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Knitted wool stockings in the Museum of London:

A study of 16th century construction

Abstract

This paper presents the results of a study of the construction of 13 wool stockings dated to the 16th century, which are held by the Museum of London. Although knitted garments, especially stockings, became very common in later 16th century England, there has been little study of their construction in this period. Each of the stockings was examined in detail, including wale and course counts, leg shaping and heel and toe construction. Other knitted items from the same period in the collection were also examined to compare construction details. The light that these examinations shed on the construction of knitted stockings is discussed in detail, including leg shaping, toe shaping, and an unusual method of heel construction. The paper will also discuss the insights this study provides on knitted stocking construction in this period, including support for archival evidence.

Key words: Knit, stocking, wool, early modern, 16th century

Introduction

Knitted garments became very common in later 16th century England, especially stockings or hose, which were worn by virtually everyone by the end of the century. Thirsk (1973) calculated that most people would need at least two pairs annually; later research in the Netherlands (Decaleur 2001) suggests people might have needed at least three pairs. Knitting was a by-employment, not a structured industry, but was nevertheless effectively an “industrial” process – knitters knitted their items and sold them to merchants, or to others, for selling on. There are records of stockings being lengthened (Arnold 1988, 209), so it is likely that knitters made standard sizes; how many were made to fit, possibly by private commission, is unknown. Inventories of merchants and other documents often list pairs of stockings by the dozen or other multiples (for examples, see O'Connell Edwards 2007-8).

Very little is known about how knitted garments from this period were constructed. Some research has been done on the knitted fabric of caps (for example, Malcolm-Davies 2017). Civic authorities set up

schemes in the later part of the sixteenth century to teach knitting because it was seen as a way to provide the poor with an income, especially stocking knitting. These sometimes provided buildings, yarn and tools. A few records of knitting teachers and knitting schools from the sixteenth century have survived (O'Connell Edwards 2013), but none provide details of the actual practicalities of how people learned to knit, nor how they created and shaped garments, including stockings. The first knitting pattern, which was for a stocking, was published in 1655 in *Naturata Exenterata* (Rutt 1987, 239-241). To understand the construction of knitted items, therefore, we need to look at surviving archaeological finds from the period.

The 16th century stockings in the Museum of London

The Museum of London has a collection of 13 wool stockings and part stockings which are dated to the 16th century. This is the largest known collection in the United Kingdom, and was found in a relatively small area of the City of London, at Finsbury and Moorfields, which is part of the modern London Borough of Islington, whose total area is less than



| Museum of London Accession number | Notes |
|---|---|
| Stocking (or sock – terminology varies in the catalogue entry) | |
| 39.188/4a | |
| 39.188/4b | |
| 39.188/5 | |
| 22399 | (leg only) |
| 22400 | (foot only) |
| 22401 | |
| 22402 | |
| 22403 | |
| A26602.b | (foot only) |
| A26851 | |
| A26852 | |
| A26875 | (child's stocking – in very poor condition) |
| A26876 | (described as baby's stocking) |
| Other items, examined for comparative purposes | |
| Child's mitten A1989 | |
| Silk stocking A13833 | (foot only) |
| Sleeve 22448 | |
| Sleeve 22449 | |
| Sleeve 22450 | |

Table 1: List of items examined.

15 km². The museum's collection also holds three wool sleeves, a child's wool mitten and a silk stocking foot, dated to the 16th century, which were also studied to compare their methods of construction with that of the stockings. Table 1 lists the items examined.

Examination methods

The terminology used to describe the stockings is that suggested by Malcolm-Davies et al. (2018). Each item was measured and examined in detail, for wale and course counts, shaping and any other construction detail. The individual loops were examined under a hand magnifying glass; a USB microscope did not improve the clarity. Points of decrease and increase were identified by the formation of the wales. Decreases make a smooth line, and one loop appears to be absorbed by the other. Increases could

be identified by a small hole below the point where one stitch becomes two. Yarn diameter was measured from micrographs.

Findings on materials, construction and finishing

All the stockings still retain at least some of their original tubular form, and are simple knit fabric, with face loops on the outside (recto), created by knitting in the round, aside from the heels which were created by knitting back and forth. They show many similarities but are not identical. The stockings examined were previously identified by the Museum of London as being created from wool yarn, and this examination did not provide any evidence to challenge this, although its primary purpose was to look at how knitting created the finished items. The museum provides data on the yarn construction for four items, which are recorded as "2 ply, S spun". Most of the loops are clearly visible, although some are less distinct, covered by a nap, possibly full, probably as a result of wear or laundering. The other items used for comparative purposes are all identified by the museum as made from wool yarn, aside from A13833, which is identified as silk.

Wale and course counts, gauge and yarn diameter

The number of wales per 10 cm on the adult stockings are all within the range 27 to 33, and the course count per 10 cm varied from 40 to 55. The two small children's stockings (A26875 and A26876) have a higher count – averaging 45 wales and 60 courses per 10 cm.

Yarn diameters were measured for eight stockings. Individual diameters were quite variable, which reflects the hand-created nature of the yarn, but there were two distinct groups. The average yarn diameter of five of the stockings (39.188.4a, 39.188.4b, 39.188.5, 22401 and 22402) was in the range 1.24 mm to 1.56 mm (total range 0.92 mm to 1.99 mm). The yarn diameters of the other three (22400, 22403 and 26876) were narrower, with an average ranging from 0.92 mm to 0.98 mm (total range 0.65 mm to 1.38 mm).

Leg construction

Only six of the stocking legs have their top edge preserved, which means the original leg length is unknown on the others. The child's stocking A26875 also shows a finished edge at the top, but it is too badly damaged to measure the length of the leg accurately. The construction of the stockings was from the top down, confirmed by the fact that the decreases towards the heel are clearly visible. Four of the cast-on edges have the appearance of a "cable" cast-on in which each loop is created by drawing the yarn between the last



Fig. 1: Example of short-row single ridge heel construction on a stocking (inventory number A22402) (Image © Museum of London)



Fig. 2: A variant heel (inventory number 26851) with a single ridge short-row heel knitted back and forth with loops picked up along the side. It then reverts to being knitted round (Image © Museum of London)

two loops on the needle (Stanley 1982, 15). Those of items 22403 and 39.188/4a are different from the other items in having obvious horizontal 'V's, and there is also a small chain of a few loops joined to the top edge (fig. 8). The length from the top of the leg where there is a finished edge to the start of the heel for four adult stockings (39.188/4a, 39.188/4b, 26851, 26852) varies from 30 cm to 33 cm but item 39.188/5 measures 38 cm between those points, and item 22403 only 22 cm. The width at the top on the longer legs varies from 21 cm to 27 cm and the width at the heel is generally 18 cm; on items 39.188/4a and 39.188/5 the wale count is coarser at the top of the leg than lower down, 28 per 10 cm rather than circa 32 per 10 cm.

Wales were counted and measurements taken at various points down the length of the legs. The counts varied from leg to leg, depending on its finished appearance. All the stocking legs are tapered, but there is no set pattern for this. Decreasing is not done at set intervals nor is it usually done above a previous decrease. Item 22401 is an exception, with a

vertical line of decreases at the front which results in a diagonal slant on the leg, with four decreased in six courses, then six or seven courses without decreases followed by another three decrease courses, each separated by two or three courses without decreases. Most of the stocking legs have a flow of decreases - but two (items 39.188/4b and 22402) have more decreases only around the ankle area, whilst item 26851 has a few decreases on the upper leg, and the majority in the ankle area. The wale count on item 26852 remains the same all down the leg, though the width reduces. The sleeves were examined for comparison, and showed a similar tapering shape, although one may have been increased up from the wrist.

Item A26851 shows a clear colour demarcation line at 9 cm above the start of the heel; item 22401 shows a similar demarcation at 10 cm above the start of the heel. On item 39.188/4b the yarn appears to be thicker on the leg from 7 cm above the top of the heel section. Only the foot of item 26602b exists; its heel edge is a straight line, suggesting it may have been cut.

Only the silk stocking has a marker rib (a so-called false seam). None of the wool stockings has this feature.

Heel and foot construction

Nine of the stockings show a similar heel construction, with every row knitted back and forth rather than round, resulting in ridges. Experimental reconstruction has shown that this is single ridge fabric, as the ridges caused by the alternating direction of working, resulting in alternating courses of face and reverse loops on each side, are more distinct than they would be in the verso of simple knit, in which every row consists of reverse loops. The heel section is worked with only some of the loops, using a “short-row” construction, as the knitting is turned before the course has been completed, and knitted back across the work in the previous row (Righetti 1986, 114-117). On some courses another loop is incorporated at the end of the ridge. This extra loop increases the width of the heel (fig. 1): the relative position of the extra wales and ridges is different on each stocking. The number of wales added vary on each side, and their positions are not mirrored. Usually, fewer than half the total leg wales are used in the heel. The stocking then continues to be worked round, and the foot is usually worked straight to the toe section. There are two



Fig. 3: A variant heel (inventory number 22401), with a single ridge short-row heel knitted back and forth with loops picked up along the edges and surplus wales being decreased along a gusset (Image © Museum of London)

exceptions to this single ridge short row construction. The heel of item A26851 (fig. 2) is created by knitting back and forth across the width of the heel flap and then picking up loops along the side of the heel flap, at an average of one loop per two ridges (i.e. every fourth course), knitting into both ridges, although two loops link to only one ridge. The stocking then reverts to being knitted round. One decrease was noted on the underside of the foot, about 2.5 cm away from the heel. Seven decreases were observed in the instep side of the foot in the area from 2.5 cm above it to the start of the heel, which cancel out some of the extras picked up from the heel – the foot is not noticeably wider than the leg at the ankle. Further decreases occur on the foot, 7 cm after the heel.

The heel of item 22401 (fig. 3) is also created by knitting straight on all the heel wales, and then picking up loops from the end of the ridges. The rate of pick-up is generally one per ridge (i.e. per two courses), and wales are then decreased along a gusset line, which is created by all the decreases being knitted to the side of one specific wale, which is differently situated on each side of the foot. On one side, the line starts near the bottom of the foot, and points diagonally down towards the underside of the foot. Five wales are decreased over 25 courses, finishing about 5 cm from the pick-up line. The other decrease line is straight, and the decreases are on the top of the foot, so the picked up wales are all straight – 10 wales are decreased over 7 cm.

Item 39.188/5 has what seems to be an extra, now golden brown, strand in a rectangular area above the back of the heel 15 courses high and 25 to 26 wales wide. The demarcation between the two vertical zones is very clear.

Toe construction

A total of seven stockings have either complete or partial toes. Aside from item 22401, the construction is similar and very basic. The width of the foot is reduced close to the toe, by several rounds of decreasing by knitting two loops together repeatedly within 3 cm of the end of the foot. The number of wales decreased in a course varies – on item 22403 the number of wales is halved, whilst on others, such as item 39.188/4b, only some are decreased. Item 22402 (fig. 4) shows that the decreasing was done in segments. Some stockings have at least some of the decreases separated by a course without decreases. On some feet (items 22400, 22403, 26602b and A26851), there are a few decreases before the main block of decreases for the toe, 5 cm or less from the toe. Item 22401 is an exception to this. It has a line of



Fig. 4: The toe of stocking inventory number 22402 with decreases in segments (Image © Museum of London)

decreases towards the toe, starting at 7 cm away from the toe, on both sides of the foot, with several courses without decreases between each decrease. On the top of the foot there is a pronounced inverted “V” of decreases at the point of the toe, creating a triangular shape (fig. 5).

Interpretation

Wale and course counts and yarn diameter

The wale and course counts on the adults’ stockings were all within a small range, suggesting that similar yarn and needles were used. There was no automatic correlation with wale/course count and yarn diameter. A22400 and A22403 had the smallest yarn diameter, and a high wale/course count (33 wales and 50 to 55 courses per 10 cm); but although the yarn diameter of 39.188/5 and A22401 was larger, they had a similar wale count, though with only 40 courses per 10 cm; whilst 39.188/4b had a lower wale count, but a closer course count (49 per 10 cm). The variation may be due to individual knitters’ styles, knitting more tightly or loosely, but the effect of washing and wearing, and the effect of being in the ground for more than 300 years must also be considered. Sleeve 22450 had a similar wale count, but a course count of 53 per 10 cm. The



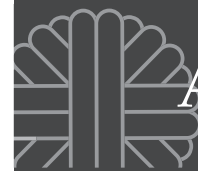
Fig. 5: The decrease lines on the toe of stocking inventory number 22401 (Image © Museum of London)

wale/course count for the silk stocking foot was much finer – c. 72 wales and 120 courses per 10 cm, and the yarn diameter much narrower, with an average of 0.53 mm (range 0.48 mm to 0.58 mm).

The wale/course count on the children’s stockings was finer than the adult wool ones ranging from 41 to 60 wales and 55 to 66 courses per 10 cm. The yarn diameter measurement for A26876 was the narrowest of those sampled, with an average of 0.92 mm (range 0.65 mm to 1.24 mm). There are two possible reasons for this: either that these items were initially made for a child of the upper classes whose family could afford finer yarn, and passed them on; or that it was common practice to use finer yarn for garments for children. However, the wale/course count for the mitten (A1989) is similar to that for the adult’s wool stockings, as is that of the child’s mitten held in the Norfolk Museums Service (NWCHM 1961.74.6), suggesting the first possibility is more likely.

Leg construction

An examination suggests that the cast-on edges may have been created using a “cable” cast-on (see above). Tiramani and North suggest a “purl chain cast-on”, creating each loop from the last, for their re-creation of a 17th century silk waistcoat (item 807-1914) in the



Victoria & Albert Museum, London (2011, 16). Rutt (1987, 13) considers that the “thumb” method was the most commonly used in this period but cites only secondary sources. However, the cast-on used on items 22403 and 39.188/4a was probably achieved by making a looped chain and knitting into the loops (Ringgaard 2016): the loose loops there being the unused part of the chain.

Women’s stockings in the period are occasionally listed as a specific item, particularly in inventories (for example, Raine 1863, 277). The two different leg lengths observed on the adult stockings could suggest that the longer ones were men’s and the shorter one a woman’s – or an older child’s. The wide range of widths at the top of the legs may simply reflect the fact that they were worn by people with different leg sizes, and, in some cases, the coarser wale count suggests the fabric had stretched to accommodate a wider leg. The reduction in width down the leg of item 26852, despite a lack of any wale decreases, is another indication of the elasticity of the knitted fabric, and the effect of wear.

The unusual position of the shaping on the front of item 22401 could suggest that the knitter had seen an ornamental line created by knitting two wales together, possibly like that on the silk stocking foot

A13833, and was experimenting to reproduce this. The fact that this stocking has two gussets decreasing the heel wales by knitting two together on the same wale line, albeit at different positions each side of the foot, is further support for this interpretation, but shows that either the knitter did not have an understanding of how to mirror ornamentation, or did not feel the need to do so.

It could be argued that some stockings show evidence of re-footing, with a cut line at the top of a foot, or a straight line across the leg suggesting a yarn change, after a damaged or worn out foot and heel section had been cut off. Evidence for re-footing stockings occurs in literature of the period – see, for example, Historical Manuscripts Commission (1895, 17) and Arnold (1988, 209). However, a linear change could simply indicate that the knitter had started with a new yarn at this point. It is possible that the silk stocking foot, which has some damage, was cut off in order that the leg could be re-footed.

Heel and foot construction

The heel construction on all the stockings except A26851 and 22401 has not been described elsewhere, other than in instructions for a reconstruction of a child’s stocking (Huggett & Mikhaila 2013, 147).



Fig. 6: A silk stocking heel (inventory number A13833) showing a fully-fashioned heel shaping, and foot gusset (Image © Museum of London)



Fig. 7: Reproduction of short-row single ridge heel construction (Image: Mike Edwards)

Norfolk Museums Service has a stocking which dates from this period (NWCHM 1961.74.3), with this style of short row single ridge heel construction, at least one of which was found in London. Reconstructions (fig. 7) show that the short-row single ridge construction of the heel on the Museum of London stockings does make a reasonably elastic heel in wear with stretch around the outside of the heel and ensuring a smooth and unwrinkled fit on the front of the foot, and also places the toe finish not at the tip of the toes but in under the gap between the toes and the ball of the foot.

This construction is quite different to the “common heel” (Laning 2011, 29) which is often used in reconstructions (Ravelry 2007) and modern heel construction, which makes a shape specifically for the heel. Both divide the leg into two sections at the heel, and continue using half the wales, until the base of the heel is reached. The flap of a “common heel” is folded in half and joined into a seam, and the stocking continues by picking up loops along the side of the heel flap, and reverts to being knitted in the round, usually decreasing the number of wales.

A modern heel uses variations of short-row shaping for the section under the heel, before picking up loops along the sides of the flap, and reverting to knitting in the round, with excess wales being decreased along a “gusset line” at the top of the heel angling down towards the foot. The two exceptions in the Museum of London use parts of these two methods. On item A26851 wales are decreased just above the heel, then picked up along the side of the

foot, and then wales are decreased circa 7 cm away from the heel. On item 22401 loops are picked up along the side of the heel and decreased along a gusset line on both sides of the foot. Neither use short-row shaping under the heel.

The silk stocking foot, A13833, (fig. 6) is fully shaped along its length. The leg has been divided, and the heel continued to the base of the foot only on the loops at the back of the leg, decreasing both edges of the flap thus made. More loops have been picked up from the edge of this, at 90 degrees to the continuation of the heel. These are then decreased away, in a fashion similar to a modern heel. “Gusset” lines of decreases run steadily down from the top of the heel along the length of the foot, on both sides, each taking away more than 50 wales. Underneath the foot are two lines of reverse loops on the recto, with increases beside each line, resulting in the underside of the foot steadily widening as it gets nearer the toe, partially compensating for the gusset decreases. The silk funeral stocking of Johan III of Sweden, dated to 1592, shows a similar mode of construction (Ekstrand 1982, 166-168).

The extra strand above the heel of item 39.188/5 is unlikely to have been knitted in because knitting in the round requires it to have been carried as a loose strand for the remainder of the circumference of the stocking, or broken and reattached on every course. It was not possible to examine the inside of the heel.

Toe construction

Some of the toes, such as 39.188/4b, show evidence of the decreases being made in segments. It could be argued that this was a design feature – but it may simply be how the knitter found it easiest to decrease for the toe. Item 22401 has clear lines on its toe, suggesting these could be intended for ornamentation.

The end of a stocking foot created with the heel shaping used on the majority of these stockings finishes slightly under the toes, on the underside of the foot, with the final part of the toe decreases fitting in the gap between the ends of the toes and the ball of the foot. The “knit two together at very frequent intervals” method might be expected to create an uncomfortable lump of fabric under the foot in wear. However, a reconstruction knitted in this way showed it does not form a large lump.

The toe of the silk stocking (A13833) is very different. It is foot shaped, with decreasing only at the sides of the foot, and the remaining loops in the centre of the foot, on the top and the underside, appear to be cast off



and joined together, looking rather like a fish's mouth. It is possible that the knitter of item 22401 was trying to mimic what they could remember of the shaping on a similar stocking to A13833.

Conclusion and further research

The uniformity of construction of many of these stockings suggests a standard method, but it is dangerous to extrapolate from a negligible percentage of all stockings created in the period. It is possible that the majority were the work of one person, or of a collection of people in the area, who may possibly have been trained by one person; or that these stockings were created to suit the demands of one merchant. It could be argued that a localised construction method



Fig. 8: Stocking inventory number 22403 showing cast-on edge probably created by knitting into a looped chain showing the chain of loose loops (Image © Museum of London)

existed in the area; but the variations shown, especially in the heels and feet of 22401 and 26851, suggest that knitters were aware of other construction methods. Their awareness might well have been through seeing other stockings, including finer, silk ones, such as A13833, and adapting what they could remember of these for coarser wool ones.

It would be instructive to make a detailed examination of the construction of other stockings from the period in similar detail from different geographical areas, to identify further points of comparison and contrast.

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