ATTACHMENT OF ROTATING BAND TO SHELL CASING BY BRAZING

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Filed: Nov. 15, 1972

Appl. No.: 306,788

U.S. Cl. 29/493, 29/474.5, 29/1.2, 29/1.23, 29/1.3, 102/93

Int. Cl. B23k 5/22, B23k 31/02

Field of Search 102/93; 29/1.2, 1.22, 1.3, 29/501, 493, 474.4, 474.5, 1.23

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ABSTRACT

The improvement of attaching rotating bands to shell casings by brazing.

2 Claims, 4 Drawing Figures
ATTACHMENT OF ROTATING BAND TO SHELL CASING BY BRAZING

The invention described herein may be manufactured, used, and licensed by or for the Government for governmental purposes without the payment to us of any royalty thereon.

This invention relates to improved means of attaching rotating bands to artillery shells, and more particularly by brazing the band to the shell casing.

A rotating band is a cylindrical ring of copper or gilding metal, positioned around the exterior surface of a projectile. It affords a snug seat for the projectile in the forcing cone and centers the base in the bore. As the projectile moves forward, the soft rotating band is engraved by the bands of the bore. Because of the compression of the band, excess metal flows toward the rear. This flow of metal is taken up by cannellures, or grooves, cut in the rotating band. Since the riflings of the weapon has a helical twist, rotating is imparted to the moving projectile by the engraved rotating band. In addition, the rotating band prevents the escape of the propellant gases forward of the projectile by completely filling the grooves of the rifling.

One method of positioning a rotating band on an artillery shell has been to make a circumferential undercut groove on the outside of a cylindrical shell body. The bottom surface of the groove is knurled or otherwise roughened to enhance the mechanical bond to the shell body. The rotating band is then heated and squeeze into the groove. Another method of manufacture has been to deposit a length of weld overlay of metal on the outside diameter of a shell body.

The present invention comprises the securing of the rotating band to the shell body by a metallurgical bond obtained through a low temperature brazing technique. This provides a stronger, more reliable attachment than the mechanical bond. In addition, the present invention eliminates the need for providing a circumferential groove on the outside of a cylindrical shell body in order to accommodate the heated rotating band, thus providing a more uniform, stronger shell body wall configuration. An advantage of the present process over the weld overlay method is that melting of either the shell body or band materials is avoided, thus eliminating the chance of encountering compositional changes in the shell body or bond material and cracking. Also, the braze bonding process is considered more compatible for joining a wider variety of shell and band composition that could be assembled by the weld overlay method.

It is an object of the present invention to provide and disclose improved means of bonding a rotating band to a shell casing.

It is a further object of the present invention to provide and disclose improved means of bonding a rotating band to a shell casing which are compatible with the casing materials.

It is a further object of the present invention to provide and disclose improved means of bonding a rotating band to a shell casing which are not detrimental to the strength of the shell casings.

Other objects and a fuller understanding of the invention may be ascertained by referring to the following description and claims taken in conjunction with the accompanying drawing in which:

FIG. 1 is a prospective view of a bonding fixture system utilized in compressing rotating bands onto a shell casing. FIG. 2 is an exploded view showing integral parts of the system of FIG. 1. FIG. 3 is a view of rotation band bonded to an artillery casing. FIG. 4 is a view through lines 4—4 of FIG. 3.

The present invention is carried out by attaching a brazing filler metal foil interlayer 11 between rotating band 13 and shell casing 15, as shown in FIG. 1. The band and filler foil are held in place by means of several beveled compression fingers 17. The compression fingers are secured by means of outer ring 19 and beveled inner ring 21. Outer ring 19 comprises internally threaded segment 23 which is designed to be compatible with externally threaded segment 25 of beveled inner ring 21, as shown in FIG. 2. Beveled compression fingers 17 are forced against rotating band 13 by the tightening together of outer ring 19 and inner ring 21.

Brazing was accomplished by positioning the assembled components in a vacuum chamber. The assembly was subjected to a temperature of about 1,500°F for a period of one hour. Induction heating was utilized with a coil located in the inside cavity of the shell body. The heating operation was carried out in an inert atmosphere of flowing helium gas through the system. After brazing, the shell body was heat-treated to required strength by aging at 900°F for a period of about three hours. A fabricated system was obtained in accordance with FIG. 3 having a coil interlayer between the shell casing and rotating band as shown in FIG. 4. In a specific example, applicants attached a gilding metal rotating band to an 18 percent by weight Monel Steel Alloy 155 MM shell body. Gilding metal is an alloy having a composition of 95 percent Cu and 5 percent Zn on a weight basis. Gilding metal is commercially available from most suppliers of brass and other copper alloys. The brazing filler metal used was a commercially available alloy described in American Welding Specification AWS A5.8—69 as type B Ag—18. The nominal composition of the alloy is 60% Ag, 30% Cu, and 10% Sn, sold under the tradename of Silvaloy No. 60 by Engelhard Industries, Inc. Other filler metal includes BAG—5a which comprises (1) 71% Ag, 27—28% Cu, 0.15—0.30% Li, and (2) 71.5% Ag, 28% Cu, and 0.50% Ni. In combination with a titanium base alloy containing 6% Al, 6% V, and 2% Sn, a filler metal (BAG—1) sold under the tradename of Easy Flow 45 by Handy and Harmon comprising 45% Ag, 15% Cu, 16% Zn, and 24% Cd was utilized. All the above compositions are on a percent by weight basis.

Although we have described our invention with a certain degree of particularity, it is understood that the present disclosure has been made by way of example and that various filler metal may be utilized in conjunction with the shell casing without departing from the spirit and scope of the invention.

Having thus described our invention, we claim:

1. Method of applying a soft-metal preformed rotating band by brazing to a hard-metal cylindrical artillery shell casing without grooving or deforming said casing, the inner circumference of said preformed rotating band being substantially the same as the outer circumference of said cylindrical shell casing, said method comprising the steps of:
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3. applying an annular foil of brazing material to the outside of said ungrooved shell casing;
4. placing said rotating band over said annular foil;
5. placing an annular clamping fixture over said rotating band, said fixture comprising a plurality of inner compression segments, and outer compression ring means surrounding said segments for applying uniform radial pressure to said rotating band;
6. tightening said outer compression ring means of said clamping fixture onto said inner compression segments, whereby said uniform radial pressure is applied to said rotating band, and said rotating band is pressed onto said brazing foil and shell casing; and
7. applying a brazing temperature to said shell casing, brazing foil and rotating band, without removing said clamping fixture, until said rotating band is brazed to said shell casing.

2. Method according to claim 1, wherein said brazing temperature is applied from the interior of said shell casing.

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