April 25, 1961 C. A. PARLANTI 2,981,155

COMPOSITE GUN BARRELS

Filed March 4, 1953

FIG. 1.

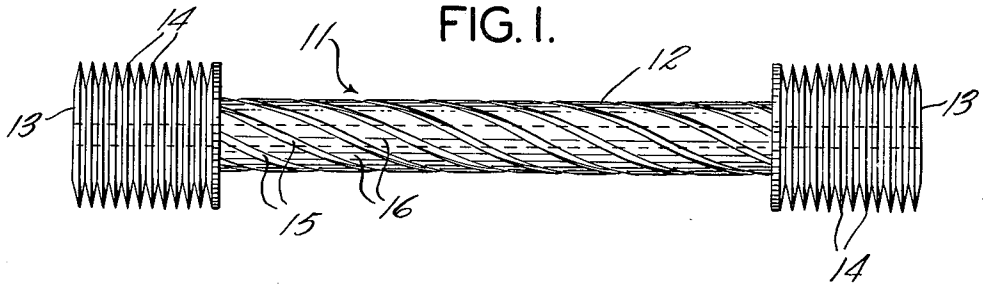


FIG. 2.

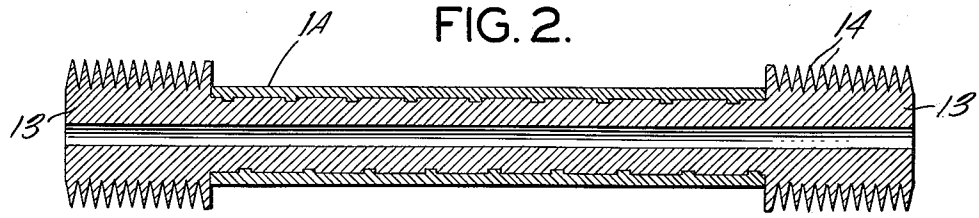
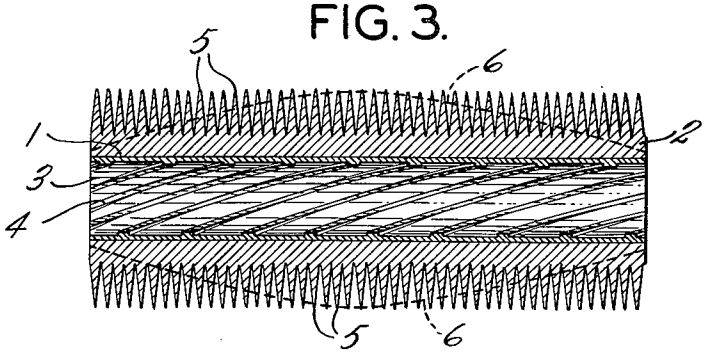


FIG. 3.



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COMPOSITE GUN BARRELS

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4 Claims. (Cl. 89—16)

This invention relates to gun barrels and to methods of making the same.

It is known that the increasingly high muzzel velocities which are being used in modern guns produce greatly increased friction forces as the projectile travels through the gun barrel. This in turn results in the generation of increased heat, and in cases where rapid firing is required, the low thermal conductivity of steel frequently causes localized accumulations of heat which result in distortion of the barrel.

It is an object of the present invention to provide a gun barrel in which provision is made for rapid transfer and dissipation of heat.

It is a further object of the invention to provide methods of making such gun barrels.

Other objects and advantages of the invention will appear hereinafter.

A preferred embodiment of the invention selected for purposes of illustration is shown in the accompanying drawings, in which,

Figure 1 is an elevation of a core suitable for use in casting a gun barrel shell embodying the invention.

Figure 2 is a longitudinal section through the core and cast shell.

Figure 3 is a longitudinal section through a completed barrel.

Referring to the drawings, the gun barrel illustrated in Figure 3 comprises a relatively thin shell **1** of steel and an outside casing **2** of aluminum or aluminum alloy containing at least 70% aluminum. The inside surface of the steel shell has rifle grooves **3** and lands **4** formed therein and the outside surface is surrounded by and in contact with a casing **2** throughout its entire length, or at least throughout a substantial portion of its length.

The outside of the casing **2** is provided with cooling fins **5** to aid the transfer of heat, and the outside surface of the casing, including the fins is treated to provide a thin outside layer of aluminum oxide, which, I have found, greatly increases the rate of heat transfer. If desired, the fins **5** may be machined down to heights indicated by broken line **6** to modify the rate of heat transfer at various points along the barrel as may be desired. The contour of the curve **6** for any type of gun may be determined by suitable firing tests.

The preferred method of making a gun barrel as above described is as follows. Referring to Figure 1, a core **11** of aluminum or aluminum alloy is first prepared, said core having a substantially cylindrical center section and enlarged end sections **13** provided with cooling fins **14**. The outside surface of section **12** is provided with rifle grooves **15** and lands **16** which are the reverse (negative) of the grooves and lands of the rifling desired on the interior of the barrel.

The outside surface of the core including the end sections is then treated to provide a thin layer of aluminum oxide, preferably by one of the well known anodizing processes. This has a two fold effect in the subsequent

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casting operation in which the core **11** is used. First, the layer of aluminum oxide retards the absorption of heat from the molten steel into the center section. Second, it increases the rate of heat transfer from the end sections.

The core **11** is placed in a suitable casting mold having a cylindrical cavity surrounding the center section **12** and a cylindrical steel shell **1A** (Figure 2) is cast around the center section. The shell should be of substantial thickness, as for example, from 1″ to 2″. The shell may now be subjected to any desired heat treatment, and in the course of this treatment the core melts and runs out of the shell. Subsequently, the outside of the shell **1A** is machined down to provide the shell **1** having a thickness (measured from the bottom of the rifle grooves) of approximately 0.1″.

This shell is now placed in another casting mold in which it serves as a core around which the casing **2** is cast. Preferably, the mold is constructed and the casting operation is conducted in accordance with the invention disclosed in my prior application Serial No. 225,296, filed May 9, 1951, now Patent No. 2,759,231.

Subsequently, the exposed aluminum surfaces of the barrel are treated to provide a thin layer of aluminum oxide thereon for purposes previously described. This is preferably done by one of the well known anodizing processes, the ends of the barrel being sealed during the treatment to prevent the electrolyte from affecting the steel.

Thereafter, the barrel may be mounted on a lathe and the rifling may be accurately machined to the desired size. Also the cooling fins may be cut to any contour desired by the designer to provide proper cooling characteristics.

It will be understood that the drawings herein are merely representative and are not intended to portray any actual gun barrel in accurate proportions.

It will be understood that the invention may be variously modified and embodied within the scope of the subjoined claims.

I claim as my invention:

1. A gun barrel comprising a relatively thin cylindrical shell of steel, the inside surface of said shell having rifle grooves and lands formed therein, the inside diameter of said shell being greatly in excess of the wall thickness thereof, and an outside casing of metal containing not less than 70% aluminum surrounding said shell and in direct, fixed contact therewith throughout substantially its entire length, said outside casing having a thickness substantially greater than the thickness of said shell of steel.

2. A gun barrel according to claim 1 in which the outside of said casing consists of a thin layer of aluminum oxide.

3. A gun barrel according to claim 1 in which the outside of said case has been anodized.

4. A gun barrel according to claim 1 in which the thickness of said shell of steel is approximately 0.1″.

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