FORM 2

THE PATENTS ACT, 1970

(39 of 1970)

As amended by the Patents (Amendment) Act, 2005

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The Patents Rules, 2003

As amended by the Patents (Amendment) Rules, 2016

COMPLETE SPECIFICATION

(See Section 10 and Rule 13)

TITLE

"BULLET RESISTANT PATKA WITH 360 DEGREE PROTECTION"

APPLICANT

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The following specification particularly describes the application and the manner in which it is to be performed.

PRIORITY STATEMENT

The present application hereby claims priority from Indian patent application with the application number 202341024809, filed on 31 March 2023, the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD OF INVENTION

The present invention relates to bullet resistant Patka. More particularly, it relates to method of making bullet resistant Patka designed to protect the head from all sides including the vulnerable area thereby protecting the wearer from direct firing of bullets, especially in high-risk situations.

BACKGROUND OF INVENTION

Ballistic helmets are generally used to absorb the impact from firearm-fired projectiles and fragments from explosions and fragmenting munitions. Helmets are the most basic, fundamental component of armor, and have been in use since the dawn of civilization. From the Sumerians, through the Ancient Greeks and Romans, and to the peak of plate armor's development in the 16th century, the helmet was considered a vital component of the warrior's equipage.

Generally, 'bulletproof helmet' or 'bullet resistant helmet' are collectively referred to as helmets that protect the head of the wearer from direct firing by way of blocking bullets. Such protective helmets are therefore worn for self-protection by special operations forces and increasingly also by policemen arriving on site first.

The most important function of a protective bullet resistant helmet is stopping an impinging projectile, such as a bullet, and preventing the projectile from penetrating the head of a wearer of the protective helmet. And, in order to make the helmets impenetrable, these helmets are made from special alloy steels wherein nickel, manganese, chromium, carbon and silicon are used as materials.

In accordance with Indian conditions, the protective head gear designed for use by Indian Armed Forces is often termed as Bulletproof Patka. The Bullet Resistant Patka is employed by frontline Combat Forces, Para Military & Police Forces, Riot Control Forces and similar troops when deployed on Internal Security duties in all types of weather conditions.

Unlike the standard helmet, the external appearance of the Helmet Patka gives a non-threatening appearance to troops, involved in Internal Security duties, where 'hearts and mind' are as important as combat readiness.

As per Indian Specification, the Helmet Patka includes armour steel strip in the front which protects the forehead by defeating fire of 7.62x39mm (AK-47 family of weapons) from a distance of 10 meters. The remaining circumference of the skull is protected against fire of 9mm family of weapons from a distance of 10 meters. The trauma pads covering in the helmet can absorb shock/trauma in the event of bullet hits. The cylindrical design ensures ricochet of bullets striking from any angle, thereby reducing trauma.

Accordingly, two plates of variant thickness namely in the range of 4-5 mm and 3-4 mm are used at front and back respectively. These two plates for variant thickness are joined through welding.

The welding region is the most vulnerable area in Helmet Patka. Since, there was no solution available till date, the Indian testing criteria for Helmet Patka excluded this vulnerable region from test firing with live rounds.

In this prevailing situation, when there is no solution available to make the welded area as strengthened as the other part of Helmet Patka, the present invention offers a safe well as affordable solution. The present invention effectively overcomes the drawbacks of the trivial, traditional, antiquated, and ineffective method used in making bullet resistant Patka helmet and offers a bullet resistant Patka providing protection from fired bullet in the vulnerable welded region.

OBJECT OF THE INVENTION

The primary object of the invention is to develop a Bullet Resistant Patka offering 360-degree protection to the head against incoming bullet even at the welded joints.

Another object of the invention is to provide a method of making bullet resistant Patka with strengthened joints which can withstand the impact of the bullet at welded region often referred to as vulnerable area.

SUMMARY OF THE INVENTION

This summary is provided to introduce a selection of concepts, in a simplified format, that are further described in the detailed description of the disclosure. This summary is neither intended to identify key or essential inventive concepts of the disclosure nor is it intended for determining the scope of the disclosure.

The present invention discloses a method of making the bullet resistant Patka having strength to withstand the impact of bullets at the joints, characterized in that the method comprising the steps of preparing a low alloy martensitic steel plate of predefined thickness of 4.8 mm and 3.2 mm by rolling; cutting the said low alloy martensitic steel plate into predefined dimensions; performing an overlap welding at the joints between the said two low alloy martensitic steel plates; heating the said low alloy martensitic steel plate at 920-930 degree C for 20-25 min; water quenching the said low alloy martensitic steel plate for 30-60 minutes; tempering the said low alloy martensitic steel plate at 250 – 270 degree C for 60 min; and short blasting the said low alloy martensitic steel plate to smoothen its surface.

Further, in accordance with an embodiment of the present invention, the present invention discloses a bullet resistant Patka having strength to withstand the impact of bullets at the joints, characterized in that a low alloy martensitic steel plate of composition in weight percent: C - 0.4 to 0.5, Si - 0.1 to 0.4, Mn – 0.3 to 0.5, Cr - 0.1 to 0.3, Ni – 0.4 to 0.8, and the balance Fe with unavoidable impurities.

DESCRIPTION OF THE INVENTION

The present invention discloses a unique bullet resistant helmet that provides 360-degree protection. The helmet is designed to protect the wearer's head from direct firing from any angle, thereby reducing trauma.

In accordance with the present invention, the helmet is made from low alloy a low alloy martensitic steel plate of composition in weight percent: C - 0.4 to 0.5, Si - 0.1 to 0.4, Mn – 0.3 to 0.5, Cr - 0.1 to 0.3, Ni – 0.4 to 0.8, and the balance Fe with unavoidable impurities.

In order to achieve the object of the invention, the method for producing a bullet resistant steel plate of the present invention comprises (1) smelting and casting of Martenisitic Steel; (2) rolling; (3) Cutting (4) Welding and (5) Heat Treatment

The design principle of each chemical element of special alloy used in making of the bullet resistant patka is as follows.

Carbon: C exerts the effect of solid solution strengthening in the steel and contributes the largest to the improvement of the strength of the steel. C is also the strengthening element with the lowest cost. In order to achieve a certain hardness classification, it is necessary to contain a high content of C in the steel. However, if the content of C is too high, it is disadvantageous to the welding performance and toughness of the steel plate. In consideration of the adaptability to the toughness of the steel plate, the C content in the antiballistic steel plate of the present invention should be controlled to 0.43 to 0.48%.

Silicon: Si is a deoxidizing element. By dissolving Si in ferrite, the effect of solid solution strengthening can be exhibited, and the strength and hardness of the steel sheet can be significantly improved. The effect of solid solution strengthening exerted by Si is lower than C, N and P alone, but higher than other alloying elements. In order to make full use of the solid solution strengthening effect of Si, the content of Si is generally not lower than 0.3%. In the present invention, the solid solution strengthening effect is exhibited by controlling the Si content in the range of 0.2 to 0.3%.

Manganese: Mn reduces the critical cooling rate and greatly improves the hardenability. At the same time, Mn has a solid solution strengthening action on the steel sheet. If the Mn content is too high, the reduction in martensite transition temperature is too much, causing the increase of room temperature residual austenite, which is disadvantageous to increase the strength of the steel sheet. In addition, since coarse MnS is generated at the cast slab center segregation site, the toughness at the center of the plate thickness is also lowered. It is necessary to set the Mn content in the antiballistic steel plate to 0.30 to 0.40% based on the technical solution plan of the present invention.

Chromium: Cr can be dissolved not only in the element that reduces the austenitic phase area but also in ferrite. Cr can improve the stability of austenite, move the C curve to the right, reduce the critical cooling rate, and improve the hardenability of the steel. In the present invention, the Cr content should be controlled to 0.20 to 0.30% in the antiballistic steel plate.

Nickel: Ni dissolves only in the base phase ferrite and austenite in the steel and does not form carbides. The austenite stabilization effect of Ni is very strong and is a main element that guarantees the high toughness of the steel sheet. In consideration of the action of Ni element in the ballistic steel plate of the present invention and the addition cost of alloying elements, the Ni content should be set in the range of 0.4 to 0.8%.

In accordance with an embodiment of the present invention, a low alloy martensitic steel plate of composition in weight percent: C - 0.4 to 0.5, Si - 0.1 to 0.4, Mn – 0.3 to 0.5, Cr - 0.1 to 0.3, Ni – 0.4 to 0.8, and the balance Fe is rolled to achieve plates having thickness of 3.2 mm and 4.8 mm respectively. The plates are further cut into predefined sizes and molded to form protective headgear herein referred to as Bulletproof Patka. The 4.8 mm sheet forms the front end of the Patka while 3.2 mm sheet forms the back end of the Patka.

The plate of varied thickness ensures that the Patka is not too heavy as it will affect troops readiness in combat scenario. Further, overlap welding between two low

alloy martensitic steel plates is performed. This overlap welding ensures protection at vulnerable welded area of the bullet resistant patka.

In accordance with an embodiment of the present invention, the welded bullet resistant Patka is further heated to 920-930 degree C for 20-25 minutes followed by water quenching. After 30-60 min from water quenching, tempering is performed at 250 – 270 degree C for 60 min. The resultant bullet resistant patka is capable of deflecting bullets from any angle including welded region.

ADVANTAGES AND APPLICATION

The newly designed Bullet Resistant Patka offers 360° protection to the wearer. It protects the wearer head preferably Combat Forces, Para Military & Police Forces and similar troops in combat zone where there is high probability of getting the bullet strike in vulnerable area.

CLAIMS

We claim:

1. A method of making the bullet resistant Patka having strength to withstand the impact of bullets at the joints, characterized in that the method comprising the steps of:

    a. Preparing a low alloy martensitic steel plate of predefined thickness of 4.8 mm and 3.2 mm by rolling

    b. Cutting the said low alloy martensitic steel plate into predefined dimensions;

    c. Performing an overlap welding at the joints between the said two low alloy martensitic steel plates;

    d. Heating the said low alloy martensitic steel plate at 920-930 degree C for 20-25 min;

    e. Water quenching the said low alloy martensitic steel plate for 30-60 minutes;

    f. Tempering the said low alloy martensitic steel plate at 250 – 270 degree C for 60 min; and

    g. Surface Treating the said low alloy martensitic steel plate for painting.

2. A method of making the bullet resistant Patka of claim 1, wherein the surface treatment is performed through short blasting

3. A bullet resistant Patka having strength to withstand the impact of bullets at the joints, characterized in that a low alloy martensitic steel plate of composition in weight percent: C - 0.4 to 0.5, Si - 0.1 to 0.4, Mn – 0.3 to 0.5, Cr - 0.1 to 0.3, Ni – 0.4 to 0.8, and the balance Fe with unavoidable impurities.

4. A bullet resistant Patka, as claimed in claim 3 wherein the content of C in the low alloy martensitic steel plate is 0.40 to 0.5, preferably 0.45; the content of Si in the low alloy martensitic steel plate is 0.1 to 0.4; preferably 0.2 to 0.3; the content of Mn in the low alloy martensitic steel plate is 0.3 to 0.5, preferably 0.4; the content of Cr in the low alloy martensitic steel plate is 0.1 to 0.3, preferably 0.2; the content of Ni in the low alloy martensitic steel plate is 0.4 to 0.8, preferably 0.7; and balance Fe with unavoidable impurities.

5. A bullet resistant Patka, as claimed in claim 3, wherein the low alloy martensitic steel plate has a thickness in the range of 3 to 5 mm; preferably 3.2 mm at the back side and 4.8 mm at the front.

6. A bullet resistant Patka, as claimed in claim 3, wherein the said low alloy martensitic steel plates are joined through overlap welding.

Dated this 30th Day of March 2024

For Mishra Dhatu Nigam Limited



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ABSTRACT

BULLET RESISTANT PATKA WITH 360 DEGREE PROTECTION

A Bullet Resistant Patka having strength to withstand the impact of from any angle including welded region, characterized in that the method comprising the steps of preparing a low alloy martensitic steel plate of predefined thickness of 4.8 mm and 3.2 mm by rolling; cutting the said low alloy martensitic steel plate into predefined dimensions; performing an overlap welding at the joints between the said two low alloy martensitic steel plates; heating the said low alloy martensitic steel plate at 920-930 degree C for 20-25 min; water quenching the said low alloy martensitic steel plate for 30-60 minutes; tempering the said low alloy martensitic steel plate at 250 – 270 degree C for 60 min; and short blasting the said low alloy martensitic steel plate to smoothen its surface