

# Process Analysis of Manufacturing of Sewing Scissors by All Forging Process and Understanding of Its Sharpness

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**Abstract.** In Japan there are several types of scissors such as pruning scissors, flower scissors, U-shaped scissors, and sewing scissors and so on. Among them sewing scissors was introduced when the black ships of Commodore Perry came from the United States in the last Edo period almost 160 years ago. The shape and size of sewing scissors have been changed to fit Japanese people. Yakichi Yoshida started Japanese sewing scissors by his own manufacturing process; all a forging process. His technique was distributed to many persons who learned his process through implicit knowledge base. According to the family tree starting with Yakichi, there has been a spread to the manufacturing family of 23. However at present only one person is remained. He is still making the cutlery which has very good reputation among high ranking wear making persons and other high quality manufacturing persons. In order to preserve this manufacturing technique the process analysis was performed through video recording and the records were put in this paper. The process was divided into 9 steps such as Preparation, Making the ring, Making part of the blade, Making the neck part, Grinding, Finishing machinery, Quenching, Finish grinding, Post finishing. Normally the expert needs dozens of years for the whole process, therefore the number of products per day is very small. In the case of cutting some materials two blades contact each other at very small part. Small as possible makes sharp cutting because of stress concentration at the cutting point. In order to create this phenomenon the inside of the blade should not be a flat surface; instead the surface is required to be dented. This dented surface was made at the third step, and particularly only one sub process can make it. Our further study will be made for more accurate time analysis and also the bending process will be focused to understanding the secret of sharp cutting.

**Keywords:** Sewing scissors · Process analysis · Skill succession

## 1 Introduction

There are two types of scissors in Japan. One type is Japanese and the other is western. It is said that the western style scissors were brought from the United States in the late Edo period. Its history is described in the next section. As improvements were made on the scissors that were brought in, they have become part of ordinary life for the Japanese. There are various forms of manufacturing methods such as using pressing machines for mass production and hand-made. Among the various types of scissors there is one that is used by a craftsman specifically for high-class men's clothing. It is made by the blacksmith's method that was started by Yoshida Yajuuro. However, there is now only one craftsman who makes this type of scissors using the method and the craftsman is in his old age.

So we began the research in to the secrets of scissors that are loved, and took records of how it is made with hope that it will lead to a succession of the techniques. In this thesis first the history of scissors is described, and through observation with video, each important scene of the manufacturing process is shown. By doing this the holistic perspective of the process can be captured, and simultaneously there can be data left for the next generation. Also, to understand the secret of the sharp quality of the scissors, it was found that there was contact between the two blade in a small range in the case of opening or closing. Furthermore, we state about the form of the blade of the scissors that allows there to be contact at one point. These are the first step of our research report.

## 2 Methods

A pair of scissors is a tool that cuts an object by crossing two blades. Scissors that exist from ancient times in Japan are U-shaped and called "grip scissors." Japanese scissors have a long and thin metal board on both sides with a blade, and are designed to cut an object by bending it into a U-shape and having the blade of the two sides cross. Japanese scissors have an old history, and the oldest ones have been excavated from the ancient tombs in Shuyama Castle (Nara Prefecture) and Notsuke (Gunma Prefecture).

Currently, in Japan the scissors that are mainly used are the western-style X-shaped scissors (Rasha scissors, sewing scissors). Compared to the U-shaped Japanese scissors the X-shaped western scissors have a blade in the inside of both metal boards, and it is designed for the blades to come together and cut an object by crossing the two blades with the supporting point as central axis. Rasha scissors have the characteristics of the blade being long from the point where the screw is, and the finger rings are different in size because one is a ring for the thumb and the other is the ring for the rest of the fingers.

Western scissors are said to have been brought in at the time when Matthew Perry landed his black ship at Uruga in 1853. At the time the scissors were called "Meriken scissors (American scissors)," and they were scissors for cutting thick fabric such as Rasha. The scissors were big and heavy, having a total length of about 330 to 360 mm,

and the weight being about 1 kg. They were not suitable for the hands of Japanese people. The beginning of Rasha scissors was in 1877 based on “Meriken scissors.” And in 1892 the first original Japanese pair of Rasha scissors was made by Yoshida Yajura (later renamed Yakichi). Yakichi was called the “founder of sewing scissors,” and made use of the sword smith techniques at the time and repeated many trials and finally produced what is now the scissors of modern time. The characteristic of Japanese Rasha scissors is that compared to Meriken scissors they are small and light, and do not require support from a tailor stand and can be controlled freely with only the hands. The function of the scissors gained precision and mobility. The characteristics of shape were that ridges were put on the blade peak and the hit point was lengthened. Meriken scissors were made entirely by bronze, but the Japanese Rasha scissors were “chakko-zukuri” (a unique Japanese forge welding method based on the traditional Japanese sword smith method) which is based on the ancient ways of Japanese sword smith. The entire shape of Rasha scissors were made by extra-mild steel, but hard steel was applied only for the blade portion. The manufacturing method for sewing scissors designed by Yakichi is called “so-hizukuri,” not like the casting method of pouring into a model but to heat extra-mild steel and rofge by hitting a hammer to form the shape. The “so-hizukuri” technique has been taught to many people. According to the genealogy of scissors craftsmen with Yakichi at the top, this technique has been spread to 23 different systems. However, the systems gradually vanished, and now there only one craftsman who uses the “so-hizukuri” technique.

### 3 Manufacturing Scissors

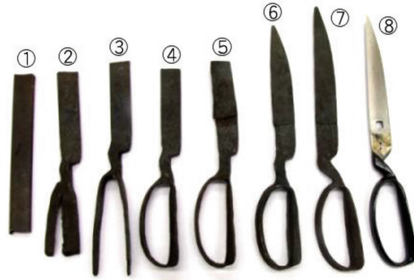
Figure 2 shows the photo of the shape in the middle of manufacturing scissors. The blades for the “thumb ring” and for the “lower fingers ring” are made respectively. They are combined after completion. We introduce the process in the following eight steps for manufacturing sewing scissors as shown in Fig. 1 with the still images.



**Fig. 1.** Photo of the eight steps for manufacturing sewing scissors.

## 4 Process of Manufacturing Scissors

We observed the entire process by a video camera and classified into large steps and into small steps. The large steps include 4 process of works, the large steps 1 contains 8 small steps, the large steps 2 contains 3 small steps, the large steps 3 contains 1 small steps, the large steps 4 contains 10 small steps. Process of manufacturing scissors is shown in Figs. 3, 4 and 5.



**Fig. 2.** Photo of the shape in the middle of manufacturing scissors (Photo credit; Cutlery Shop Furukawa).

## 5 Secret of Scissors with Good Sharpness

Figure 6 is the cross section when light is shined on the scissors when closing the scissors from opening position. Regardless of closing angle, it can be seen that the two blades touch at very limited range. Figure 7 shows the location where the two blades contact. The shape shown in the width was measured by the three-dimensional measuring device. The results are shown in Fig. 8.

In either case, the blade is shaped in a radiating line, which means the surface of the scissor blade is indented from the edge inward. This shape allows the edges to touch. This structure enables both blades to contact only at a point, not by a large contact surface (6). The process shown in Fig. 3 contributes to produce this mechanism.

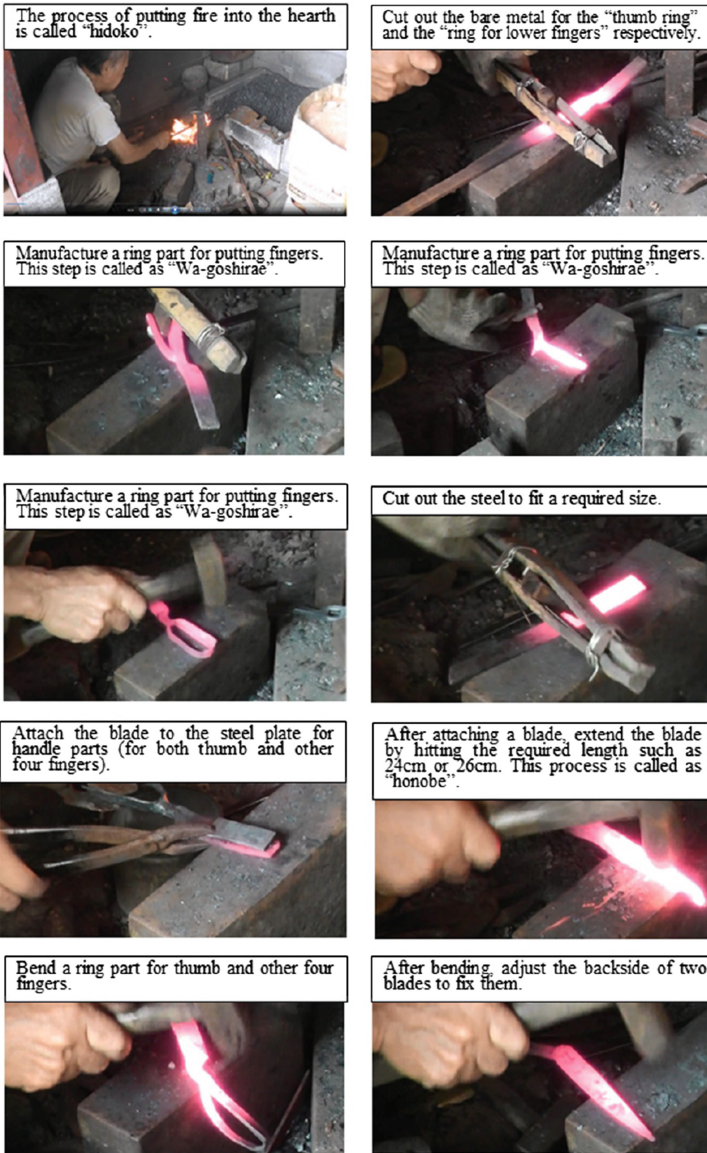


Fig. 3. Process of manufacturing scissors.

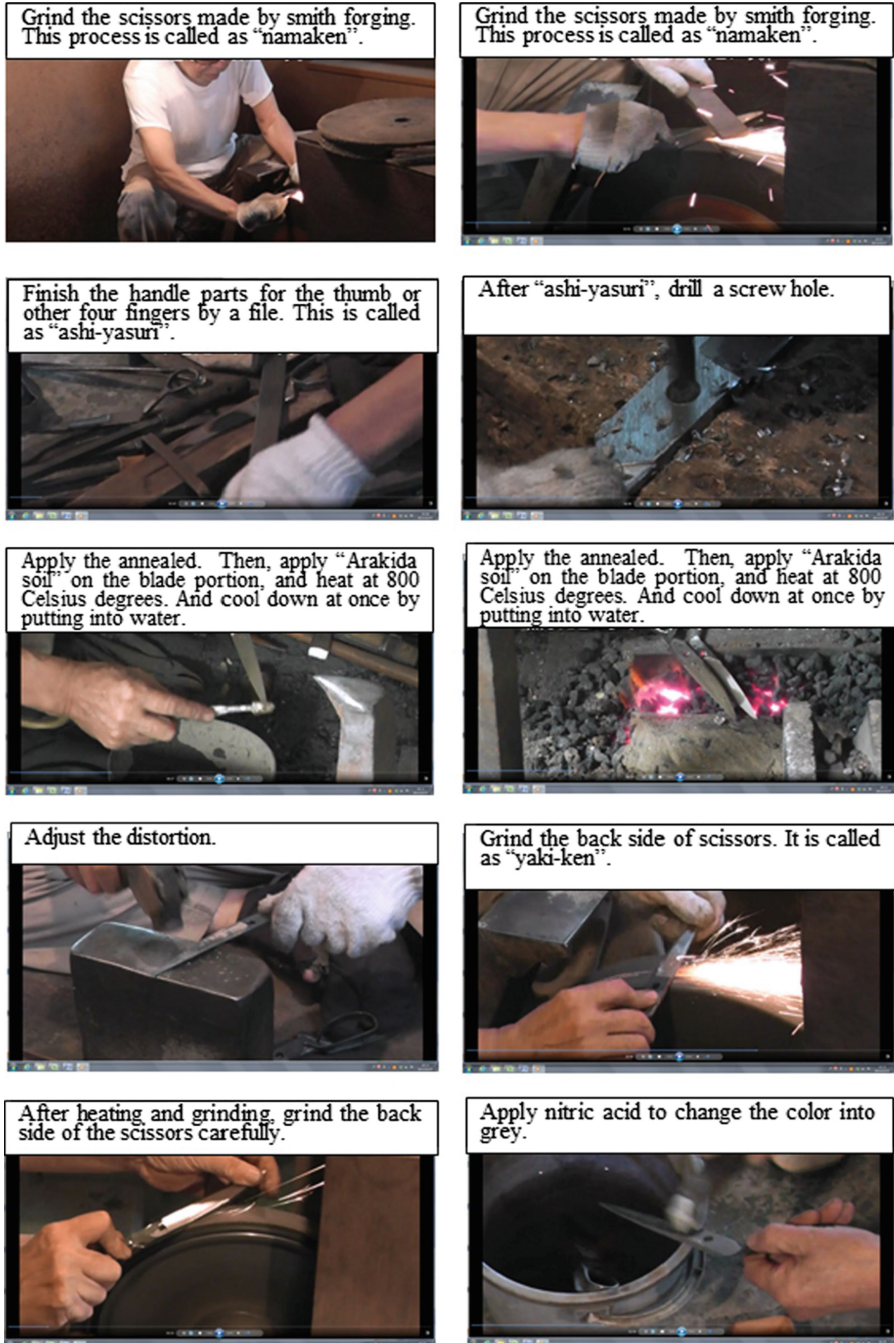


Fig. 4. Process of manufacturing scissors.

Polish the surface of the scissors with an iron bar to produce a mirror finished surface. This is called as "heraduke".



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Apply the final grinding of the back side by a metal plate.



Engrave the name of the craftsman.



Put in a screw and make sure its functions.



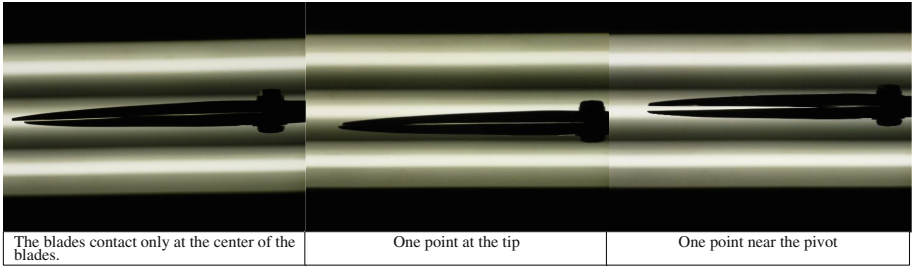
Adjust warpages while preventing the blade for the thumb ring and the blade for the other fingers from contacting each other.



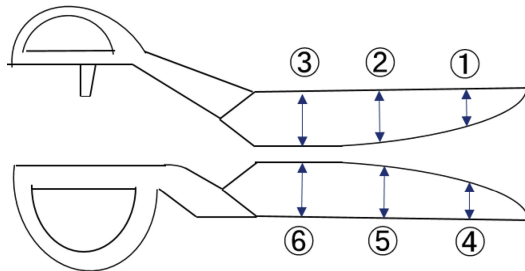
At the very end, apply "kogatana-duke", which means create a wave of layers so that the innermost layer is the sharpest on a blade, then finish.



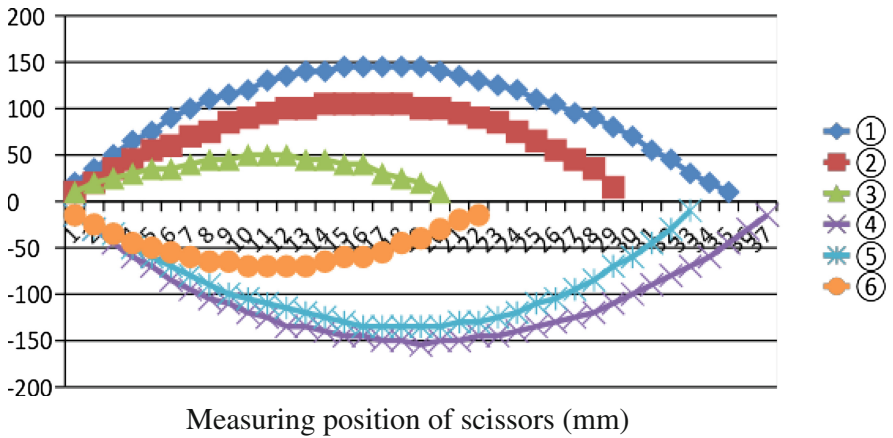
Fig. 5. Process of manufacturing scissors.



**Fig. 6.** Blades contact only at the center of the blades.



**Fig. 7.** Scheme of measuring locations.



**Fig. 8.** Result of form measurement.



## **6 Conclusion**

Using the method of forging Western scissors introduced to Japan in the late Edo era, we can record all processes of handmade craftsmen. This study enabled us to unveil a part of the secret of the sharpness of scissors, which tailors of high-class men's clothing love.

## **References**

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