

# WHAT MAKES a PROFESSIONAL PAIR OF PROFESSIONAL BARBER SCISSORS

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May 8, 2013

Metc-143-20C

## Abstract

This paper discusses the steel and the alloys used in the manufacturing of barber scissor. It will discuss heating processes used to change the properties in the steel based on length and alloys combined with the steel. The paper also discusses the alloys used that give scissors the different properties like hardness, corrosion resistance and other properties needed to make a professional pair of scissors.

## Introduction

This paper is about the types of steel used for the use of Professional Barbers scissors and the properties in the characteristics in these scissors that make them a high quality pair of scissors. There are many alloys that are mixed with steel to give them the many different properties desired from hardness for better sharpness, corrosion resistance, the look of the stainless steel, softness for machinability.

## Steel Used in Professional Barber Scissors

Stainless steels used for Barber shears are from two types of stainless steel alloys. These are 440 and 420, known as J2 [3]. The difference in these are the amount of carbon in steel.

440 series of stainless steel is used for the higher end of barber scissors, because the hardness is between the range of 54-57Rc [1]. If it is harder than 57Rc, the steel becomes too brittle. A less expensive pair of barber scissors is made of stainless steel in the 420 which has less carbon so, therefore it is soft and, but very rust resistant. These scissors have excellent corrosion resistance but the hardness is only 38-44Rc. Therefore results in soft scissor, however easy to machine. The 410 ss scissors do not stay sharp as long as the 440 series.

Another steel used in Professional steels is VG-10. This is a steel formulation of high carbon content. It is a super steel and produced in Japan it is designed to maintain sharpness, and durability without becoming brittle as stated in [2]. This is a problem for a lot of steels used in Barber scissors.

The most important material in barber scissors is the type of steel being used. The steel being used determines the sharpness, strength, durability and length of wear. These are very crucial characteristics that barbers required in a pair of Scissor that is going to be used by a professional barber.

## Alloys and the properties that make them important

Professional barbers use their shears a lot and are cutting several peoples hair. This type of use and the expected abuse on the scissors a barber needs is at the top of the line product. The steel alone is not hard enough or does it allow for a corrosion resistant product. To obtain these characteristics, element called alloys are added the steel to enhance corrosion resistance, hardness, toughness and processibility.

Hardness is very crucial to steel and a major decider of what the steel is used for. Carbon is the major alloy in steel that contributes to the hardness. The higher the carbon the harder

the steel without going over 1.25 percent of carbon and creates higher levels of cementite ( $\text{Fe}_3\text{C}$ ).

Molybdenum is added to the steel to increase toughness and corrosion resistance. It is also added to increase the amount of time the steel can be quenched so that a martensitic structure can be formed. Molybdenum also inhibits grain growth which in turn makes the molecules stronger.

Another alloy that may be added to the steel is Cobalt. This makes the scissors lighter than normal steel alloys making for the best scissor. However this is one of the more expensive scissors.

Chromium is an alloy that is added in fairly large quantities and used to protect against corrosion and adds heat resistance to allow the steel to maintain desired characteristics during forging and finishing [2]. This allows the steel to have its stainless properties. The only negative property of chromium is that it does not harden the steel.

Manganese is an alloy in the steel that is added to contribute to the hardness and strength and the amount added is dependent on the level of carbon in the steel. It is important for the finish of the steel, particularly if the sulfur is high in the steel. However the sulfur is used for machinability purposes.

### **Heat treatment and microstructures formed**

After the scissors have been forged or stamped and the screws have been drilled the scissors are heat treated in one of three processes. These processes are: in a salt bath, In an Environmental chamber, or by induction heating. This is done at a temperature between 1450 F and 2000 F. Heat treating is done to improve tensile strength, ductility, toughness, wear resistance, machinability, formability, bending quality, corrosion resistance, magnetic properties and others. This process is very difficult and because there a large amount of alloys in steel not all steel needs heat treated. It is then cooled back to room temperature. While at room temperature the steel is composed **of Ferrite** Iron, and all other alloys are in a lamellar microstructure called Pearlite. While the steel is

+heated the carbides dissolve into the iron. When all the carbon is dissolved into the iron it is an Austenite iron again. Austenite is an ideal structure because the carbon is dispersed in an even pattern through the iron.

### **Tempering and microstructures formed**

This is a process used to heat steel for 30 minutes or longer based on the size of the material at a temperature of 350 F to 500 F. Tempering is very useful for Martensite because it is a very unstable structure and it is converted to a more stable ferrite structure [1]. This is obtained because the carbon has enough time to squeeze out of the lattice spaces but not enough time to clump together which is why martensite is an unstable structure and not desirable to use for scissors. Tempered martensite is much stronger than the metastable martensite which it turns into makes it desirable for scissors.

It is important to temper martensite because it adds corrosion resistance, because when 420 and 440 steels are initially annealed they are not stainless and because of the tempering process and the carbides are reduced the hardened steels have a much better corrosion resistant property.

### **Quenching and microstructures formed**

Quenching is very important to the heat treating process because it dictates the properties and structures of the steel based on the rate that the steel is cooled. Cooling needs to be done at a rate such that the carbon is dispersed evenly throughout the lattice structure of the iron. If cooled too slowly the too many clumped particles will form and on the contrary if cooled too fast the steel will be stressed from being shocked, causing different types of issues, for example warpage and stress cracks. So therefore Barber scissors are quenched in oil.

Hardening high chromium steels such as 420 and 440 is difficult because the Austenite tends to retain after quenching. So, therefore the Austenite can be converted to the more stable Martensite by multiple heat tempering or ice tempering.

**Conclusion:**

The steel used for barber are combined with different alloys to obtain the properties needed to make high quality professional barber scissor, like keeping them, sharp, making them stainless, making them soft enough to be machined and many other properties not discussed in this paper.

[1] Dar Expo, Professional Barber Scissors, October (2005), retrieved from <http://professional-barber-scissors.blogspot.com/2010/10/barber-styling-scissors-material.html>

[2] Sheareducator, Professional Haircutting, Fashion and b\ Shears, retrieved from [www.squidoo.com](http://www.squidoo.com), (2011)