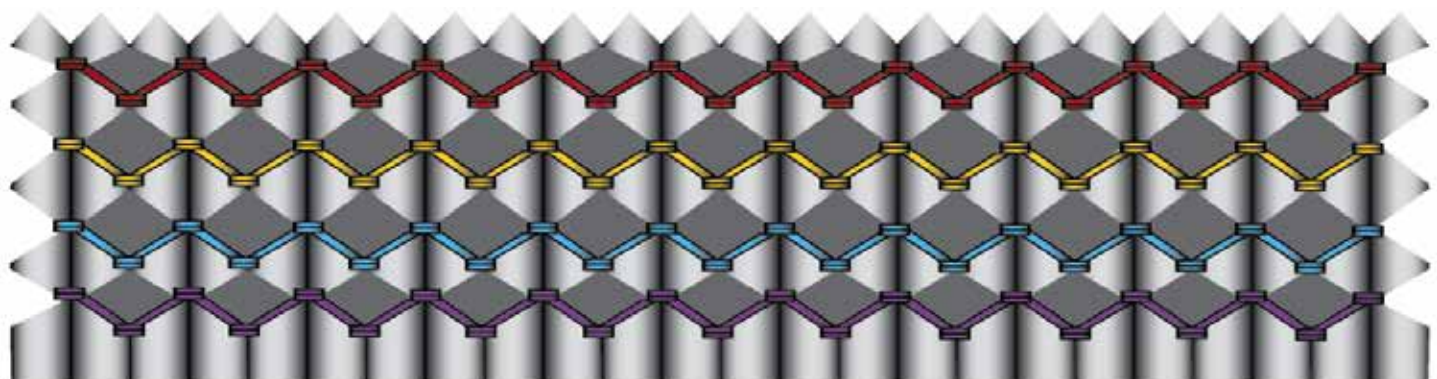


Figure 43. This back-view of honeycomb stitches shows the stitches and threads after the gathering threads have been removed and the fabric stretched. Illustration designed and copyrighted by author

If the stitches do not alternate rows, but rather go straight across, the finished piece will not be as elastic. This elasticity was determined through practical tests of honeycomb stitching in alternating rows and straight rows. Alternate-row honeycomb stitching provides up to 30-35% elasticity, whereas straight-row honeycomb stitching provides only 10-15% elasticity. Usage of the honeycomb stitch for elasticity does seem to be employed in the 15th and 16th centuries, as evident by the Alpirsbach shirt find where one can see that the honeycomb pattern is on the inside of the sleeve, not the outside (fig. 44). If the honeycomb stitch was intended for decorative purposes, and not elastic purposes, it would appear on the outside of the sleeve instead. Also note that the pleats do not extend around the full edge of the sleeve, another clue that the stitching was intended to be functional more than decorative. The sleeve is estimated to be 16 cm in circumference, of which 10 cm is pleated in the honeycomb stitch—this amount of pleating would allow the sleeve to widen from 16 cm to 19 cm., which would be enough to allow a hand to squeeze through the end of the sleeve and still allow the sleeve to close around the wrist snugly.



Fig. 45. A simple apron secured with the honeycomb stitch.

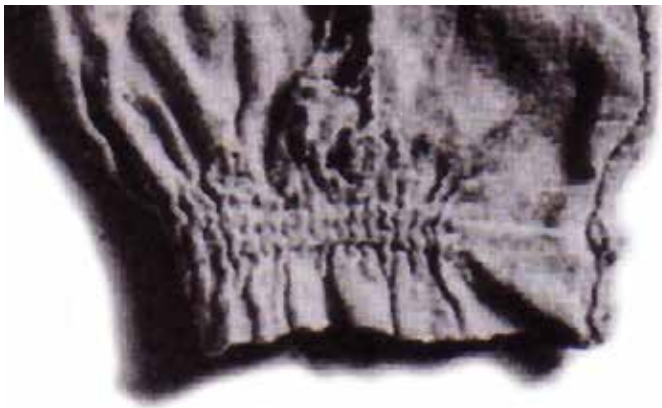


Fig. 44. The outside of the Alpirsbach shirt sleeve with the honeycomb pattern on the inside. The outside looks remarkably like a modern elastic wristband.

The honeycomb stitch appears often at the top of aprons (figure 45), such as on the woman in the 1546 Camp scene of Charles V (see figure 46). To learn to make a simple honeycomb pleated apron, see chapter 3.



Fig. 46. A simple apron secured with the honeycomb stitch.

2.4 Casings as a Method of Securing Folds

When the folds occur very close to the edge of fabric, a strip of fabric can be used to encase the raw edge, stabilizing the folds at the same time. Casings appear on all of the pleated textile finds at Castle Lengberg, as well as two of the finds at Alpirsbach (collars on Cat. 27 and 28). The strips are folded in on either side then fastened to the folds on both the inside and outside with whip stitches. In one Castle Lengberg find, the strip of fabric (casing) was equally broad on both the inside and outside (Find 430.02). In the remaining Castle Lengberg finds the

casings were broader on the inside and narrower on the outside, and additional back stitches are sewn through the front and back layer of the casing as well as through the folds sandwiched inside. In one find, a line of running stitches was also added below the backstitch and above the whip stitch (see fig. 47).

Two extant smocks, one in the Museum of Fine Arts, Boston (Arnold, 54) and another in the Metropolitan Museum of the Arts (Arnold, 55) also use thin casings over the raw edge of the folds, and they are also whip stitched to the pleats, but due to their small size (about 5 mm.) no additional backstitching or running stitches were used.

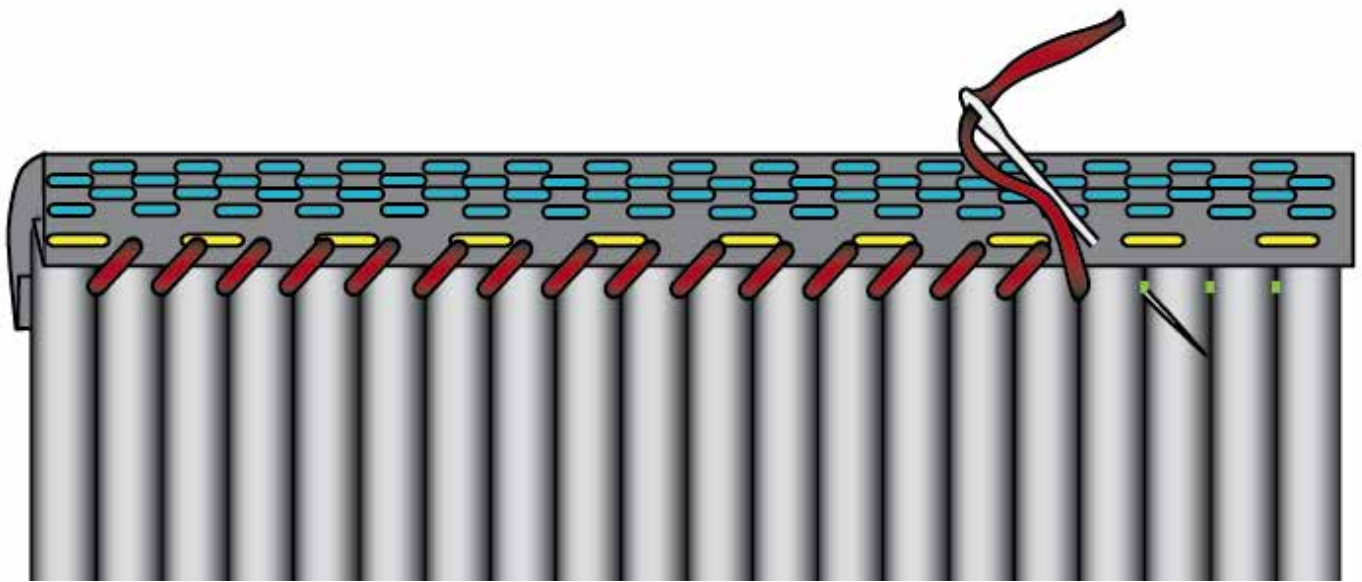


Fig. 347 Outside of pleated fabric textile with a casing. Red stitch is a whip stitch. Blue stitch is a backstitch. Yellow is a running stitch. Illustration designed and copyrighted by author

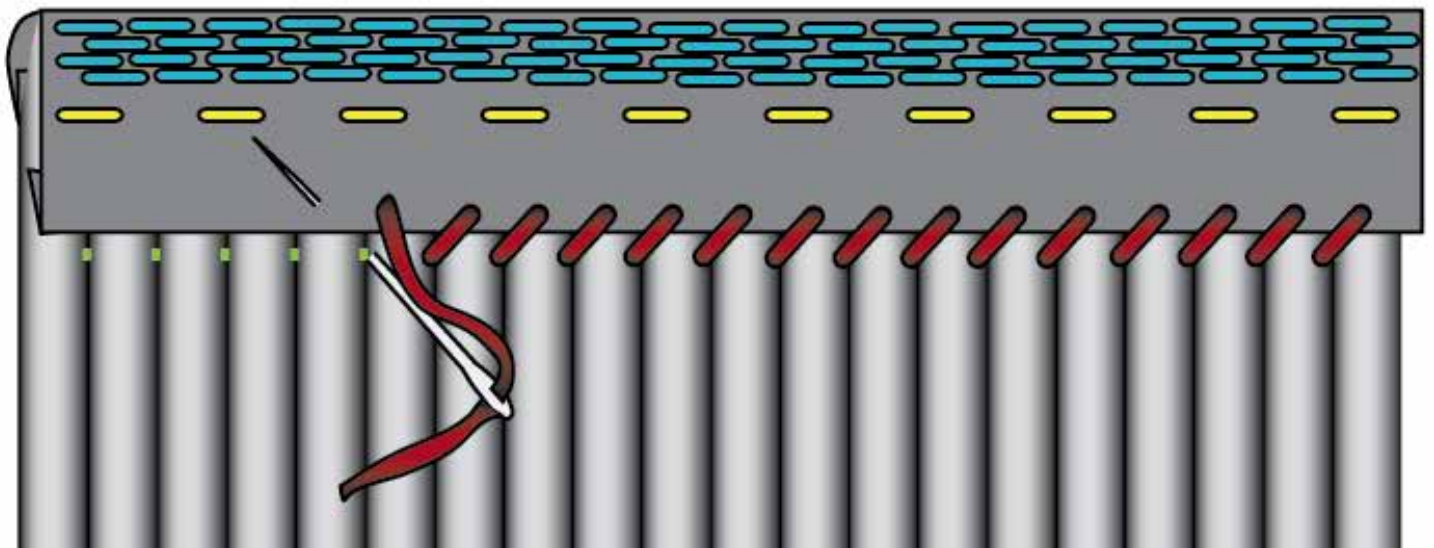


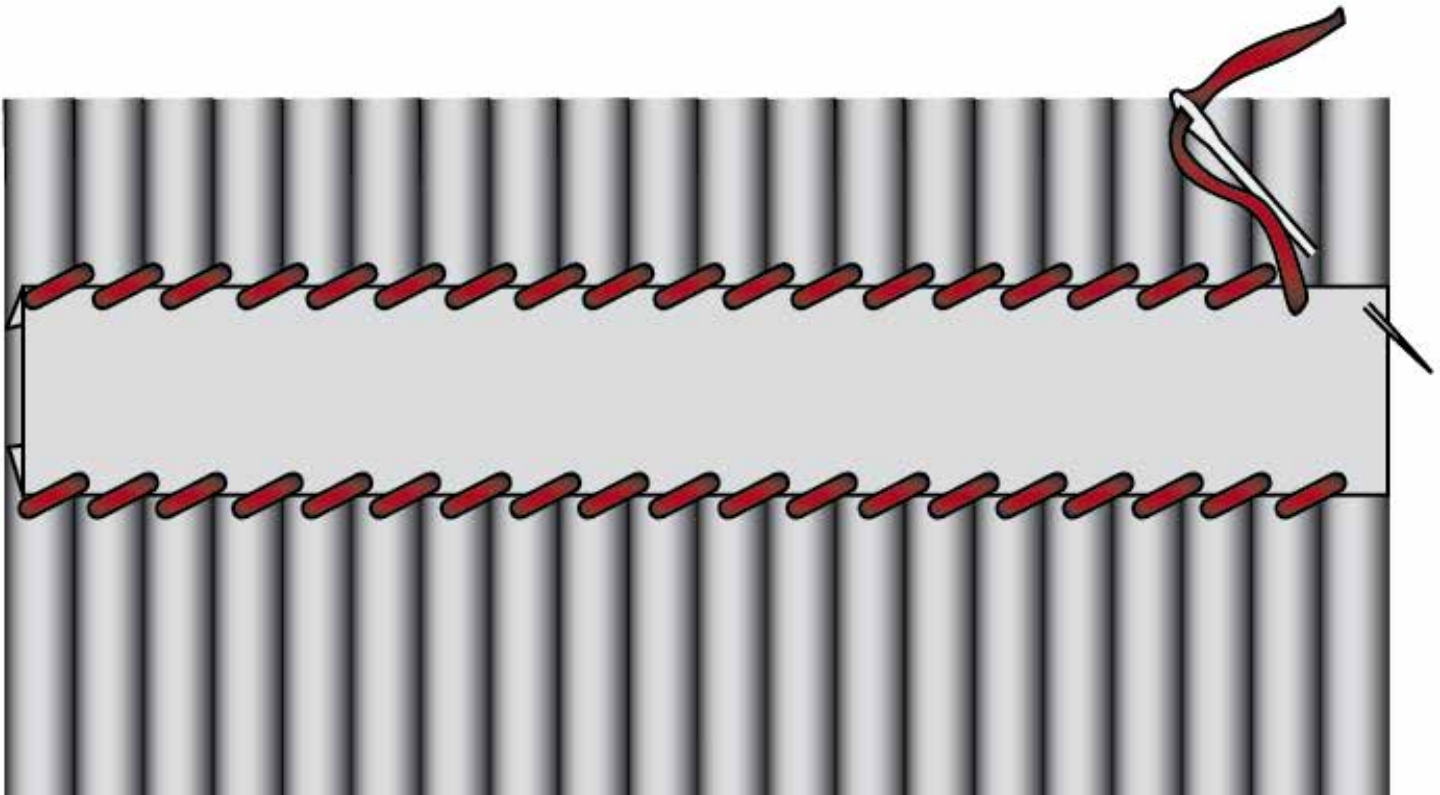
Figure 48. Inside of pleated fabric textile with a casing. Red stitch is a whip stitch. Blue stitch is a backstitch. Yellow is a running stitch. Illustration designed and copyrighted by author

2.5 Back Panels as a Method of Securing Folds

One interesting find in Alpirsbach is a pleated collar with a panel of fabric across the pleats on the back, while the front is covered with a 3 cm. wide strip of bobbin lace. The back panel is whip-stitched on either side to the inside of the fabric, covering the pleats the same 3 cm. of pleats that the front lace covers (see fig. 32). No additional stitches on the back panel are observed in the photograph, nor mentioned in the article. It is significant to note, however, that a 9-thread braided cord is sewn to the two edges of the bobbin lace, and the pleats below it, on the front. More details on stitches are not available for this fragment. Experimentation with back panels over pleats reveals that, in practice, they effectively secure pleats.

Other Methods of Securing Folds

Other methods of securing folds likely exist, but sufficient information is not available. Modern smocking stitches, such as the trellis stitch, chain stitch, and cable stitch may have been used, but evidence on extant garments or paintings has not yet been found by this author.



*Fig. 49. Inside of pleated fabric textile with a back panel whipstitched to it.
Illustration designed and copyrighted by author*

Chapter 3: A Simple Honeycomb Pleated Apron

Aprons are an ubiquitous accessory in medieval and renaissance ages. Not only do they protect clothing from dirt and grime, they serve as a handy way to carry items and can even be fashionable. Pleating the top of an apron is a simple way to gather a larger quantity of fabric as well as show off one skill with a needle. Simple pleated aprons are popular in Europe in the 14th, 15th, and 16th centuries, as seen in the images below. Approx. project time for completion: 1 hour (1-inch pleats) to 4 hours (1/4-inch pleats).



*Image from the Luttrell
Psalter (1325-35)*



*Unknown Master of the
Nativity*



*Landsknecht Seamstress,
1535*

How to Make a Pleatwork Apron:

Here are instructions to make your own apron similar to the one shown on the previous pages. It's possible to do this in as little as an hour, or as long as an afternoon—it depends upon the size of your pleats and how much hand stitching you want to do.

What You Need:

One yard (36" x 55") of medium weight linen (selvedge to selvedge)

Linen, cotton, or silk threads (one matching, one contrasting)

Beeswax

Milliner's needle

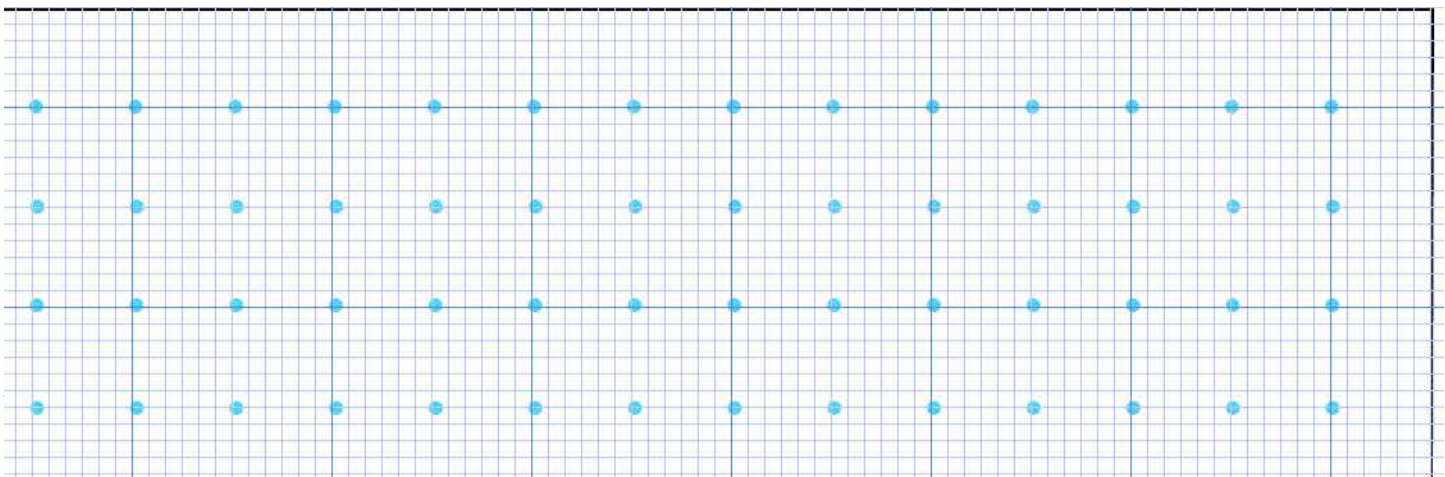
Scissors

Dot Template

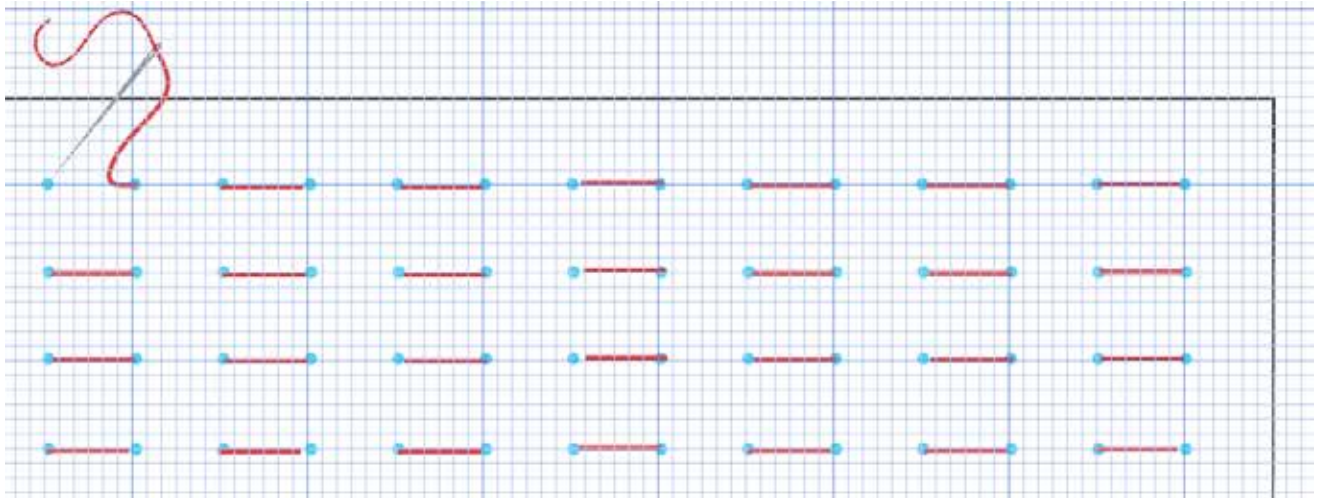
Method of marking the dots, such as water soluble marking pen (modern) or pounce (period)

Step-by-Step Instructions:

1. Square up your linen (cut it straight along grain). For a tutorial on how to do this, see <http://germanrenaissance.net/squaring-up-your-linen-how-to-cut-evenly-along-the-grain-by-pulling-a-thread/>
2. Lay your linen on a flat surface, with each the selvages at either end, perpendicular to you. Using the dot template provided, line it up to the top of your linen at one selvedge end of your fabric and begin marking. You can either poke holes in the template and lay it on top of your linen to mark, or put the template under your linen so you can see the blue dots through it to mark. Continue marking all across your fabric until the top edge, from selvedge to selvedge, is marked with your dots, as shown below.



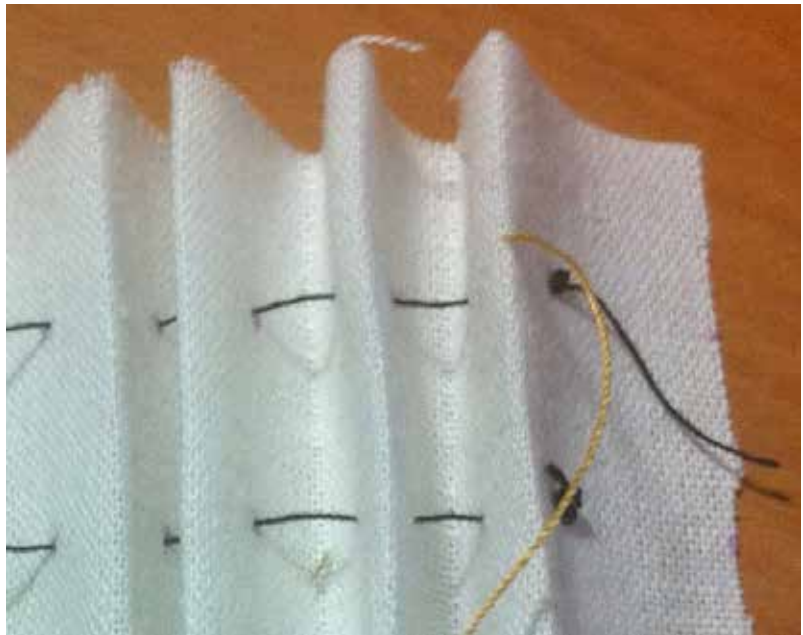
Continue until you reach the end of the row of dots, leaving a long trail of thread at the end. Continue with a new thread in a new row. Repeat until you have all rows threaded.



4. Holding the threads tightly all in one hand, gently pull the threads until pleats form and the fabric folds into a neat stack. Press and hold the pleats in your fingers to crease the fabric (be wary of ironing, as this may cause your marking dots to become permanent). Historically, they would have wetted the material and used a press or simple gravity to crease the pleats. Creasing them like this makes the next steps easier and makes the pattern we're about to make stand out nicely. Once your fabric has been creased, allow it to relax slightly.



5. Now thread your needle with matching thread, then wax your thread with beeswax to strengthen and lubricate your thread. Bring your first stitch up from the back of your fabric to the front, right into the top-right pleat, as shown in the photo below.



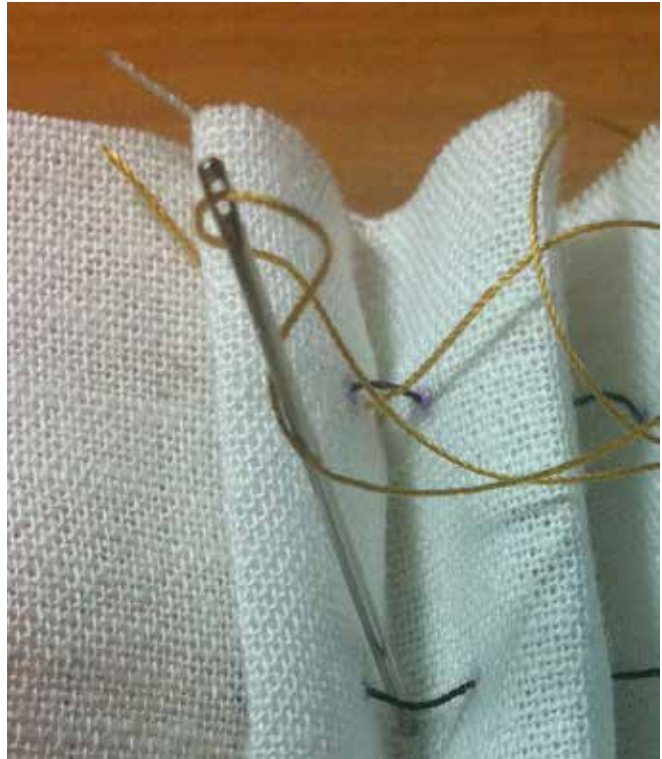
6. Now put your needle through the top edge of the pleat you started at and the next one to the left, as shown below.



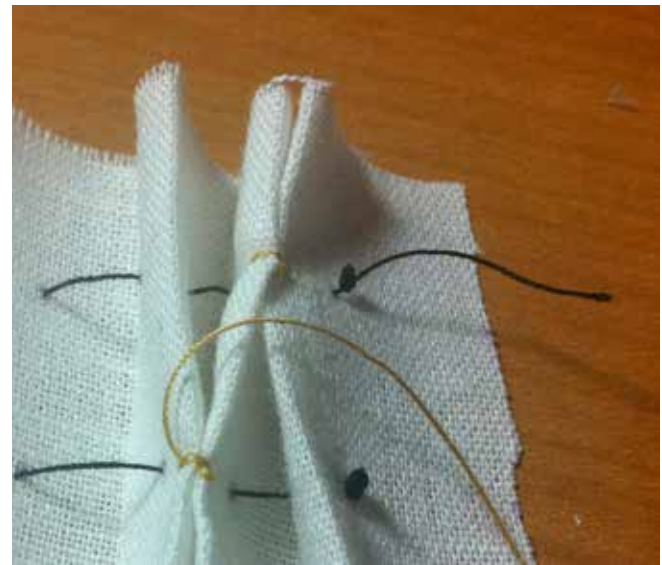
7. Pull the needle through, then backstitch over these two pleats twice to secure them together.
8. Push your needle back into the second crease, maneuvering it so it stays in the crease on the backside, then push it back through on the row below.



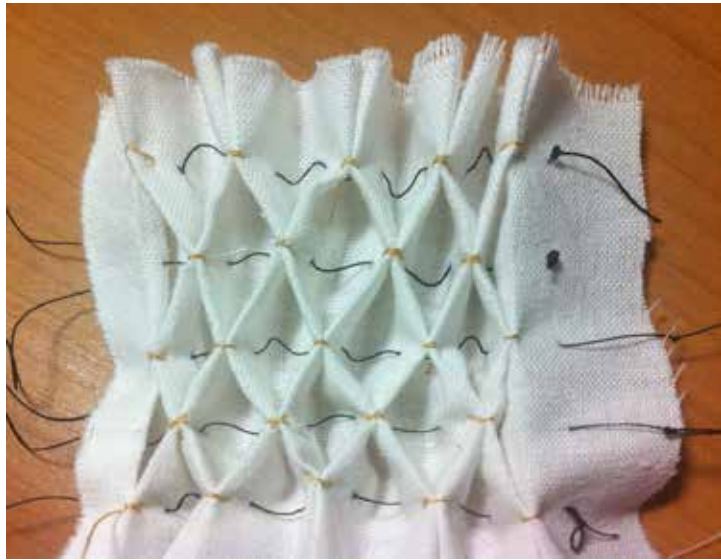
9. Repeat with the two creases on the row below, making sure you're offsetting the pleats (this is how you get the honeycomb pattern). Backstitch at least twice to secure the stitch before inserting your needle back in behind the crease.



10. Push your needle back up through the fabric, behind the crease, at the top of the next pleat and stitch again. Continue like this across the top two rows.



11. Repeat with the remaining sets of rows.



12. Now cut off the knots of the thread you used to gather your pleats and gently pull them out.



To make the apron band and tie, cut about 4" off the bottom of your apron (or, if your waist is larger than 40", cut two 4" lengths off and sew them together). Fold the top down one inch and the bottom up one inch, then iron. Now fold in half (tucking those two folds in) and iron again. Sandwich the top of your apron into the folded band, centered in the band, and stitch closed along the full length of the band, creating your apron band and tie. Feel free to shorten the tie to the length you desire.

Now just hem the bottom and, optionally, the sides (if your selvages are clean, you can leave it as is).

Voila! You have a pleated apron.

Notes:

This apron makes a honeycomb pattern that is quite large. Use a smaller gauge of dots to create a smaller pattern, such as 1/2" or even 1/4" for a very fine matrix.

The honeycomb stitch is flexible. When determining how much fabric you need for a project, estimate that you need about 3-4" of material for every 1" of finished pleatwork. If you want a wider apron, sew two panels together, selvedge to selvedge, with a whipstitch.

Most aprons were white linen, but 16th century German inventories indicate that yellow, red, black, and green aprons also existed.

To care for your apron, you can machine wash it, but do not machine dry. Instead, carefully press the folds of your pleats with your fingers when it is still damp, then allow to air dry.

Pleatwork can be done on shirt necklines, collars, sleeves, and cuffs.

The modern name for pleatwork is smocking. The German word is *fitz-arbeit* (which means pleat-work). The German word for apron is *schurz*.



For more information on pleated aprons, check out these websites:

Web sites:

<http://germanrenaissance.net/tag/pleatwork/>

<http://www.PleatworkEmbroidery.com>

<http://catrijn.blogspot.com/2009/05/smocked-apron-part-1.html>

<http://haandkraft.blogspot.com/2008/12/pleated-apron.html>

<http://matildalazouche.livejournal.com/2569.html>

<http://m-silkwork.blogspot.com/2010/06/smocked-apron-tutorials.html>

<http://maniacalmedievalist.wordpress.com/category/aprons/>

<http://opusanglicanum.wordpress.com/2013/05/03/smocked-apron/>



I teach a two-hour class in how to make this apron as I travel around. To date, I have taught this class at Pennsic 43, Pennsic 44, Red Dragon 2013, and Lilies War 29.

Chapter 4: An Elaborately Pleated Apron

This is a reproduction of a pleated linen *schurz* (apron) similar to those worn by German women in the early-to-middle 16th century. The apron is made of linen with hand-gathered pleats that are secured with a variety of period stitches (stem stitch, honeycomb surface stitch, and chain stitch) in silk thread, along with a casing strip similar to the textile finds at Castle Lengberg¹. The hems are finished with a drawnwork hemstitch. Such an apron is more apt to be worn by a wealthy and/or high-born woman in Germany, but may also be seen on women in Landsknecht *tross*. Approx. project time for completion: 40 hours.



Detail of apron in *Melencolia I* (1514) by Albrecht Dürer



My reproduction pleatwork apron



My pleatwork apron detail

A Closer Study of 1500-1580 German Aprons

Aprons are commonly depicted on German imagery from 1500-1580, and are shown being worn by all classes of women. Aprons are also mentioned in the household accounts² from this period. Unfortunately, no aprons from this time period and place have survived to my knowledge, but there are some extant aprons from Italy and England. Most aprons in these three primary sources (imagery, text, and artifact) are or appear to be made from white linen, linen/wool blends, or linen/cotton blends, and there is evidence for aprons of other colors to a lesser extent in imagery and text, such as red, yellow, green, and black. Many, though not all, German aprons are depicted and described as being pleated at the top to gather the fabric into a smaller area. Imagery and text also tells us that these pleats may have been secured in a variety of stitches. For example, sumptuary laws of 1512³ mention, “none with gold or silver smocking or needlework aprons shall wear,” as well as, “no rich pleating shall be on an honor-worthy-apron, that there also should be less pleating and small smocking so that the apron would not be so gathered.” And, indeed, deeply-pleated and/or gilt-thread aprons are not depicted in imagery. Thus, I have attempted to recreate an honor-worthy apron with small smocking that is not overly gathered. It’s important to note that as no extant German aprons are available to study, I have had to pull together what I think a woman might have created and worn based on my research into these primary sources. My design is drawn from many sources, but primarily from *Melencolia I* by Durer (pictured on previous page), but is not intended to be an exact representation. I made my pleats and embroidery quite small so as to boast at my persona’s skill with the needle and her wealth. In reality, this is a teaching garment that I will wear at my pleating classes to show students a variety of stitches.



Frau mit Weberspeck (1564)
by Tobias Stimmer



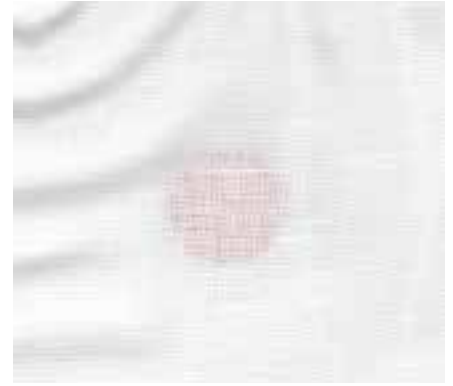
Portrait of a Woman (1566) by
Lucas Cranach the Younger



Frau (1515) by Urs Graf

Apron Materials

I used natural and, as much as my budget allowed, period-appropriate materials in the creation of this gown. The thread count on the linen is 45 threads per inch, which was the highest woven linen I could find at the time (I believe it would have been higher in period). I should note that I opted for a medium weight linen, as I feel an apron made of linen that is too lightweight just tends to float and flyaway, which is impractical and visually unappealing. In imagery, aprons always appear to hang down with some substance.



I used white silk thread, rather than linen, because it is stronger, and that is very important in creating sturdy pleatwork. Fine linen used in the garment

I should note that the apron's belt appears whiter than the apron, but you can see this type of color variation in period imagery as well. While the material for the belt and the apron itself are cut from the same cloth, the apron was in progress for nearly a year while the belt was kept separate (both have since been washed). The color variation is more likely due to the shadows produced by the pleats and the natural beeswax used to strengthen and lubricate the thread.

Materials Used



Detail from *Fountain of Youth* (1546) by Lucas Cranach the Elder

What They Used	What I Used
Linen, linen-woolsey, linen-cotton	100% medium-weight linen
Linen or silk thread	Silk thread (Guttermann's silk thread) and silk floss (Soie d'Alger)



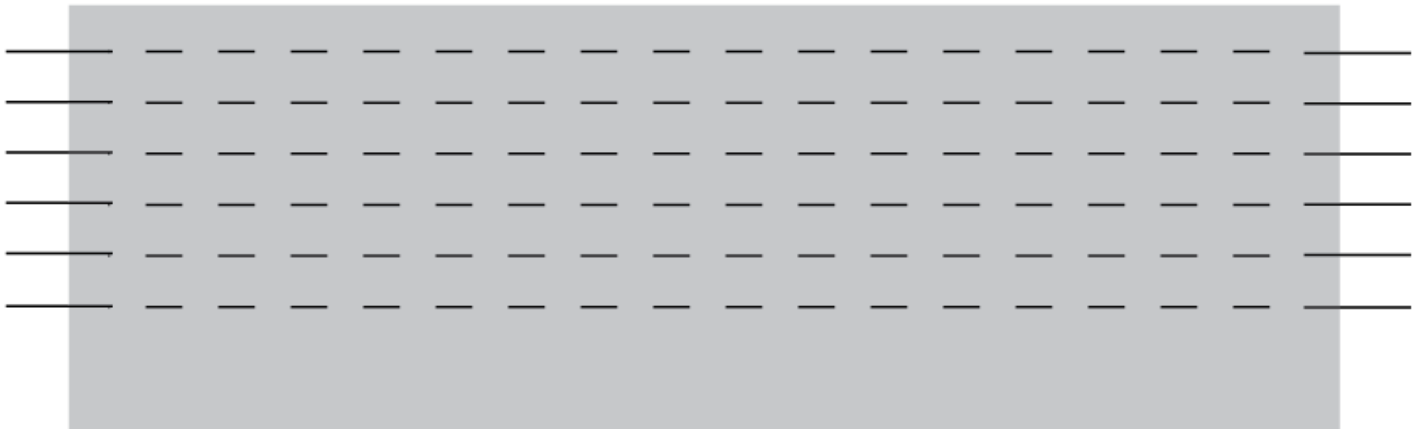
Detail of apron from *Soldier and Woman* (1569) by Jacob Vinck

Apron Construction

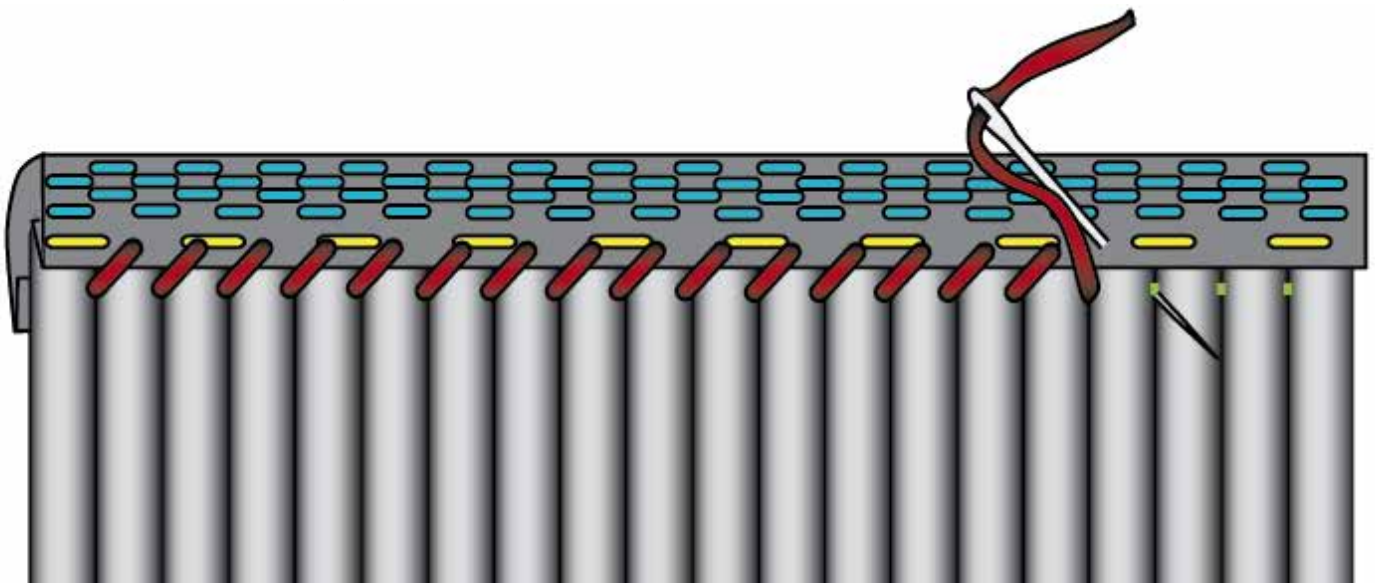
The apron is a rectangle of cloth, selvedge to selvedge. It is hand-gathered at the top with running stitches of silk thread every 3 mm. Once the running stitches are in place, the linen is made lightly wet and the threads are pulled to create the pleats (about 6 pleats per centimeter, which corresponds to my research on how closely spaced they tended to be in period imagery). The pleats will not stay in place for long without support, so four different, period-appropriate stitches⁴ were employed to secure the pleats: whip stitch (to a casing strip at the top edge), honeycomb stitch, stem stitch, and chain stitch. After the pleats are secured, the selvedges and bottom edge are finished with a drawnwork hemstitch, with the help of a bone smoothing tool (to crease the edges). Finally, a linen strip of appropriate length is folded over and whip stitched to the apron so it may be worn around the waist. After construction, the apron was hand washed with Madame Crespine's soap and left to dry in the sun for natural bleaching.

Apron Stitches

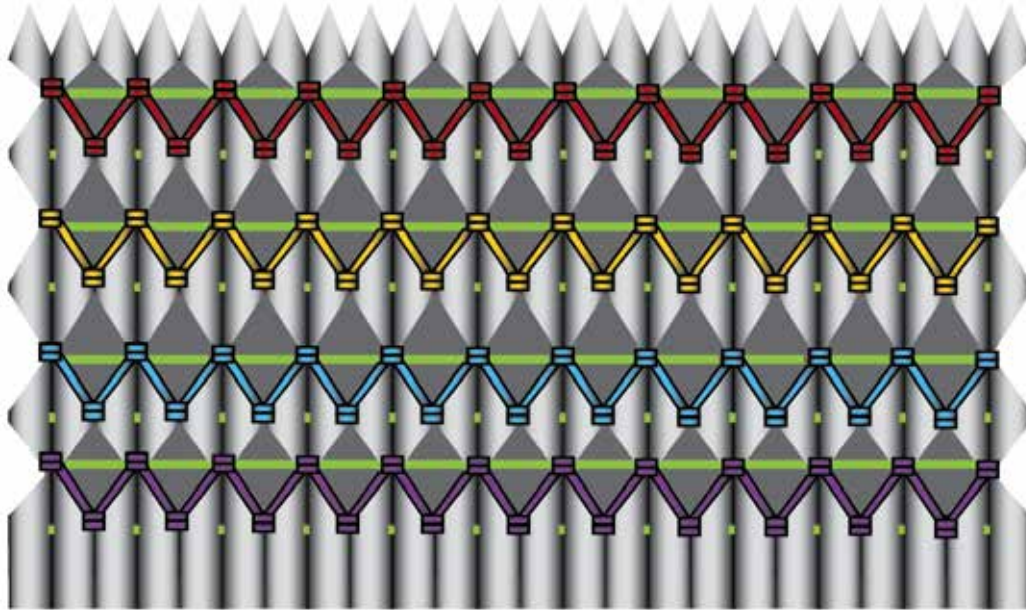
Details and primary sources for these stitches can be found in my research paper, *Techniques of 15th and 16th Century Pleated Undergarments*.



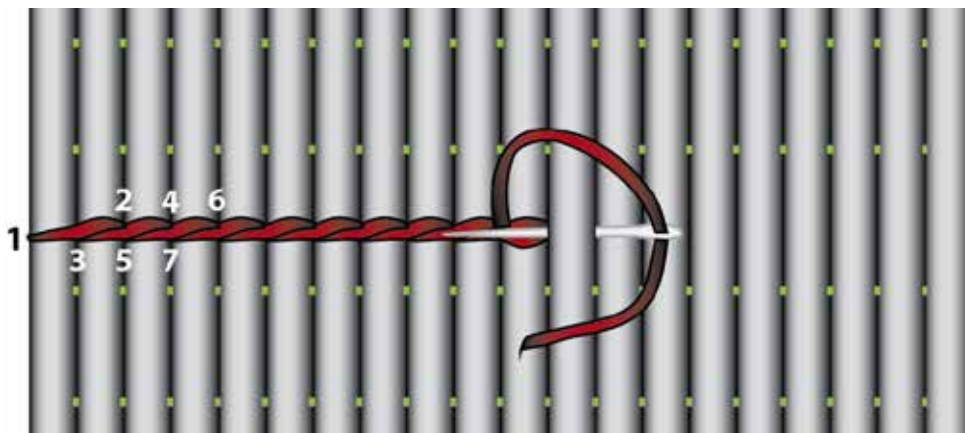
Running Stitch: Parallel and even, each line is a separate thread.



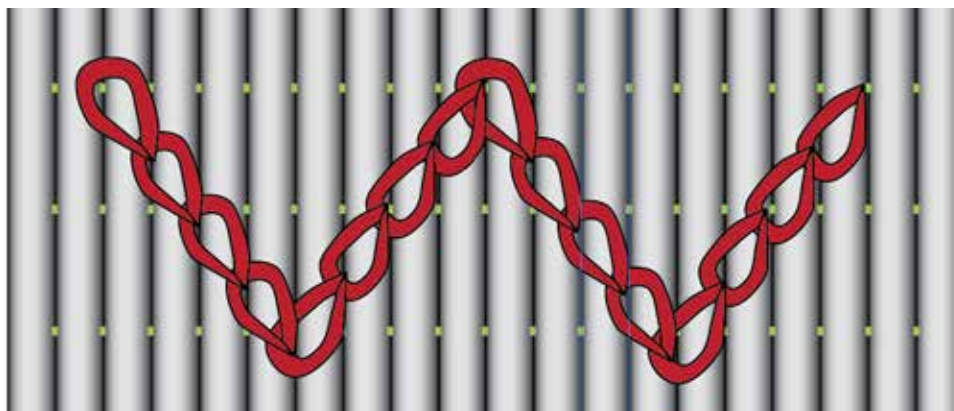
Whip stitch on casing strip: The red stitch indicates the whip stitch.



Honeycomb Stitch: Each thread color indicates one continuous stitch, alternating between two rows, as this allows for elasticity. It should be noted that the thread that is carried between the alternating rows is actually on the back-side of the fabric.



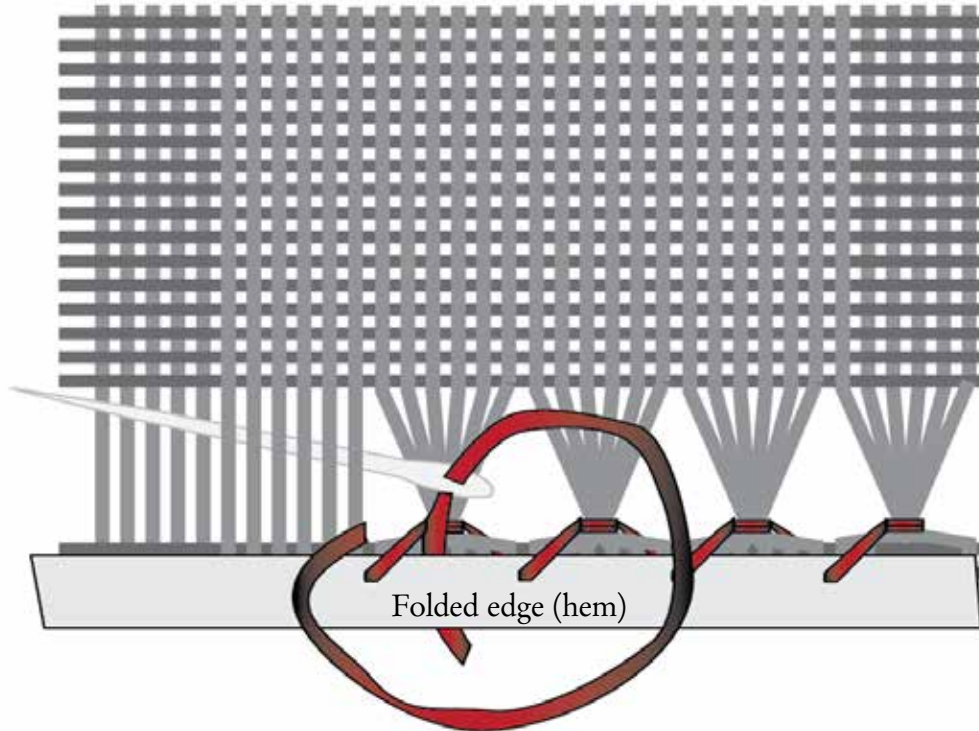
Stem stitch: Start at 1, go in at 2, pass back through the center of the fold, then come up at 3. Repeat across the width of the fabric. For reference, the gathering stitches are shown here as the green between the folds.



Chain stitch

Drawnwork

The edges of the apron were finished with a drawnwork hemstitch, which is a finished edge technique seen on aprons and cuffs in 16th century German, Italian, and English imagery. Drawnwork involves removing the warp or weft thread(s) from the fabric and then using those drawn threads (or thread the same size) to secure the remaining threads in patterns. For my hems, I pulled out six threads along the two sides and bottom, allowing enough room for the edge to be folded twice. I then pulled the threads together in groups of three, placing a whip stitch in the folded hem as I secured them. This resulted in a simple, decorate edge that also produced a clean hem.



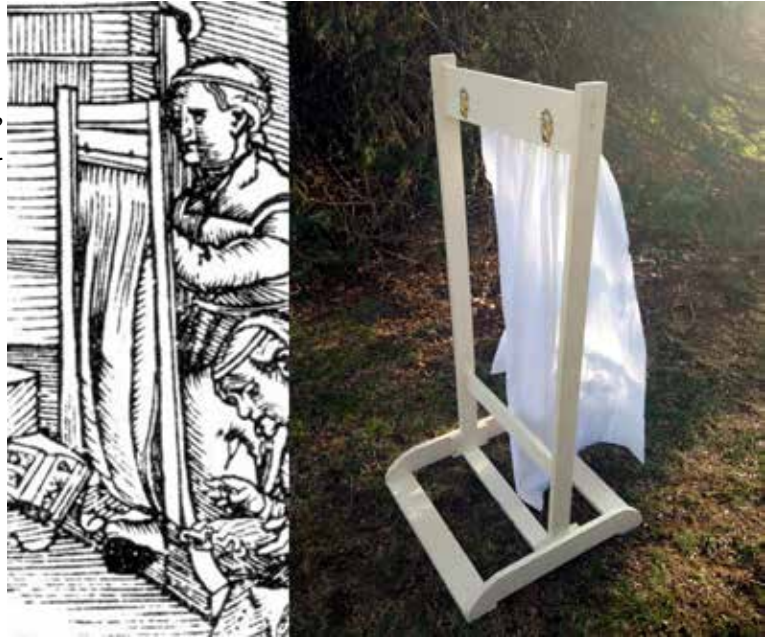
Detail of apron hem with what appears to be drawnwork in *Pyramus und Thisbe* (1531) by Hans Baldung Grien



Detail of drawnwork on cuffs in *Christ Blessing, Surrounded by a Donor and His Family* (1575) by Ludger tom Ring the Younger

Tools

I spent a considerable amount of time designing and making a wood pleating tool that I hoped would help me create pleats faster, but it did NOT work and I used the tried-and-true method (running stitches). I also used a pleating frame, which was an idea that I got in the midst of my Dorothea Meyer smock project and is based on a woodcut of a woman pleating. Gregor made it for me. It was useful for stabilizing the fabric while working on it, because if you pull stitches too tightly while pleating, you can end up with a distorted pattern. I also used a polished bone smoother to crease the edges of hems as needed.



Persona

This gown was constructed for a burgomaster's wife or daughter in early 16th century Germany. This would be a wealthy woman who could and would display her status and wealth on her person through the use of a finely pleated apron. This matches the persona of my personality in the SCA, who is a burgomaster's daughter.

References

1. Nutz, Beatrix. "How to Pleat a Shirt in the 15th Century." *Archaeological Textiles Review* 54 (2012): 79-91. Print.
2. Zander-Seidel, Jutta. *Textiler Hausrat: Kleidung Und Haustextilien in Nürnberg Von 1500-1650*. München: Deutscher Kunstverlag, 1990. 72-75. Print.
3. Belozerskaya, Marina. *Luxury Arts of the Renaissance* (Getty Publications, 2005), page 85.
4. Fingerlin, Ilse. "Leder und TextilFund," *Alpirsbach Zur Geschichte von Kloster und Stadt. Herausgegeben vom Landesdenkmalamt Baden-Württemberg. 2 Textbände und 1 Bildband*. Stuttgart: Konrad Theiss Verlag, 2001. Stuttgart: Theiss. Print.

Additional Reading and Reference Works Related to Pleatwork

Ember, Mária. *Folia Archaeologica*. Vol. XIV. Trans. Julia Palotay Szent-Györgyi. Budapest: Képzőművészeti Alap Kiadóvállalata, 1962. 133-150. Print.

Guhnfeldt, Cato. "Slik Var Klærne I Middelalderen." *Aftenposten*. Aftenposten, 3 Apr. 2007. Web. 27 Jan. 2014. <<http://www.aftenposten.no/fakta/innsikt/article1721709.ece#.Uuak-uD0BGE>>

Hägg, Inga. *Kvinnodräkten I Birka: Livplaggens Rekonstruktion På Grundval Av Det Arkeologiska Materialet*. Uppsala: Inst. F. Arkeologi, 1974. Print.

Kusmin, Sara. Fragment Av Textil. 1250. Photograph. Statens Historika Museum, Lödöse, Sweden. Kringla. 10 May 2010. Web. 27 Jan. 2014. <<http://www.kringla.nu/kringla/objekt?text=plisserade+textil&filter=subject%3Darkeologi&referens=shm/object/885179>>
Posavad, Lee Ann. Cut and Construction of the Pleatwork Shirt. Pleatwork Embroidery. 1 May 2004. Web. 27 Jan. 2014. <<http://www.pleatworkembroidery.com/articles/Pleatwork%20Shirt%20Research%20Paper>>. Rast-Eicher, Antoinette and Tidow, Klaus. "Die Ausgrabungen im Mühlberg-Ensemble Kempten (Allgäu): Metall, Holz und Textil." Bonn: Habett. 2011. 285-351. Print.
Saunders, Sally. Royal School of Needlework Embroidery Techniques. (Potomac Books, 2000).

Artifact Summary

Time: First half of the 16th century

Place: Germany

Style: Pleatwork and Drawnwork Embroidery

Material: Linen and silk thread

Method: Hand sewing, period tool use (pleating frame, bone smoother)

Complexity: Four different pleat securing stitches plus drawnwork embroidery

Amount of Fitting Required: Moderate. The pleats were calculated precisely so they covered the wearer's generously-proportioned front sufficiently with the available width of material. (A previous attempt at a similar apron resulted in one that was much too narrow after pleating.)

Variety of Construction Techniques: Moderate

Difficulty of techniques attempted: Difficult

Extent of original work (including patterns): Elaborate (numerous attempts and tools created)

Extent gone to ensure appropriateness: High

Additional Photos



Chapter 5: A Simple Honeycomb Pleated Smock

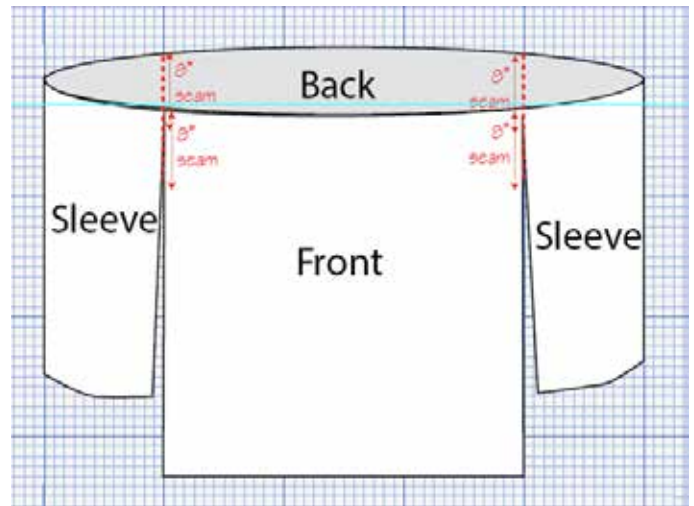
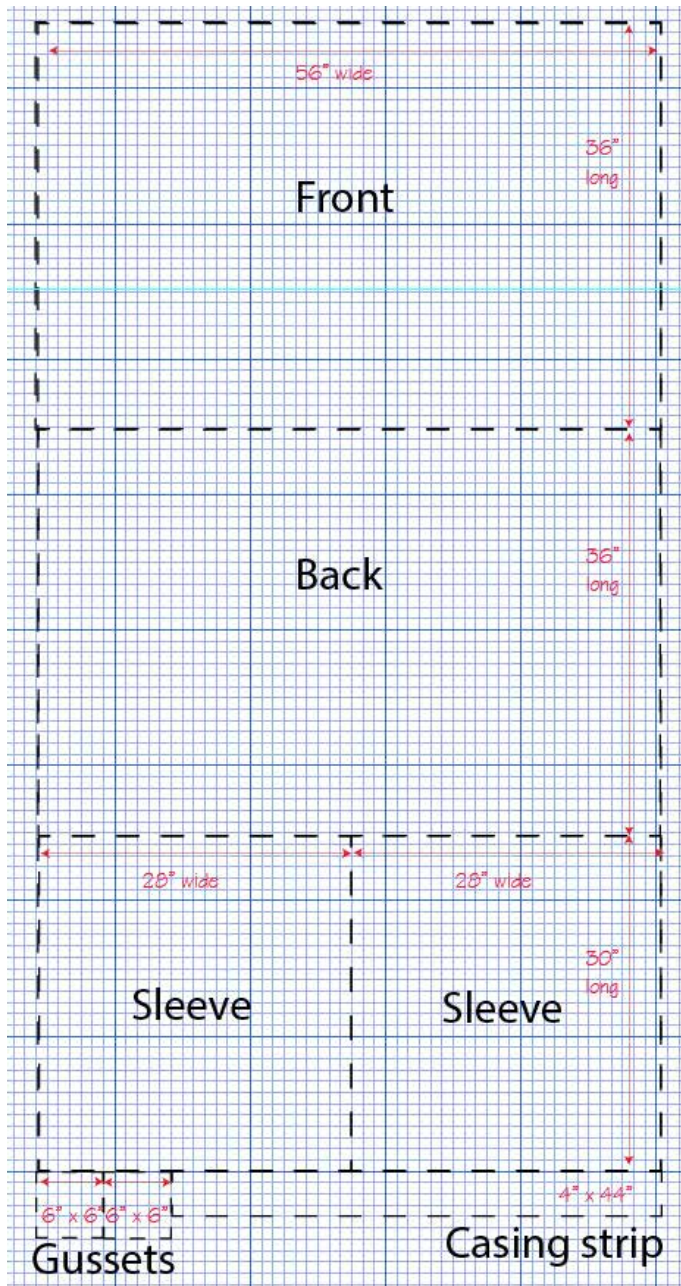
This is a reproduction of a pleated linen *hemd* (smock) similar to those worn by German men and women in the early-to-middle 16th century. The smock is made of linen with hand-gathered pleats that are secured with a small-gauge honeycomb surface stitch in silk thread. Such a smock is more apt to be worn by middle class persons in Germany, but may also be seen on Landsknecht. Approx. project time for completion: 20 hours.



Inspiration: Portrait of a Young Man by Ambrosius Holbein (1518) in the Hermitage Museum, St Petersburg



SMOCK PATTERN:



Notes:

The running stitch was created at 10 stitches per inch. The pleats are approximately 8 pleats per inch. The pleats are additionally secured with a back panel to avoid stitches pulling out with stress near the arms or overpulling of the pleats.

This was the very first pleated smock I made in 2012. I'm pleased to say it's held up well, despite plenty of less-than-gentle treatment over the years. I also machine wash and dry this smock, as the pleats are small enough that they keep their shape, more or less.



Chapter 6: An Embroidered, Pleated Smock

This is a low-neck *hemd* (smock) with a embroidered, pleated front. This smock was intended to be invisible except for the center smocking, as is depicted in Swabian costume from 1510-1520. The embroidery was inspired by a period pattern seen in the 1520 painting “Portrait of a Lady as Mary Magdalen” by Bartolomeo Veneto. The hemd pattern is very similar to the one under the Mary of Hapsburg gown, except that the sleeves are less full as there is no pleating on them. The hems were finished with a hem stitch and the sleeves were attached with an Italian Buttonhole Insertion Stitch. Creation time: Approx. 30 hours.



Hans Holbein the Elder. Portrait of 34-year-old Woman. 1516-17.

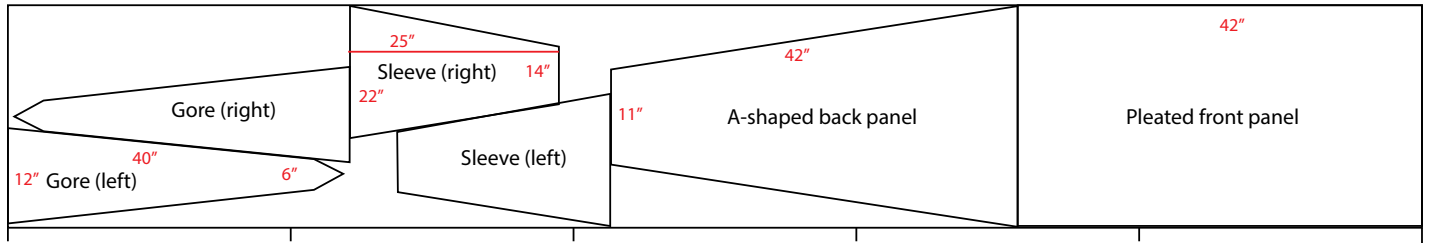


Bartolomeo Veneto, Portrait of a Lady as Mary Magdalen, 1520

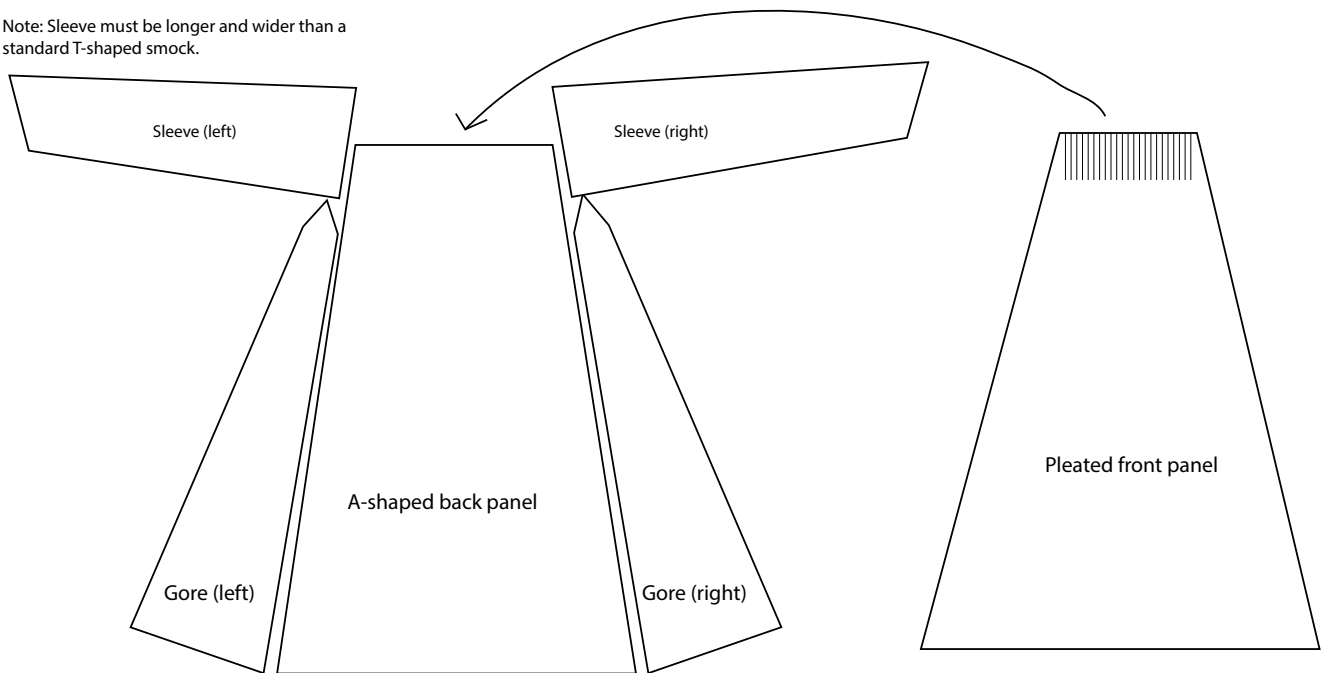


SMOCK PATTERN:

Cutting Layout



Note: Sleeve must be longer and wider than a standard T-shaped smock.



NOTES:

The pleating on this smock required several lines of stem stitching on the back for stability, which was a period practice.

The black silk embroidered lines are stem stitch, while the decorative trellis work is chain stitch.

This smock was created as a gift for Queen Esa of Atlantia, at the request of THL Amie Sparrow who made a German gown to wear with it.

The blanket stitch is also used on the Mary of Hapsburg gown, though we have only a text description and do not know what sort of insertion stitch was used.

Learn more about the Mary of Hapsburg *hemd* and see the pattern layout at <http://germanrenaissance.net/mary-of-hapsburgs-hemd-chemise-pleatwork-and-pattern-darning-notes/>



Chapter 7: An Elaborate Smock with Couched Cord

This is a reproduction of Dorothea Kannengiesser Meyer's *hemd* (smock) as painted by Hans Holbein the Younger in 1516¹, sans the goldwork trim. The *hemd* is made of high count linen, silk cord, and silk thread. All materials are natural and the garment is completely hand pleated and hand sewn. While Holbein's highly-detailed painting does not show the pleatwork beneath the gold trim, I have extrapolated a pattern based on the detail that is shown. Additionally, the rest of the garment is not visible in the painting, so I have surmised a possible construction method from other extant garments, utilizing the seam insertion method. The wrists are pleated in a honeycomb pattern for functionality, based on an extant shirt. Dorothea Meyer was the second wife of Jacob Meyer, Burgomaster (mayor) of Basel elected on June 24, 1516⁴, and as such, this *hemd* is ostentatious and intended for the wealthy wife or daughter of a powerful man. Approx. project time: 50 hours.



Painting of Dorothea Meyer by Hans Holbein

My reproduction pleatwork hemd

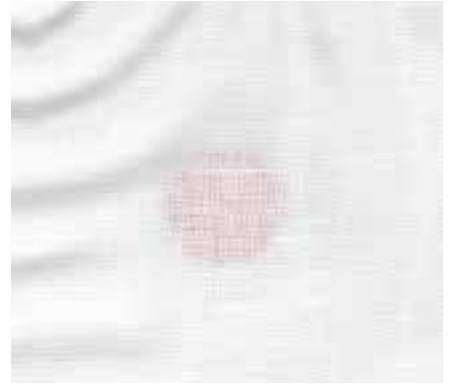
A Closer Study of Dorothea's Hemd

Studying the high-resolution image of Dorothea Meyer gave me a direction for reproducing her *hemd*. I see parallel folds of fabric that appear to be pleats with regular lines at perpendicular angles that appear to be securing stitches for the pleats. The securing stitches appear to cross over the top of the pleats in places, reminding me of stem stitches placed on the outside. Of note is the fact that the longer front pleats do not extend down the *hemd* all the way around -- only the front section is pleated down as far as it is. Yet it seems clear to me at the rest of the *hemd* is still pleated around the neckline (under the trim) based on the way the fabric is regularly gathered beneath it. Also, I do not think that the entire front piece of fabric of the *hemd* is pleated down, for if I draw a line from the end of the longer pleated section to her underarm, the angle is too drastic for period construction techniques (which I believe would have been rectangular⁶). Cords are placed on top of the pleats at regular intervals, joining and separating in a geometric pattern at the front top of the *hemd*. Tufts appear spaced regularly along the top edge, and tassels appear at the bottom of the cords which hang down over the gown's edge. Metallic threads seem to secure the cords together and to the pleats, but do not appear to be interwoven in the cords themselves -- the gold color appears where the cords are attached to the fabric and to one another, but not amongst the cords themselves (the lines you see in the cords are the shadows of the two-ply cordage, in my opinion). Much of this is subject to the viewer's interpretation, of course.



Hemd Materials

I used natural and, as much as my budget allowed, period-appropriate materials in the creation of this gown. The thread count on the linen is 55 threads per inch, which was the highest woven linen I could find at the time (I believe it would have been higher in period). I used white and gold silk thread, rather than linen, because it is stronger. The white silk cords were created by me from silk thread. I should note that I changed the color of linen from an ivory to a natural white because I look dreadful in ivory (and,



Fine linen used in the garment



A portion of my personal sampler showing

frankly, I don't think it's Dorothea's best color either). The metallic thread proved more difficult, and I tried out at least 7 different metallic threads, from inexpensive polyester/rayon threads to pricier foil-wrapped-silk and real gilt threads. In the end, the thread I felt matched the extant examples of 16th century stitches was a simple DMC metallic thread (not floss)—it was more pliable and conformed to the braid in a more natural manner than other metallic threads I tried. Historically, a "silver-gilt" thread would have been used, which typically consisted of metal strips wound around a silk core⁵. The DMC metallic thread, upon close inspection, is a gold-metallic foil wrapped around a thread core, so it makes sense that it works well in this application.

Materials Used in Making This Garment

What They Used	What I Used
Linen	Linen
Linen or silk thread	Silk thread
Silver Gilt Thread	DMC Metallic Thread
Cords (silk? linen?)	Silk cords

Exceptions listed above were made due to either the availability or prohibitive cost to obtain the period equivalent.

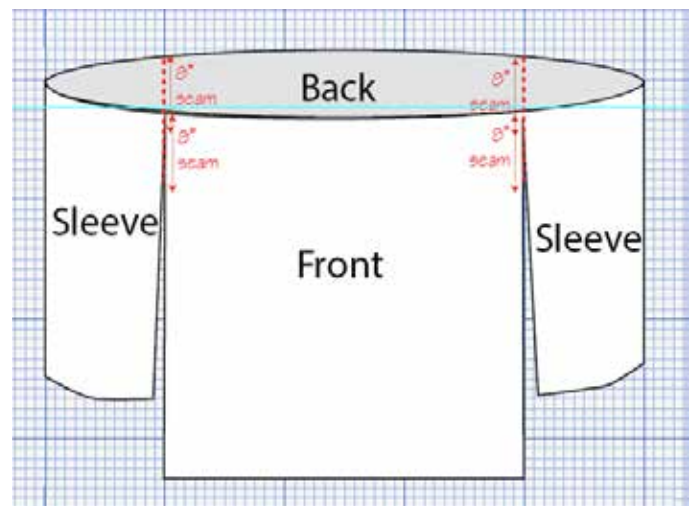
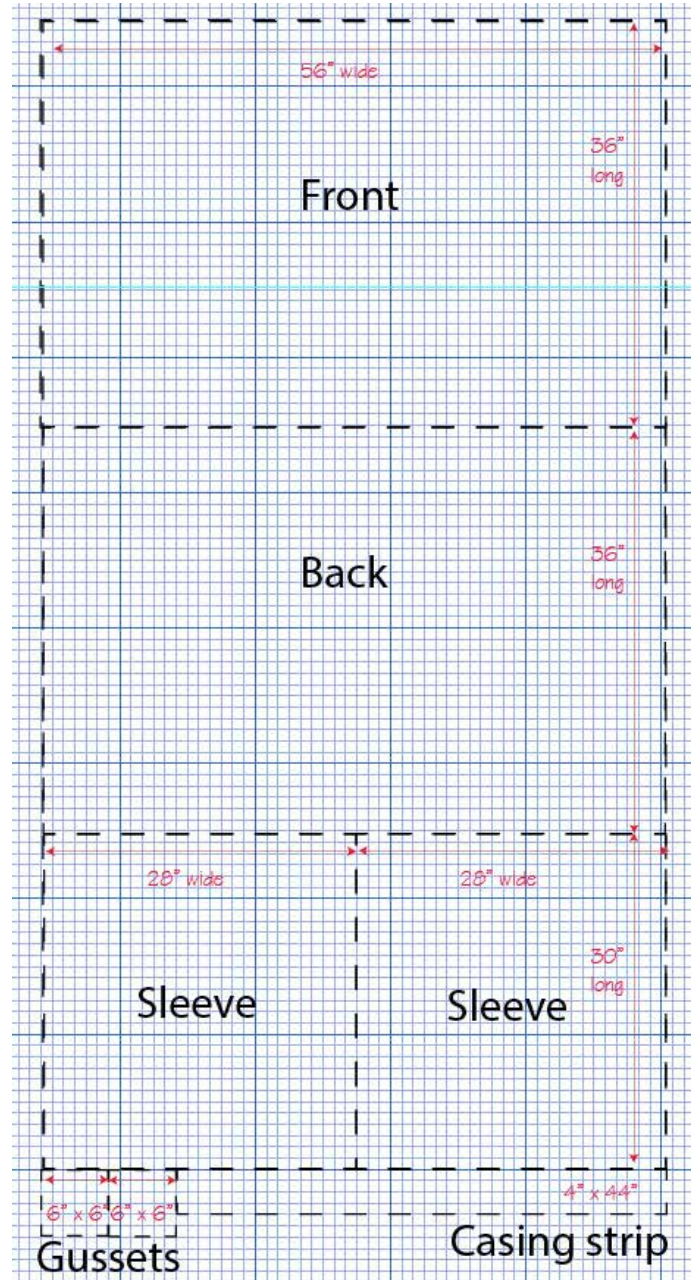
Hemd Construction

This is a deceptively simple shirt construction, created based on my experience with period cutting methods, extant garments, and study of the Holbein painting. The shirt is constructed of four rectangular panels (front, back, and two sleeves), plus a gusset under each arm (as shown to the right). The four panels join one another in a circle, creating a large neckline to pleat down to the required size (as shown below). And like several extant garments (including the 1575 garment⁶ in the Boston Museum of Fine Arts), the shirt has neither shoulder straps nor armscye; the sleeve tops become part of the neckline. There are gussets under the arm, adding extra room where it is most needed. The shaping of the shirt is the result of the pleating.

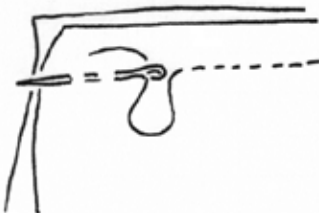
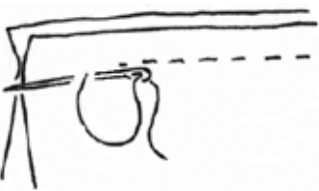
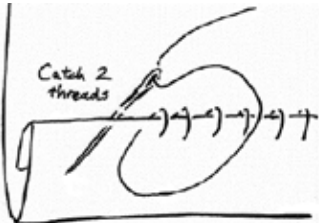
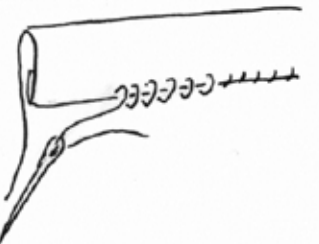

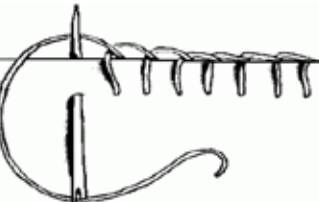
I chose to cut the sleeves at 28" (71cm) wide, which is the loom width for this period and place. The front and back are twice this amount (56"/142 cm) wide (but as I have access to modern 55" fabric, I used the full width of it rather than piecing it). Not only do these measurements make sense, but they were appropriate for my size, too. This resulted in a *hemd* that measures about 110" (142 cm) around the hem and about 162" (410 cm) around the neckline before pleating (43"/110 cm after pleating). This may seem like a lot of fabric, but that is just about what is needed for the number of pleats in Dorothea's *hemd*.

Length is on the short side, as I sometimes kirtle my skirts up (in a period fashion) and the *hemd* should not show.

To prepare for this project, I first made a "simpler" pleated shirt using this pattern so I could wear and evaluate it. That shirt took several months to pleat, but it provided very helpful information, like the necessity of underarm gussets despite the volume of material.



Construction Stitch List

Stitch Used	Diagram
Straight (running) stitch	
Back stitch	
Hem stitch	
Whipstitch	
Slipstitch	
Blanket stitch	

*Note: Credit to Master Henry Kersey for teaching hand sewing techniques and tips.
Stitch Images Credit: <http://www.ia470.com/wardrobe/stitches.html>*

Hemd Pleating

This *hemd* is all about the pleating, which is where I placed my greatest attention and care. After studying this painting for several years, and writing a research paper on pleating techniques (see appendix A), I've come to the conclusion that Dorothea's *hemd* is pleated with roughly 6 pleats per centimeter. This measurement is calculated by comparing the painting with the average distance of a woman's collarbone to determine a scale, and then pleats were carefully counted. One may not think that the Holbein painting is detailed enough to count pleats, but I found that the pleats were quite uniform and corresponded perfectly to a grid based on the tassels and silk cords. This, of course, makes charting a pattern sound simple, and it was anything but simple. I found it incredibly complex, but in the end, it all made sense. Here's a preliminary graphic of Dorothea's *hemd* pleat pattern:



I was able to determine the number of pleats from the painting. I determined how far apart each pleat should be set by using the formula (see below) that I developed during my research. A 4400 mm piece of 0.4 mm thick fabric that will result in a 1100 mm piece must have pleats set 1.6 mm apart. [$((4400/1100) / 2) - .4 = 1.6\text{mm}$]. A 4400 mm piece of 0.4 mm thick fabric with pleats every 1.6 mm will yield a finished piece that is 1100 mm wide. [$(4400 / .4 + (1.6 * 2)) = 1100\text{ mm}$]. To determine how far apart to set my gathering stitches, I knew I would need 6 pleats per centimeter, and my neckline would 110 cm when pleated, so I determined I need 660 pleats.

$$\frac{x}{(z+(y*2))} = \text{length of finished product [alternate notation: } [(x/(z+(y*2))) = a]$$

$$\left(\frac{x}{a}\right) - z = \text{space between each stitch [alternate notation: } [((x/a)/2) - z = y]$$

Where x = width of fabric (before pleating);

y = stitch size (how much fabric per fold);

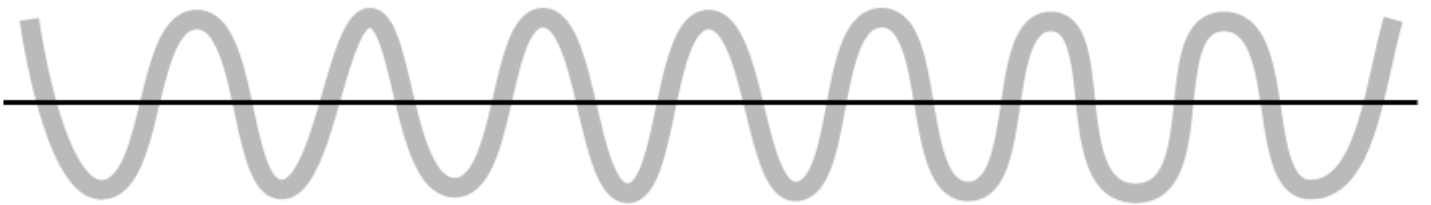
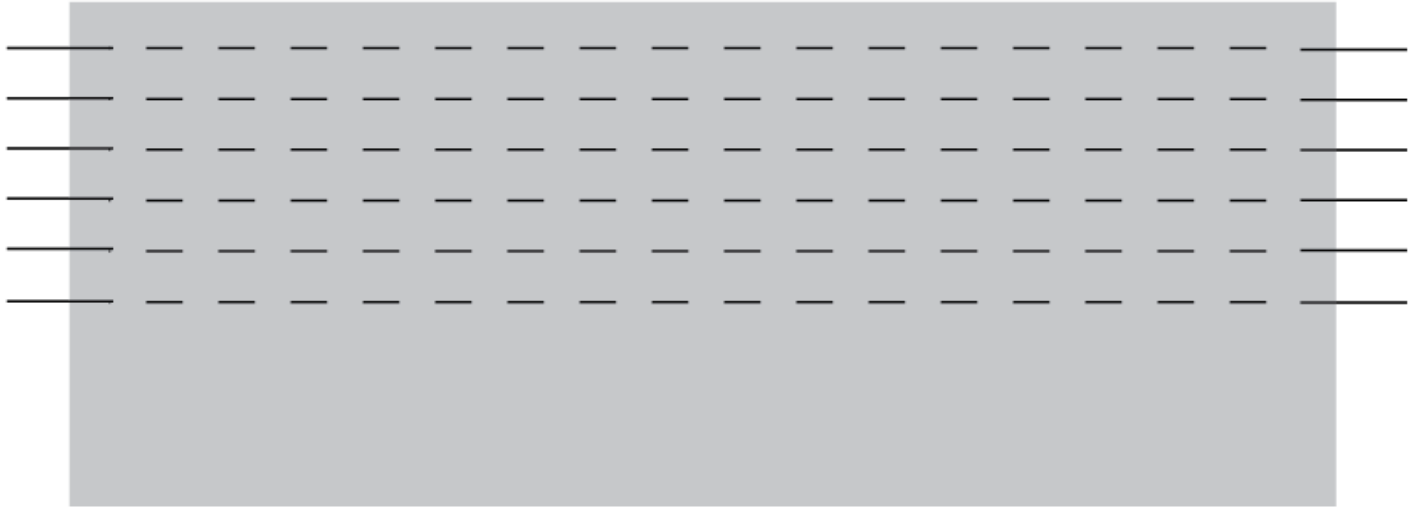
z = thickness of material (measured with calipers); and

a = finished product.

Each pleat requires two equal-distant running stitches (to gather), which means 1320 running stitches spaced out over 440cm results in a running stitch every 3 mm. I then created a template with dots in a grid every 3.3 mm to use for marking positions for each running stitch. In period, one would not have used a formula for determining pleat spacing, but as I am attempting to recreate her specific garment, it was necessary (and it worked).

Pleating (continued)

I stitched three rows of running stitches (1320 stitches in each row), plus four additional rows in the front 27 cm of the *hemd*, as Dorothea's painting indicates a longer pleated section there. The linen was squared up and pleated in sections with doubled and waxed silk thread. I pulled and gathered the material as a I stitched, using water to make the linen more pliable during gathering.



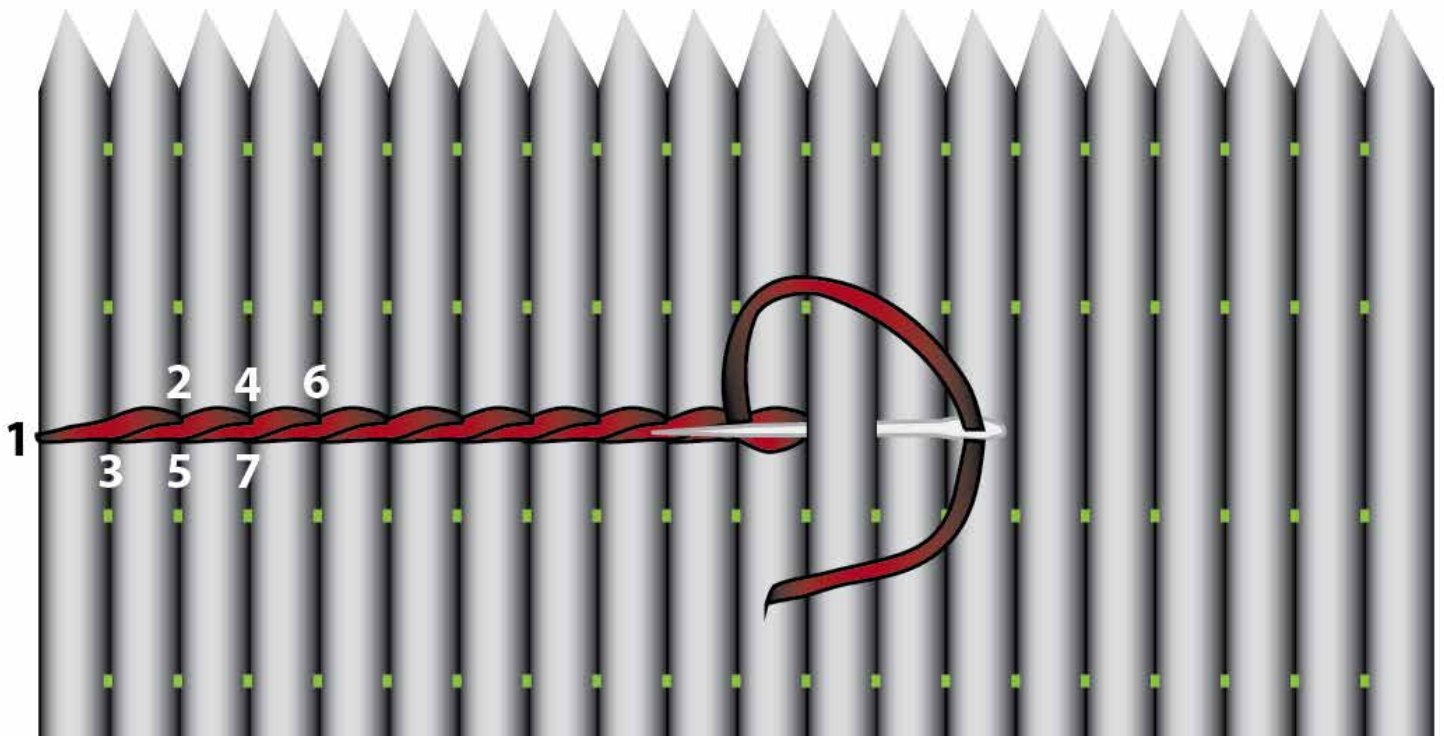
After gathering all the materials into 110cm, I carefully spaced each pleat out so they were all about the same distance, then I sewed a linen band along the top edge to secure each pleat before further work. The use of a casing strip is documented in several extant pieces, including the shirt at the Boston Museum of Fine Arts as well as the textile finds at Castle Lengberg⁶.



Pleating (continued)

In one Castle Lengberg find, the strip of fabric (casing) was equally broad on both the inside and outside (Find 430.02). In the remaining Castle Lengberg finds the casings were broader on the inside and narrower on the outside. I chose to make my casing narrower on the outside so it would offer more inside protection and stability for the pleats. Each of the 660 pleats were whip stitched to inside and outside of the casing.

I then further secured every other row of pleating with a stem stitch. A stem stitch is the simplest and most basic way of securing pleats. The stem stitch is seen on the 1567 Nils Sture shirt sleeve (Arnold, 21), as well as on all of the pleated textile fragments in the Castle Lengberg cache (Nutz, 85). In all cases this stitching was on the underside of the shirt—0.6 cm above the edge of the band on the Nils Sture shirt, and 0.5 cm to 2.5 cm above the edge casing in the Castle Lengberg finds.



Stem stitch through and over the tops of pleats to secure them. Start at 1, go in at 2, pass back through the center of the fold, then come up at 3. Repeat across the width of the fabric.

(For reference, the gathering stitches are shown here as the green between the folds.)

Illustration designed and copyrighted by author

Note that the stem stitch thread is a departure away from the painting of Dorothea. Her stem stitches appear to be in the same off-white color thread as her fabric. I chose gold metallic thread because I wasn't making the goldwork trim at this point, but I felt a shirt of this complexity required some gold finery. I chose to place the gold stem stitches on every other row (on the outside as her stem stitches appear to be), and then further secured the pleats with a row of white silk stem stitches on the inside (which is more like those found in the Castle Lengberg finds). My persona could afford a bit of gold, but quite not as much as Dorothea.

Pleating (continued)

I also pleated the wristbands of the sleeves and secured them in place with the honeycomb stitch. The honeycomb stitch secures the folds by anchoring them to one another in staggered and interlocked rows, which results in a pattern of folding that is reminiscent of a bee's honeycomb. It would be more accurate to describe this stitch as a row or grid of diamonds. The honeycomb stitch is seen at the wrists in an extant garment from Alpirsbach⁸ (see below).



Honeycomb pleatwork in this Alpirsbach find (Cat. 29).

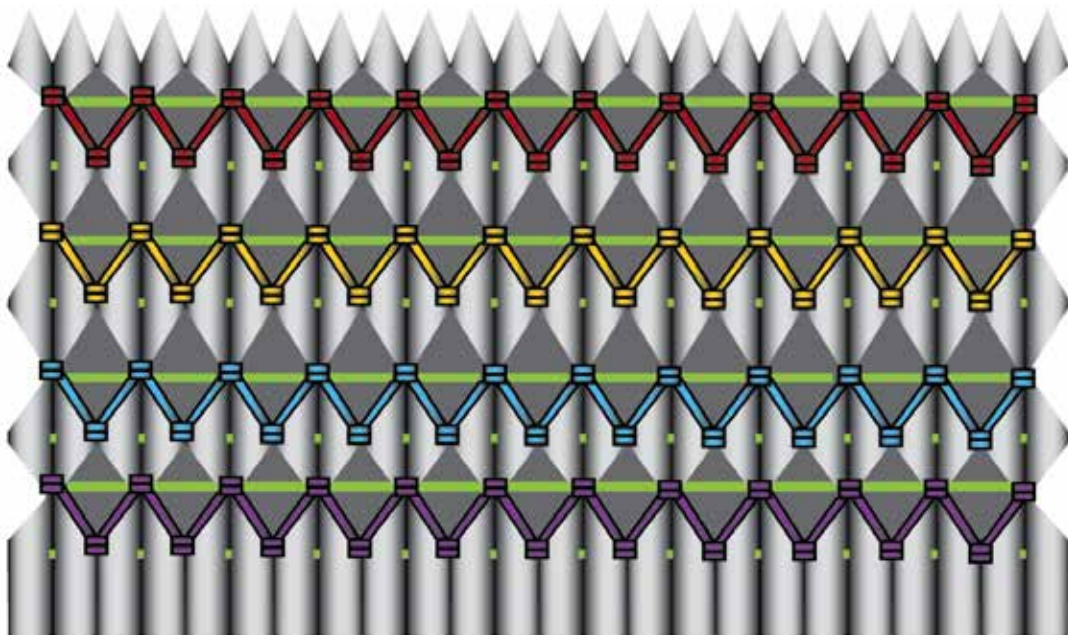


Figure 28. This front-view of honeycomb stitches shows the stitches and threads before the gathering threads have been removed. Each thread color indicates one continuous stitch, alternating between two rows, as this allows for elasticity. It should be noted that the thread that is carried between the alternating rows is actually on the back-side of the fabric. Illustration designed and copyrighted by author

Silk Cording

I made the silk cords that are attached to Dorothea's *hemd* by hand. After much trial and error (and a lot of silk thread), I got the right thickness and twist (80 silk threads per cord). I placed the cords on the front of her *hemd* in tied loops (I got this idea from the portrait, because the two-ply twists of her cords alternate, implying they are looped at some point). I then cut off the tied loops at the top to form small tassels, as in the painting. The cords under the goldwork trim could not be seen, but it was clear something was there because of the continuance of the tassels. So I studied the design and made a similar yet smaller pattern around the rest of the neckline to match. It makes for a nice, and unique, effect. This took about 8 hours.



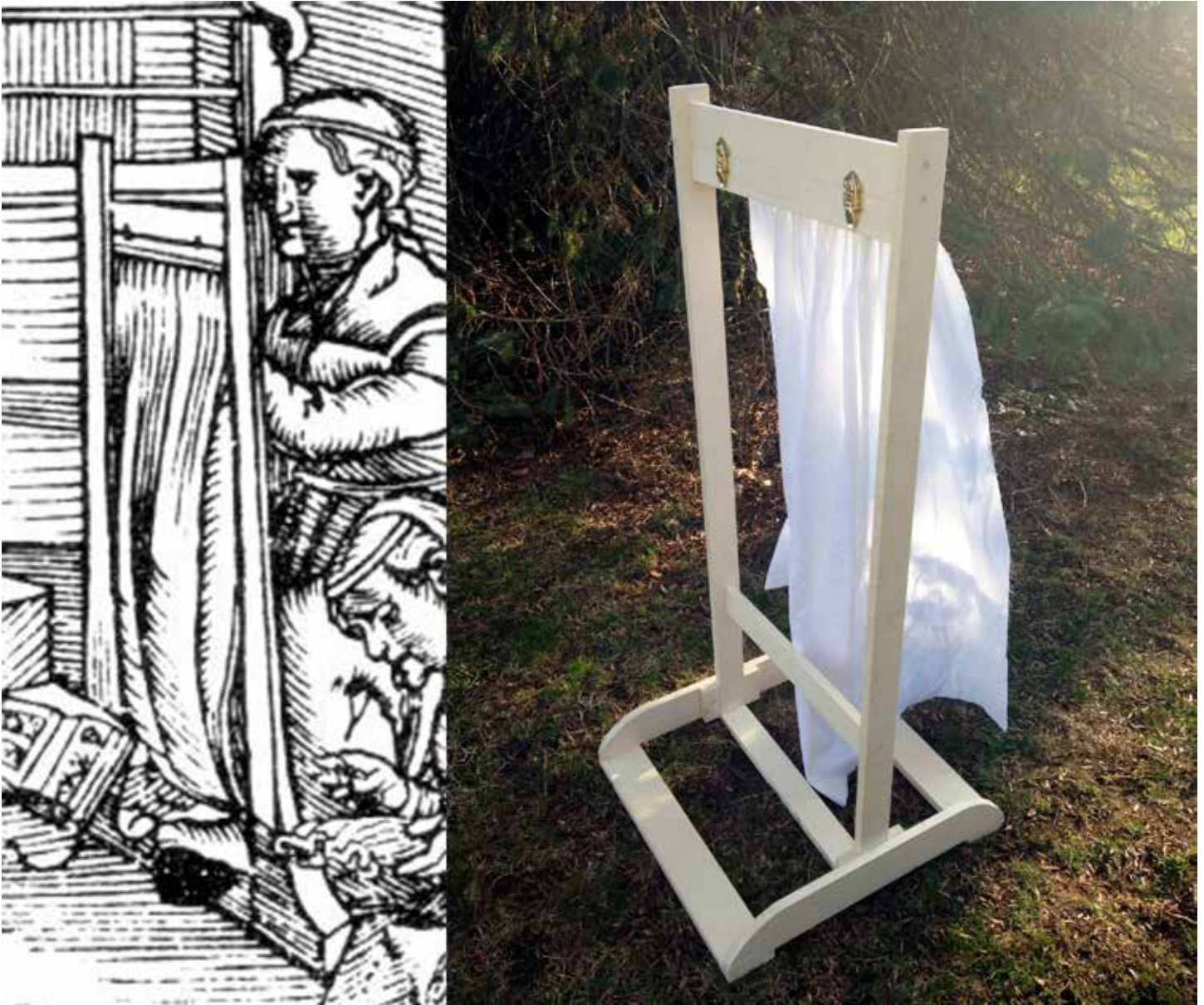
Seams

I cannot see Dorothea's seams, but I infer that a *hemd* so complex and ostentatious would probably have amazing seams, too. So I finished each panel (front, back, sleeves, and gussets) with a blanket stitch in an onion gold silk thread, and then stitched all the pieces together using the seam insert technique seen on many fine 16th century shirts, including several in *Patterns of Fashion 4* (Arnold). This took about 20 hours.



Tools

I used a pleating frame, which was an idea that I got in the midst of this project and is based on a woodcut of a woman pleating. Gregor made it for me. It was useful for stabilizing the fabric while working on it, because if you pull stitches too tightly while pleating, you can end up with a distorted pattern. I also used an awl for marking my fabric before stitching, similar to the prick and pounce method of marking fabric for embroidery—it worked well!



Persona

This gown was constructed for a burgomaster's wife or daughter in early 16th century Germany. This would be a wealthy woman who could and would display her status and wealth on her person through the extensive use of silk and gold. This matches the persona of my personality in the SCA, who is a burgomaster's daughter.

Notes

I did not apply the goldwork trim because I wanted this project to be focused on the beauty of pleatwork. Additionally, I'm not sure a linen *hemd* with such fine goldwork is practical for me, as I suspect it would require the removal of the trim each time it is washed. I may yet add it in the future, and I have already determined the method, materials, and pattern of the goldwork.

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Additional Photos

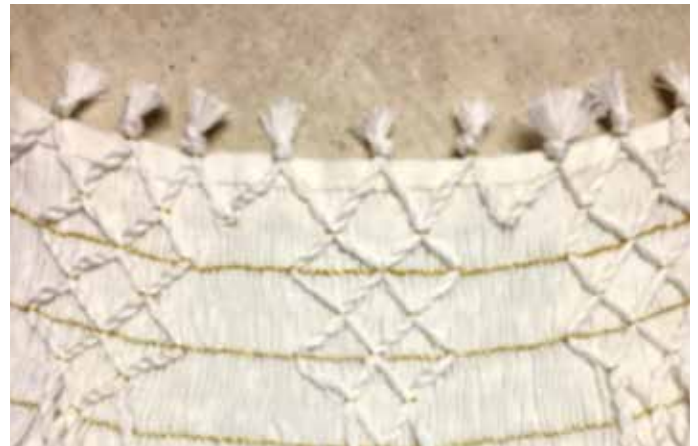
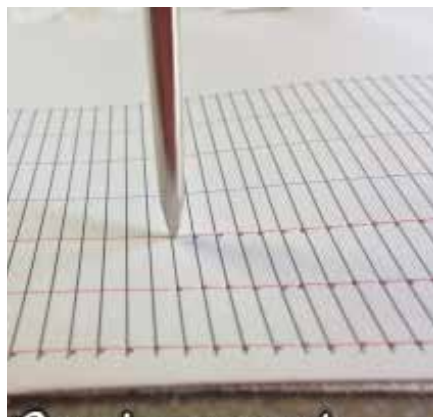
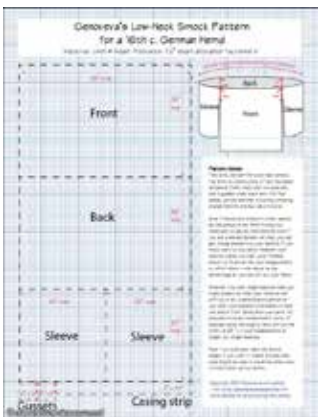


Photo Tutorial

I love sharing and helping! A step-by-step photo tutorial of the creation of this garment is available on my blog at: <http://germanrenaissance.net/dorotheas-pleatwork-hemd-smock-with-cord-tufts-and-tassels-pattern-gathering-tutorial-part-1/>



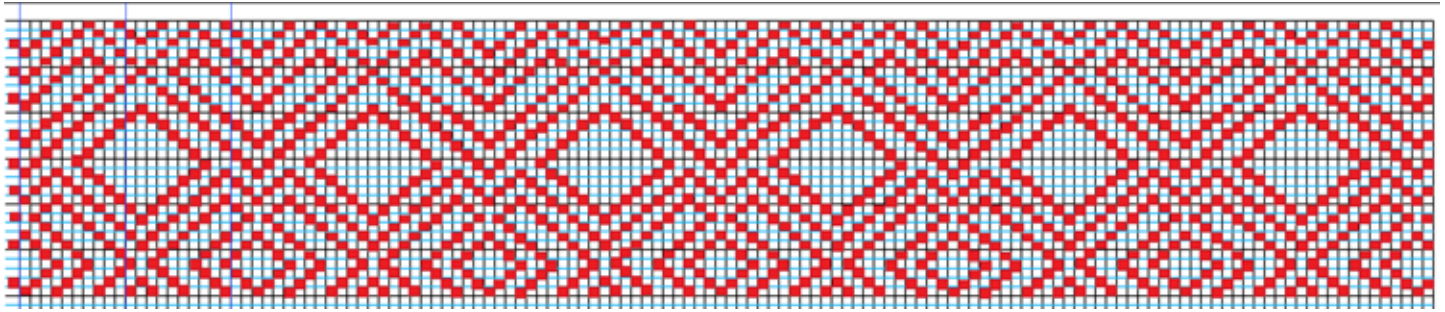
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Chapter 8: A Richly Pleated Smock with Pattern Darning

This is a reproduction of the *hemd* (smock) depicted in a “Portrait of a Woman” by Bernhard Strigel, created in approximately 1510-1515. This woman is likely from the Swabian area of Germany, as Strigel lived and wore in Memmingen, Swabia. In the portrait, we can see only the top front portion of her *hemd*, which shows a clear pattern darned decoration upon it. Using a high resolution photo of this portrait from the Metropolitan Museum of Art (accession number 71.34), I was able to chart her pattern as it appears on the pleats and then duplicate this in a similarly pleated garment. The garment’s pleats are very shallow and set extremely close (about 20 pleats per inch) in order to accommodate the very detailed design. The edges of the *hemd* are hemmed with a gold silk blanket stitch and then an insertion stitch is used to connect each peice of the *hemd* into a whole, similar to the way the Mary of Hapsburg *hemd* was constructed. Creation time: Approx. 50 hours.

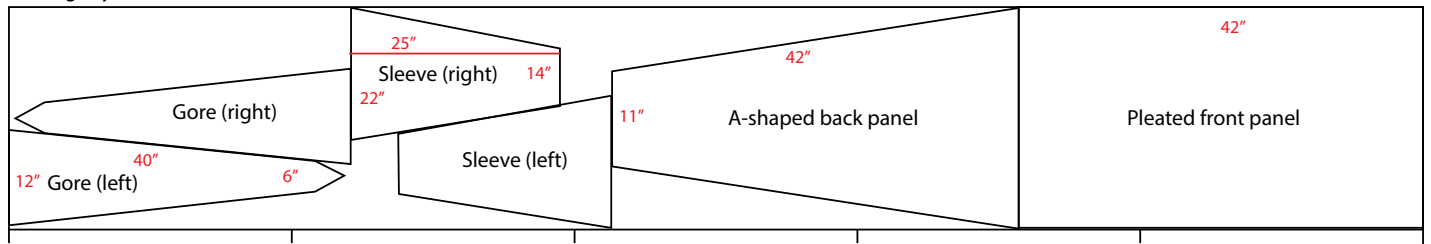


PATTERN CHART:

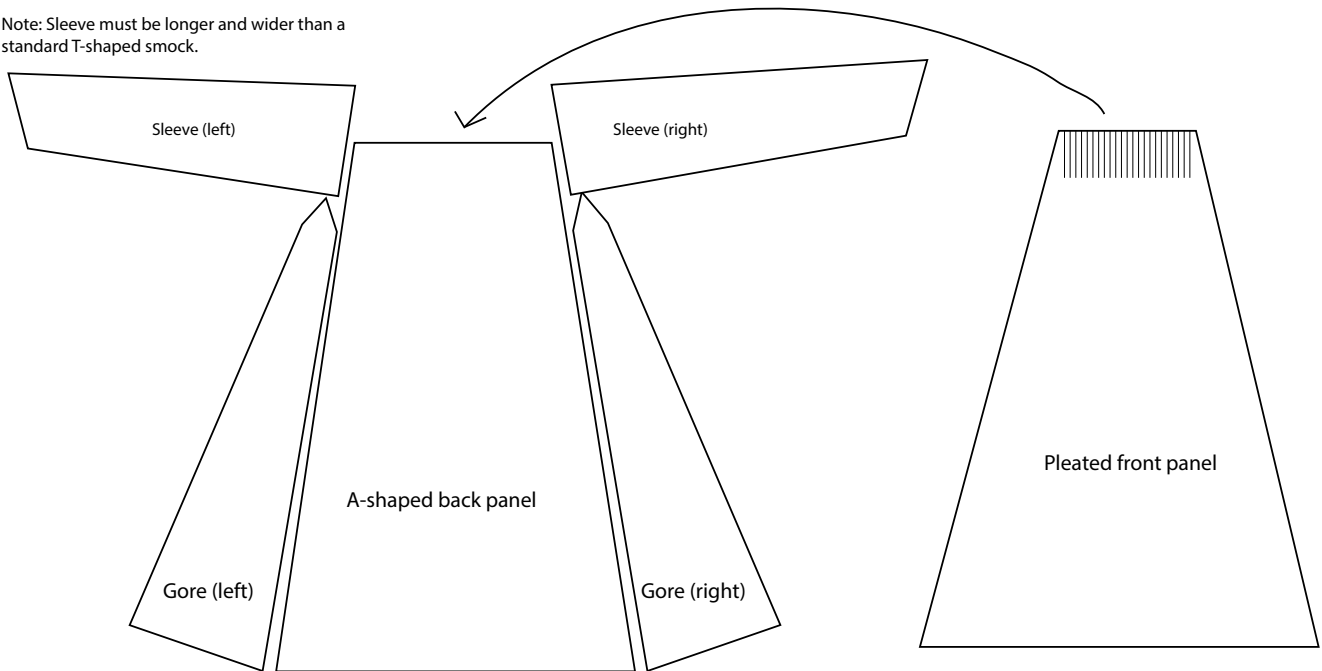


SMOCK PATTERN:

Cutting Layout



Note: Sleeve must be longer and wider than a standard T-shaped smock.



NOTES:

The gold thread could not be pattern darned in the traditional way of going over and through the pleats. Instead, the gold thread had to go over and UNDER the pleats. This is because of the fragile, stiffer nature of gold thread.

Appendix A: Pattern Grids

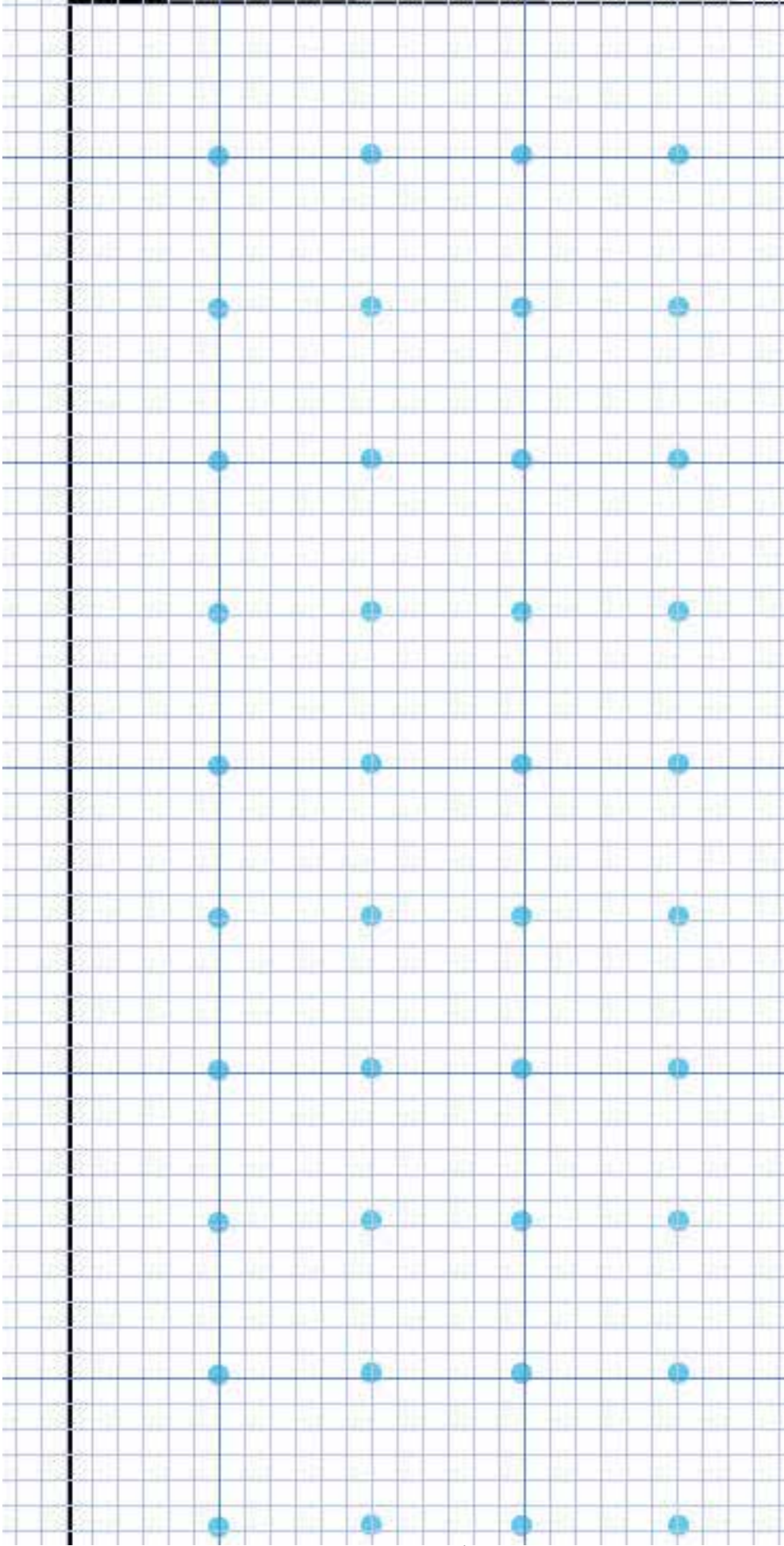
On the following pages are four pattern grids that you can print out and use for marking your fabric.

1 inch - This is a very large and fast size. This is the size I use in my beginner pleatwork classes because it can be worked quickly and is easier for a beginner to manipulate. I would not consider it a historically accurate size, however, as the vast majority of honeycomb pleated garments depicted in imagery from the period show a smaller size.

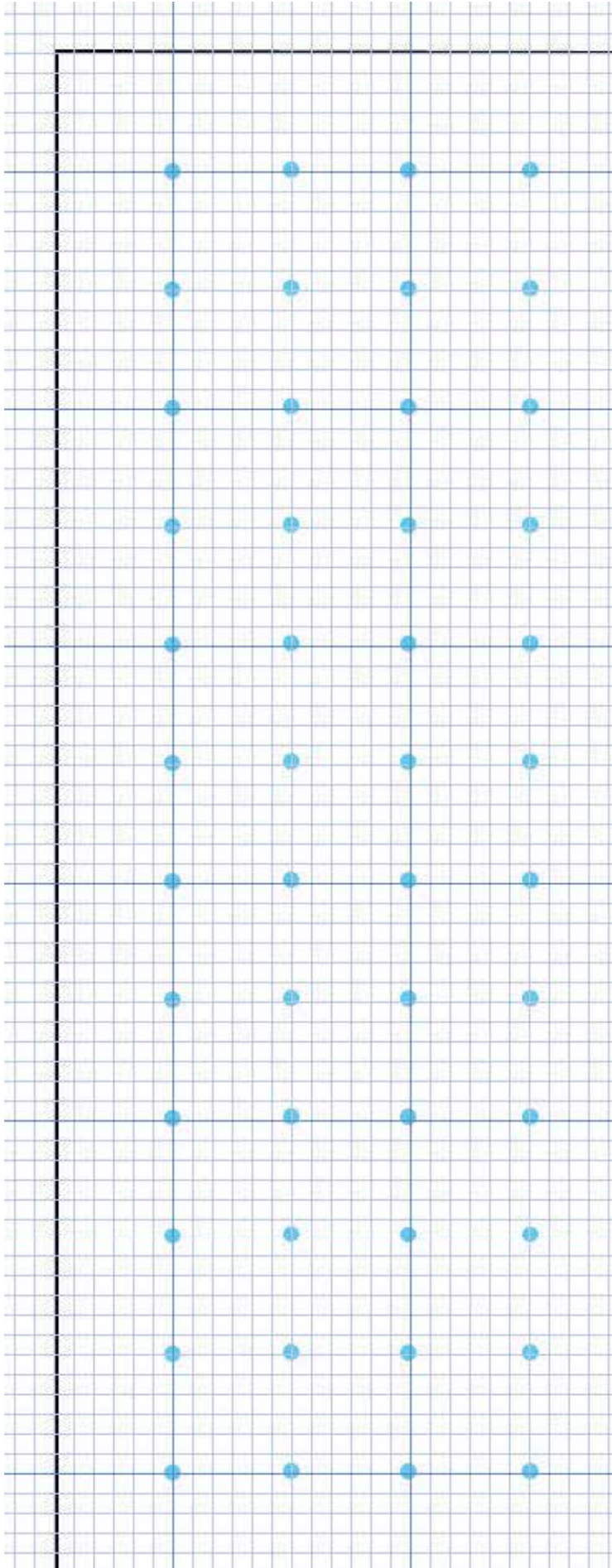
1/2 inch - Excellent for easy-to-see honeycomb pleatwork, but does not tend to work well for other types of pleatwork.

1/4 inch - Excellent for stem stitch pleatwork and small-scale honeycomb pleatwork.

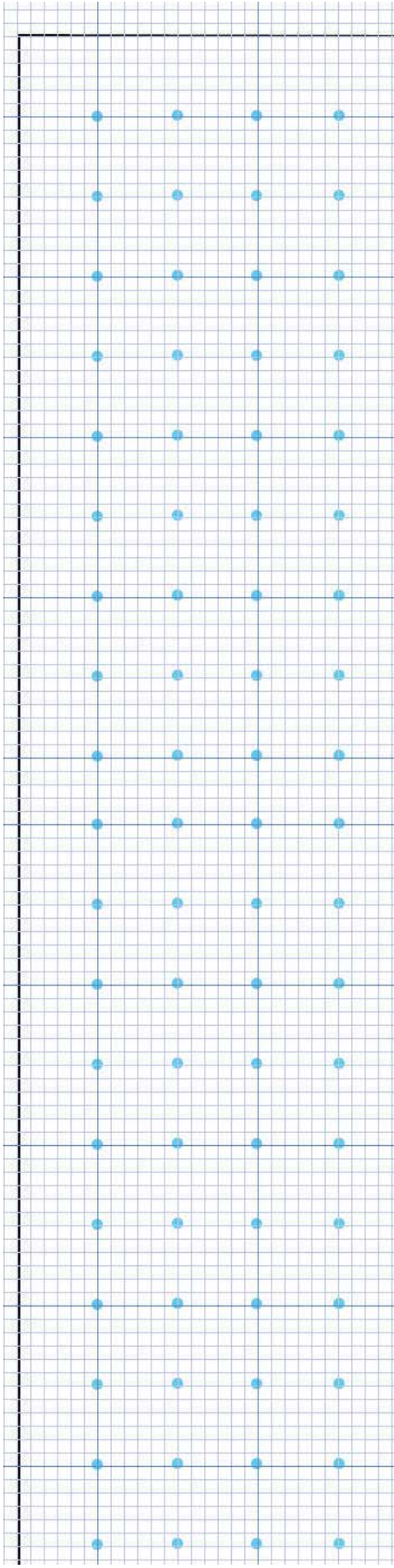
1/8 inch - Excellent for stem stitch and pattern darned pleatwork. Too small to be very noticeable for honeycomb pleatwork.



Pleatwork Dot Template – Gauge: 1 inch (very large)



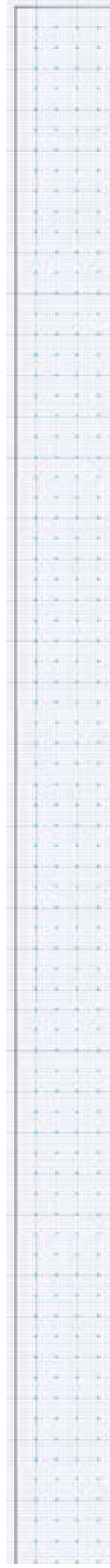
Pleatwork Dot Template – Gauge: $\frac{3}{4}$ inch (large)



Pleatwork Dot Template – Gauge: $\frac{1}{2}$ inch (medium)



Pleatwork Dot Template – Gauge: $\frac{1}{4}$ inch (small)



Pleatwork Dot Template – Gauge: $\frac{1}{8}$ inch (small)

Appendix B: Translations

APPENDIX A: TRANSLATION OF SECTION 10.3 FROM
"TEXTIL- UND LEDER FUND" (FINGERLIN, 799-801)
Original (German):

Kat. No. 27

Knabenhemd. - Leinen, Leinwandbindung, Kette 18/
cm, Schub 12/cm, Länge 105,0 cm, Weite 118,0 cm,
Ärmellänge noch 44,0, Kragenweite 35,0 cm, Kragen-
höhe noch 2,0 cm. - 2. Hälfte 16. Jahrhundert.

Hemd nach links gewendet, Ärmel zusammenge-
knotet. Rumpf aus zwei Teilen zusammengesetzt,
Schnittzeichnung, Abb. 736: aus einer 52,0 cm brei-
ten Vorderbahn und einer rückwärtigen Bahn, 66,0
cm breit, die um 7,0 cm nach vorne eingeschlagen
ist (Stoffbruch). Beide haben nur je eine Webkante
an der rechten Seite, die Webbreite kann deshalb
nicht mehr bestimmt werden. Die Webkanten hat
man mit kleinen überwendlichen Stichen verbunde-
n, alle weiteren Verbindungsnahte sind Kappnahte.
Die Schulternähte messen 7,0 cm. Der Ärmelschnitt
läßt sich wegen der Verknotung, die nicht gelöst
wurde, schwer kontrollieren. Es ist unsicher, ob eine
Verschmälerung zum Handgelenk hin vorliegt. Am
Rumpf setzen sie geradlinig an, den Abschluß bildet
ein Hohlsaum mit Knötchenstichen.

Man kann eigentlich nicht mehr von einem Steh-
kragen sprechen, weil seine Oberkante nachträglich
abgeschnitten worden ist. Nur noch 2,0 cm Stoff bli-
eben stehen, die mit überwendlichen Stichen flüchtig
übernäht sind. Als Verschuß wurde eine eiserne
Öse und ein entsprechender Haken mit großen
Stichen von ungeübter Hand befestigt. Am unteren
Rand des Hemdvorderteils fehlen ca. 25,0 cm.

Für die Umsäumung der Kanten sind Rollnähte
verwendet, so am senkrechten Brustschlitz. Vom
Hals reicht er 32,0 cm abwärts und ist hier noch weit
tiefer eingerissen. Auch der untere, am Stoffbruch
eingeschnittene Schlitz ist so versäubert, während
an der Gegenseite der feste Abschluß der Webkant-

en dafür genutzt wurde. Die Schlitzlänge geht weit
über 20,0 cm hinaus, wahrscheinlich weil sich die
Verbindungsnaht gelöst hat. Am Halsausschnitt ist
der Stoff eingehalten, darüber ein Kragen aus zwei
Stofflagen angenäht; von außen ist er mit regelmässi-
gen Stichen, die über je drei Kettfäden reichen,
aufgesteppt, an der Innenseite wurde er mit über-
wendlichen Stichen fixiert.

Kat. No. 28

Knabenhemd. - Leinen, Leinwandbindung, Kette 16
F./cm, Schuß 12 F./cm. - Länge (ohne Kragen) 85,0
cm. - Weite 104,0 cm, Ärmellänge 37,0 cm, Kragen-
weite 32,0 cm, Kragenhöhe 4,0 cm. - 2. Hälfte 16.
Jahrhundert.

Hemd nach links gewendet. Aus einer einzigen
Stoffbahn, die eine Webbreite von 104,0 cm hat,
hergestellt (Schnitt, Abb. 733). Die Webkanten sind
seitlich durch eine Naht mit kleinen überwendlichen
Stichen verbunden. Der untere Hemdrand und der
Seitenschlitz, der am Stoffbruch eingeschnitten ist,
haben schmale Rollsäume. Für den Schlitz an der
Gegenseite wurde die Naht, die beide Webkanten
verbindet, einfach 19,5 cm offengelassen. Schul-
ternähte, Ärmelinsätze einschließlich der vierecki-
gen, diagonal gefalteten Zwickel unter den Achseln
(Kantenlänge 8,0 cm) sind mit Kappnähten geschlos-
sen. Beide Ärmel, gerade zugeschnittene Röhren,
enden mit Webkanten; deshalb hat man ein Umsäu-
men unterlassen. Eine leichte Verengung zum Hand-
gelenk hin wird durch die Smokarbeit erreicht. Die
Falten sind versetzt überstocken, so daß sich ein
Wabenmuster ergibt.

Der senkrechte Schlitz in Brustmitte ist beschädigt,
nur die seitlichen Rollsäume (7,0 cm lang) sind er-
halten und die untere Schlitzverriegelung, die aus ein-
er mit Langettenstichen umsäumten kleinen runden
Öffnung besteht. Am Halsausschnitt ist der Stoff
eingehalten. Der hier angesetzte Stehkragen besteht
aus einem gefalteten, 4,0 cm hohen Stoffstreifen. Er

ist außen mit kleinen Steppstichen befestigt, innen mit überwendlicher Naht. Die obere Falte und die beiden Schmalkanten haben knapp abgesteppte Ränder. Haken und Ösen (beide aus Eisen) bilden den Verschluss. Ihre Befestigung am Stoff ist mit großen eiligen Stichen sehr unsachgemäß ausgeführt.

Risse in Kettfaden richtung zu beiden Seiten der Schlitzöffnung auf der Brust. Ausfallstellen an Rücken- und Vorderteil, großer Blutfleck am unteren Rand.

Kat. 29

Kragen, von einem Hemd abgeschnitten. - Leinen, Leinwandbindung, Klöppelspitze, Leinenschlag, Flechtschlag. - Kragenweite 29,0 cm, Kragenhöhe 5,0 cm. - 2. Hälfte 16. Jahrhundert.

Der Stehbund wurde vom Halsausschnitt unsachgemäß - wie die schräge und unterschiedlich breite Schnittkante zeigt - entfernt. Der gesamte Bund besteht aus einem Stoffstreifen, der dicht gerafft ist, was durch sehr gleichmäßig eingereichte Fäden mit kleinen Vorstichen erreicht wurde. Einseitig ist darauf eine 3,0 cm breite Klöppelspitze aufgenäht. Der oben 2,0 cm überstehende Rand ist als Rüsche mit äußerst schmalem Rollsaumabschluss angelegt. Die Spitze hat ein fortlaufendes Muster aus Rauten (im Leinenschlag), von dem dreiteilige Flechten abzweigen, und solche mit doppeltem Schlag. Rückseitig ist dieser Teil mit einem dreifach gestückten Stoffstreifen abgefüttert. Die Ränder wurden dabei engeschlagen und mit überwendlichen Stichen befestigt. Auch für die Versäuberung der Schmalkanten ist der Stoff nach innen gesteckt und mit überwendlichen Stichen zusammengenäht. Am unteren Kragenansatz steht der Rest einer aus neun Fäden geflochtenen Schnur vor. Sie war, wie Knoten und Überfangstiche zeigen, hier angenäht. Höchstwahrscheinlich hat man sie mit der gegenüberliegenden Schnur (ausgerissene Stelle) zu einer Schlaufe gebunden. Dieser Verschluss ist auch für die Bundoberkante anzunehmen.

Translation:

Cat. No. 27

Boys shirt - Linen, plain weave, warp 18/cm, weft 12/cm, length 105.0 cm, width 118.0 cm, Sleeve

Length 44.0 cm, collar size 35.0 cm, 2.0 cm cuff height. - Second half of the 16th Century.

Shirt was turned wrong side out and sleeves were knotted together. Refer to the multi-part sectional drawing, Fig 736. The 52 cm. wide front panel and a 66 cm. wide rear panel, which has a 7.0 cm wide section added on the front (on fold). Both have a selvedge on the right side only, and thus the weaving width can not be determined. The selvedges are sewn together with small overlock stitches, and all other seams are stitched seams. The shoulder seams measure 7.0 cm. The sleeves had to be cut because of the knot, which could not be untangled. It is uncertain whether a narrowing to wrist is present. The bottom hems are finished with a hemstitch. The vertical chest slit has rolled edges. At the neck there is a tear down to 32.0 cm. At the bottom, cut fabric is folded and sewn, while the selvedge has been used for this purpose on the opposite side of the solid end. The slot length goes far beyond 20.0 cm, probably because the seam is dissolved. At the neckline the fabric has a collar made of two layers of fabric which is sewn from the outside it is with regular stitches that extend over three warp yarns, and it is fixed on the inside with whip stitches. Details about a stand-up collar are unknown, because its top was cut off later. There is only 2.0 cm of fabric left of the collar, which has been sewn with overlock stitches. There is an iron wire eyelet for a closure and a corresponding hook, both sewn down with large stitches by an untrained hand. The bottom of the shirt front part is missing approximately 25.0 cm.

Cat. No. 28. (Hemd with Pleated Wrists)

Boys shirt. - Linen, plain weave, warp 16/cm, weft 12/cm. - Length (without collar) 85.0 cm. - Width 104.0 cm, sleeve length 37.0 cm, collar size 32, 0 cm, collar height 4.0 cm. - Second half of the 16th Century.

Shirt was turned wrong side out. Made from a single piece of fabric with a weaving width of 104.0 cm (cut, Figure 733). The selvages are connected laterally by a seam with small overlock stitches. The bottom shirt hem and side slit is cut on the fabric fold and have narrow rolled hems. The opposite side of the seam that joins both selvages was simply left open by 19.5 cm. Shoulder seams and sleeve inserts,

including the square, diagonally folded gusset under the arms (edge length 8.0 cm) are closed with seams. Both sleeves are straight-cut tubes and end with both edges; therefore it has no ruffle. A slight narrowing of the wrist is obtained by the smocking. The folds are staggered so create a honeycomb pattern.

The vertical slit in center of chest is damaged and only the lateral rolled hems (7.0 cm long) remain. The lower slit is fringed with a scallop-stitched small round opening. Looking at the material at the collar, there is a stand-up collar of folded, 4.0 cm high strips of fabric. It is secured externally with small stitches. The upper fold and the two narrow edges have just stitched edges (no hems). Hooks and eyes (both of iron) form the closure. Their attachment to the material is poorly executed with very large piece stitches.

Cracks (tears?) in the warp direction are on both sides of the slit opening on the chest. There are failure points on the back and front, with a large blood stain at the bottom.

Cat. 29

Collar, cut from a shirt. - Linen, plain weave, lace, cloth stitch- Collar width 29.0 cm, collar height 5.0 cm. - Second Half of the 16th Century.

The stand-up collar was removed from the neckline improperly, as seen by the different lengths of the cut edge. The entire fragment is composed of a strip of fabric that is pleated tightly by very evenly queued folds secured with small stitches. A 3.0 cm wide lace is sewn on one side. The top 2.0 cm protruding edge creates a ruffle with an extremely narrow rolled hem. The top has a continuous pattern of diamonds (in bobbin lace), branching from the three-part stems. Under this part, it is lined with a triple-thick fabric strip. The edges were fastened tightly with a whipstitch. Even the narrow edges of the fabric are tucked inside, and sewn together with overlock stitches. At the lower collar is a braided cord is made up of nine threads. Most likely there was another cord opposite (in the torn spot) that tied into a loop to close the top collar.

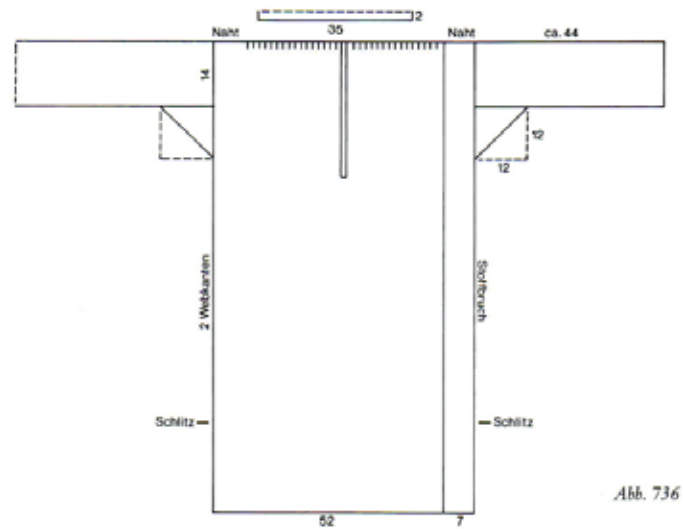


Abb. 818 Knabenhemd, Ärmel verknötet (Kat.-Nr. 27).

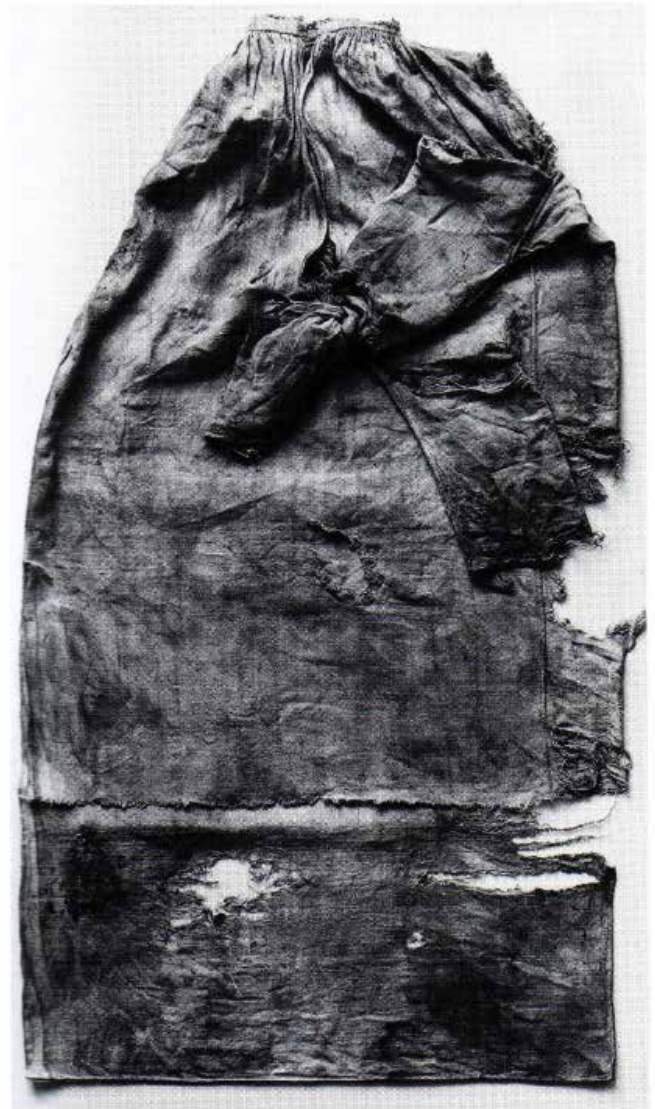


Abb. 733 Hemd, Schnittmuster (Kat.-Nr. 28).

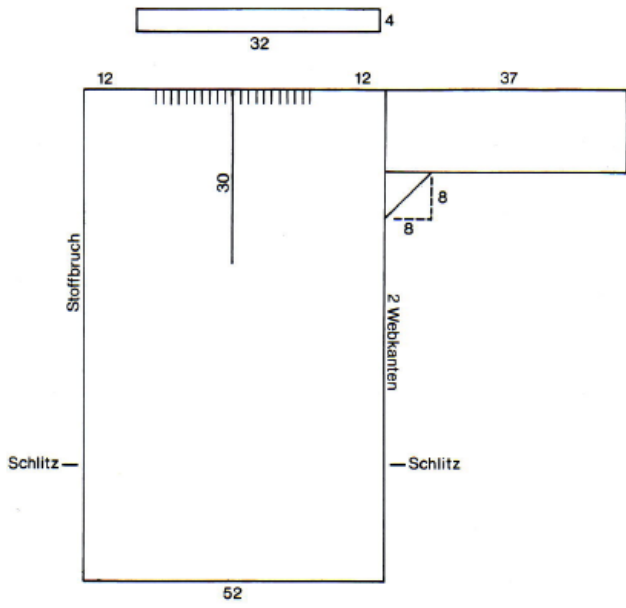


Abb. 819 Knäuelhemd (Kat.-Nr. 28).

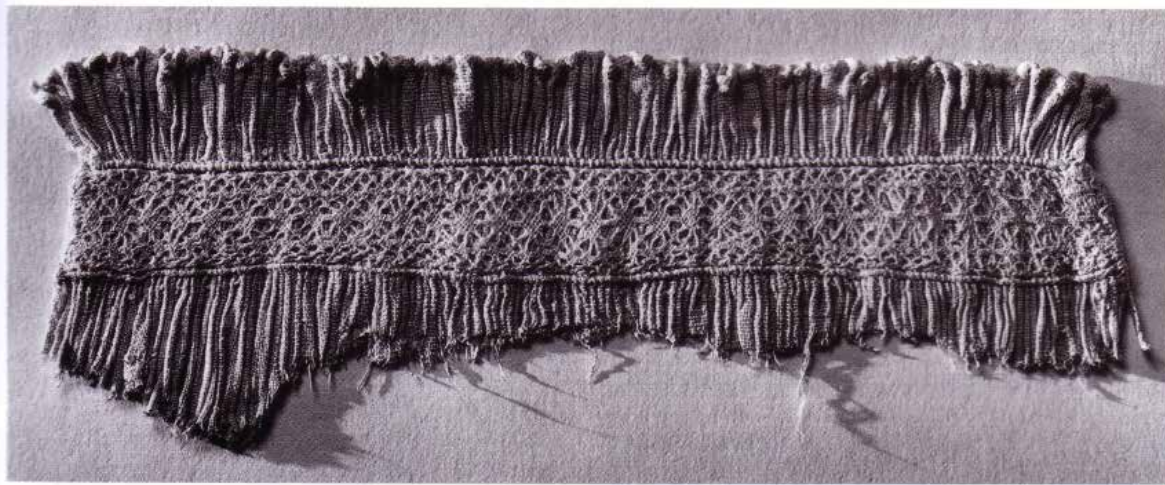


Abb. 820 Kragen mit Klöppelspitze, von einem Hemd abgeschnitten (Kat.-Nr. 29).

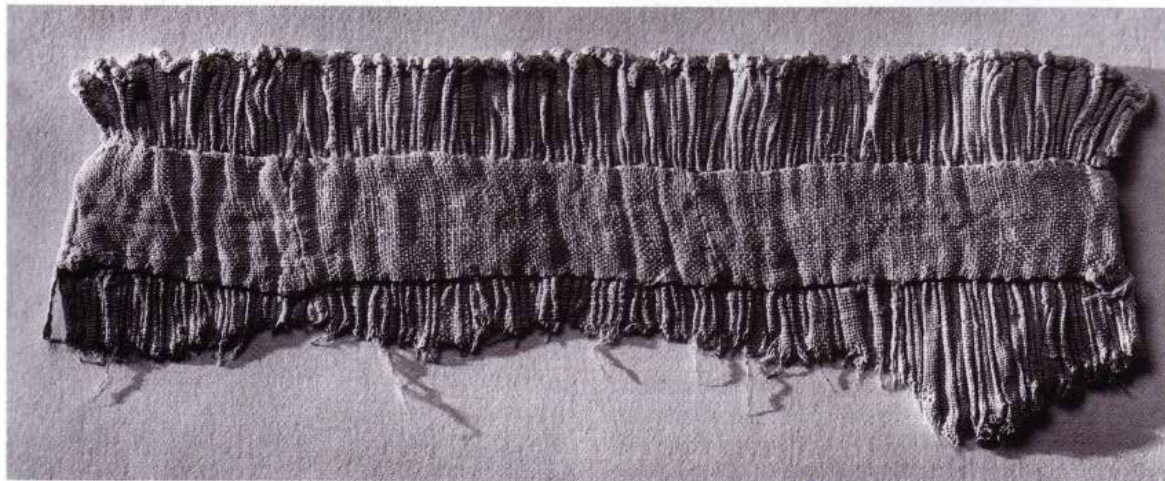


Abb. 821 Kragenninnenseite, aufgenähter Futterstreifen (Kat.-Nr. 29).

Translation of Section 10.3 from “Die Ausgrabungen im Mühlberg-Ensemble Kempten (Allgäu): Metall, Holz und Textil” (Rast-Eicher and Tidow, 322)

Original (German):

10.3 Stickerei

Es gibt im H8 R7 FB4 nur wenige Fragmente mit Stickerei. Die reichste ist sicher die Smokarbeit am Kragenfragment (15796-1, Abb 61, vgl. Abb 70 a). Das fein gefältelte Band ist mit einem Rautenmuster bestickt, das oben und unten mit einem Band aus Kordeln begrenzt ist. Das Stickmaterial ist ein Metallfaden, ein vermutlich vergoldeter Silberlahn, der in S-Richtung um eine Seidenseele gewickelt ist und mit Vorstichen gestickt wird (Abb. 62). Die Rauten sind mit kettenstich abgesetzt, die Kordeln in Anlegetechnik angenäht. Bei einem zweiten Fragment (15796-13) ist die Smokarbeit etwas einfacher bestickt, mit einem Leinenfaden (S-Draht) mit Rückstichen. Das Muster ist nicht mehr nachvollziehbar. Die Rüsche am Rand wurde mit Festonstich gearbeitet (Abb. 70 d). Auf einem Leinenfragment gibt es überdies ein gesticktes Zeichen, zwei gekreuzte Haken und Kreis, das mit Kettstich gestickt wurde (Nr. 15796-240; Abb. 63). Dazu wurde ein Leinenzwirn (S) verwendet.

Translation:

10.3 Embroidery

H8 R7 FB4 offered just few yellowed fragments with embroidery. The richest example is certainly the smocking on the collar fragment (15796-1, Figure 61, see Figure 70 a). The finely pleated fabric is embroidered with a diamond pattern, which is bounded at the top and bottom with a band of cords. The embroidery uses a metal thread, which is a gilded silver presumably wrapped in S-direction with a silk core (Fig. 62). The cords are applied with a chain stitch. In a second fragment (15796-13), the smocking is embroidered a bit simpler with a linen thread (S-wire) using back stitches. The pattern is no longer clear. The ruffle at the edge worked with Festo stitch (fig. 70 d). On an attached fragment the characters “SWEI” are embroidered in cross stitch (No. 15796-240; Fig. 63). A linen thread was used for this stitch (S).

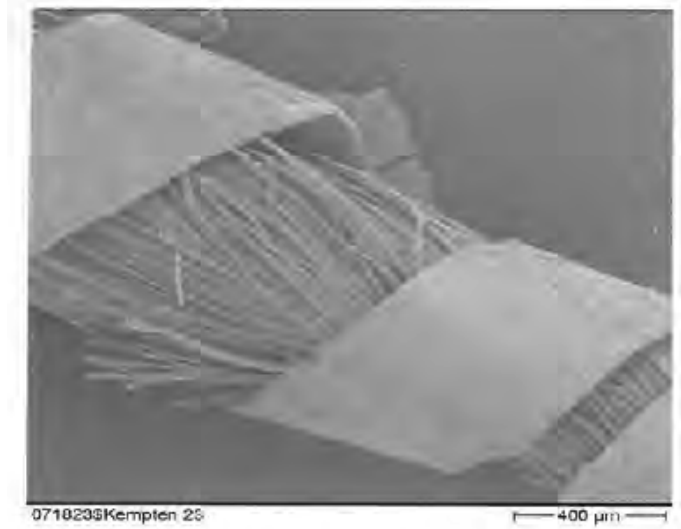


Abb. 62: REM-Bild des Metallfadens (15796-1) (REM-Foto: AR).

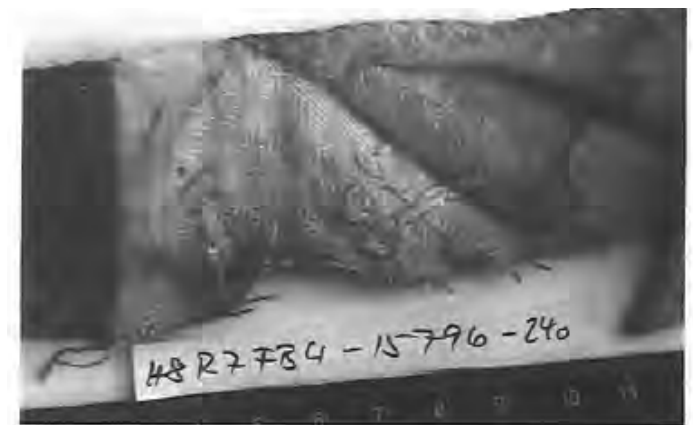


Abb. 63: Gesticktes Zeichen, Nr. 15796-240 (Foto: AR).

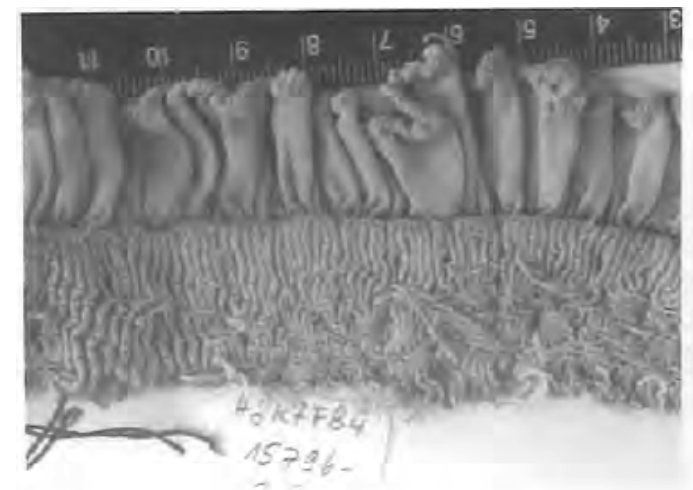


Abb. 70 a: Verzierte Kragen: H8 R7 FB4-15796-13 (Foto: AR).

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