RAZOR BLADE STOCK

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3 Claims. (Cl. 148—31)

1 This invention relates to improved razor blade stock and the method of producing the same. This application is a division of my copending application Serial No. 713,098, filed November 29, 1948.

Razor blade stock is conventionally produced from high carbon steel by hot rolling in strip form to about .080" gauge and subsequently cold reducing the same to the desired .006" gauge. The steel used is a high grade, electric furnace or open hearth alloy grade ordinarily containing about 1.25% carbon, .18 to .33% silicon, and .20 to .40% chromium. Due to the hardness of such steel, about six cold-rolling operations with intermediate anneals between each operation are necessary to obtain the reduction to final gauge. Such processing adds materially to the cost of the steel, and considerable rejects due to poor surface and non-metallic inclusions further add to the cost. Furthermore, the decarburization is somewhat of a problem in conventional method due to number of anneals given high carbon strip, but causes no problem in the method of my invention where strip is carburized.

It is accordingly an object of the present invention to provide a method of efficiently producing razor blade stock.

It is a further object of the present invention to produce razor blade stock characterized by a clean and uniform surface and freedom from non-metallic inclusions.

The foregoing and further objects will be apparent from the following detailed description.

In accordance with the principles of my invention, steel strip containing .25% maximum carbon, .50% maximum manganese, .04% maximum phosphorus, .05% maximum sulphur, .20% maximum silicon, .03% maximum aluminum, is hot rolled to a suitable gauge, for example, .080".

The strip is then pickled to remove any scale and then cold reduced to the desired gauge of about .006". Due to the softness of this low carbon and low manganese steel, it can be reduced without intermediate annealing in one or at most two cold-rolling operations.

Following the cold reduction, the strip is continuously gas carburized to increase the carbon content throughout its cross section to between 1.00 and 1.50% carbon and preferably about 1.25%. Due to the thinness of the strip, it can be effectively and continuously carburized at a suitable temperature, such as 1650° F., in any of the commercial fuel gases containing carbon monoxide and the hydrocarbons such as methane, ethane and propane.

In the conventional method for producing razor blade stock from high carbon strip, the strip is given several intermediate anneals as well as an anneal following the final cold reduction. The intermediate anneals are essential to facilitate cold reduction of this high carbon grade; the final anneal relieves the hardness induced by the last cold-rolling operation. As a result of these anneals, the finished stock possesses a spheroidized structure.

One step in the manufacture of blades from such stock consists of austenitizing the strip at a temperature between the upper (A_m) and lower (A_s) critical temperatures, for example 1450° F., followed by quenching between water-cooled plates. Since the austenitizing temperature is not high enough to dissolve all the carbides, the structure of the finished blade is a mixture of spheroidized cementite in a martensitic matrix.

Such a structure is felt to be desirable from a cutting and wearing standpoint.

In the present invention, several alternatives are available after the .006" gauge strip has been carburized through its cross section. It has been demonstrated that the carburized strip in the pearlitic condition can be austenitized and quenched as in the conventional method, and a structure of fine cementite spheres in a martensitic matrix will be produced. This structure would appear to be as suitable as the one being obtained by the conventional method and consequently no annealing of the carburized strip is necessary.

However, if a spheroidized razor blade stock is desired, this may be obtained by controlled cooling of the carburized strip from the carburizing temperature. As an alternative to this, the carburized strip may be cooled to room temperature, then given a short, super-critical anneal to produce a spheroidized structure. Another method which may be employed is to cold roll to about .010" gauge, carburize the strip, cold roll to .006" gauge, and spheroidize with a sub-critical anneal.

Preferably the strip is formed from low carbon rimmed steel. The relatively high carbon silicon killed steel conventionally used, or fine grain aluminum killed low carbon steel are unsatisfactory due to the large number of metalloid inclusions therein. These inclusions result in frequent "tear-outs" on the edge of the blades during sharpening. Also the surface of such steels tends to be poor. However, in rimmed steels the ingot surface is characterized by freedom from inclusions and blowholes. Further processing does
not destroy this skin or layer of purer metal and the same remains intact to produce razor blade stock having fine surface characteristics.

It will be noted that chromium which is required in conventional stock, primarily to prevent graphitisation during annealing is not necessary in my improved stock. This results in a considerable saving in alloy cost.

While I have described several specific embodiments of my invention, it will be understood that these embodiments are merely for the purpose of illustration and description and that various other forms may be devised within the scope of my invention, as defined in the appended claims.

I claim:

1. As an article of manufacture, razor blade stock consisting of a steel strip formed of recarburized rimmed steel and having a carbon content of at least 1.00% throughout its thickness.

2. As an article of manufacture, razor blade stock consisting of a steel strip formed of recarburized rimmed steel, said stock having a carbon content of at least 1.00% throughout its thickness, said strip being characterized by a surface substantially free from inclusions and blowholes.

3. As a new article of manufacture, razor blade stock consisting of steel strip formed of recarburized rimmed steel, said stock having between 1.00 and 1.50% carbon content throughout its thickness, .50% maximum manganese, .04% maximum phosphorus, .05% maximum sulphur, .20% maximum silicon, .03% maximum aluminium, balance substantially iron.

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REFERENCES CITED

The following references are of record in the file of this patent:

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