

# United States Patent [19]

Thomsen

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## [54] COMPOSITE FIREARM BARREL

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[58] Field of Search .... 42/76 A, 76 R;  
89/16, 14 A, 14 R; 102/105

## [56] References Cited

### UNITED STATES PATENTS

664,848 1/1901 Glover ..... 89/16

|           |         |                    |         |
|-----------|---------|--------------------|---------|
| 1,789,835 | 1/1931  | Pedersen.....      | 89/14 A |
| 3,152,548 | 10/1964 | Schwartz.....      | 102/105 |
| 3,177,811 | 4/1965  | Baylor et al. .... | 102/105 |
| 930,927   | 8/1909  | Berkstresser.....  | 42/76 A |
| 2,112,144 | 3/1938  | Coupland.....      | 42/76 A |
| 2,137,259 | 11/1938 | Boak.....          | 42/76 R |

## FOREIGN PATENTS OR APPLICATIONS

7,071 4/1894 Great Britain ..... 89/16

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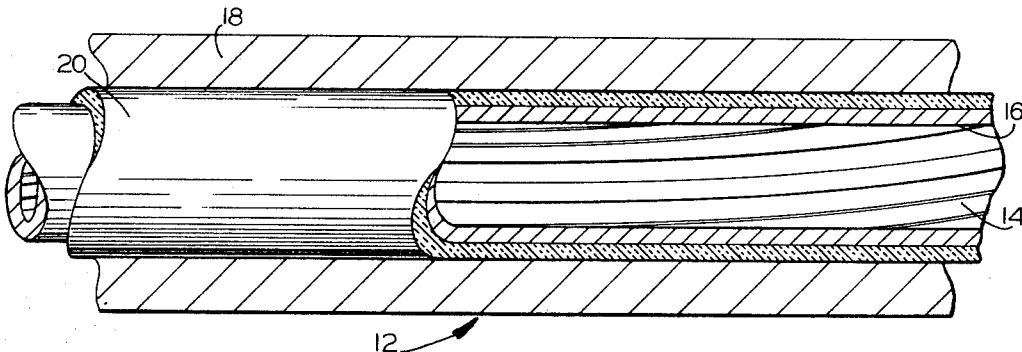
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## [57] ABSTRACT

A composite barrel incorporates means for resisting the radial distribution of heat originating in the barrel bore.

5 Claims, 3 Drawing Figures



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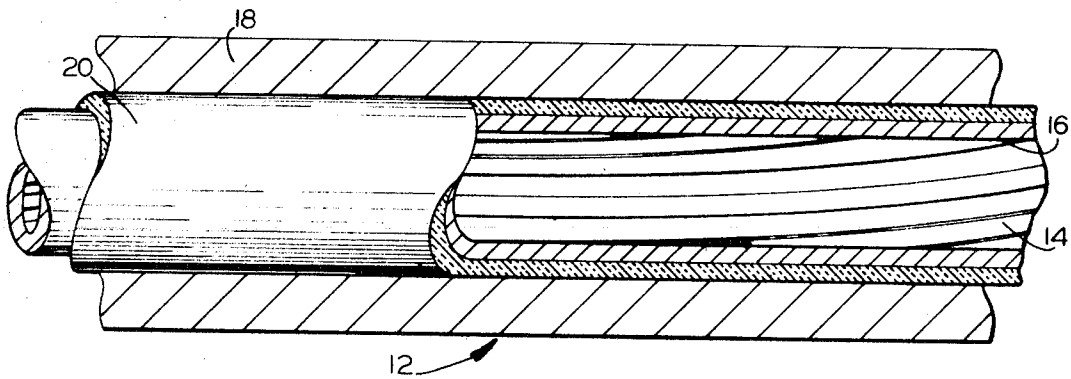


Fig. 1

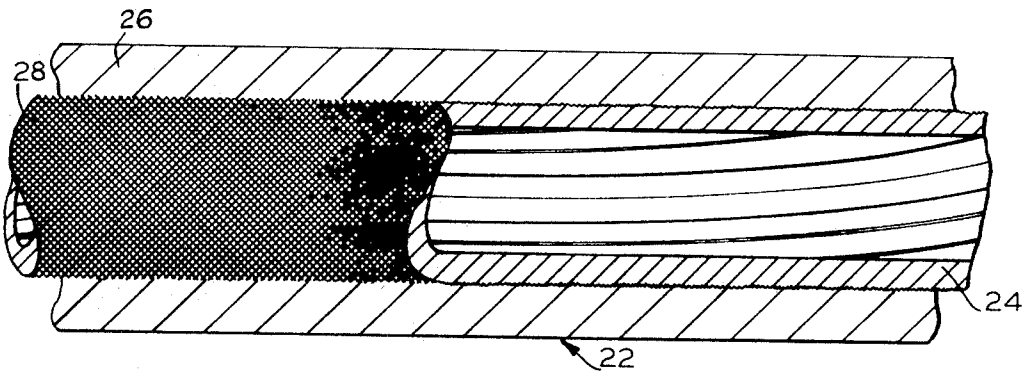


Fig. 2

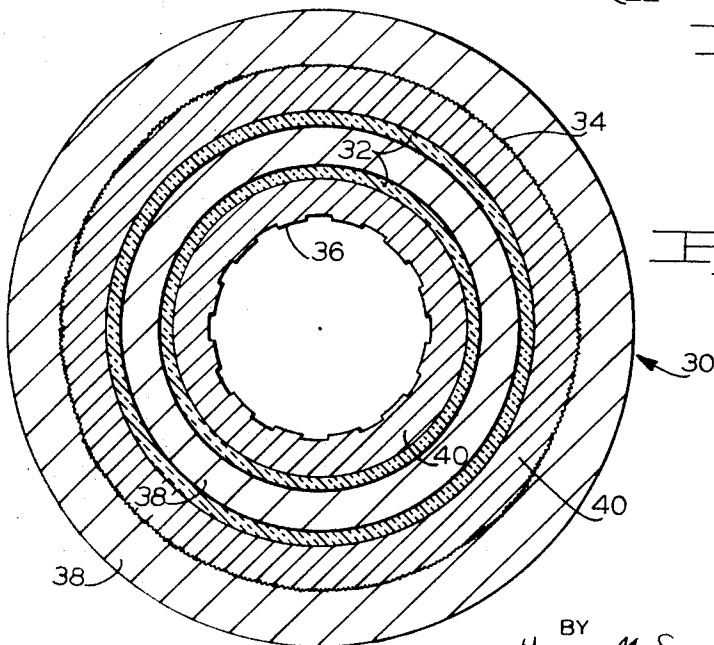


Fig. 3

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## COMPOSITE FIREARM BARREL

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

## BACKGROUND OF THE INVENTION

This invention relates to firearm barrels and pertains more particularly to composite barrels incorporating thermal resistance to the radial distribution of the high firing temperatures originating in the barrel bore.

In certain firearms, malfunctions, oftentimes dangerous, are frequently caused by the rupture of the barrels resulting from decreased stress properties in the material thereof at the elevated temperatures effected during firing bursts. Then, too, in certain other firearms, having reciprocating barrels supported by bearing members of sleeve configurations, malfunctions frequently occur due to the seizure of the barrels with the bearing members as a consequence of thermal expansion of the barrels through the elevated temperatures produced by prolonged firing.

## SUMMARY OF THE INVENTION

The problems are overcome by the present invention introducing resistance to the transmission of the heat, incident to the firing of the weapon, from the bore through the barrel wall. This is achieved by providing a composite barrel comprising a plurality of cylindrical members in nested relationship with induced thermal resistance means comprising one or more layers of a material having either a low thermal conductivity, or rough textured surfaces at the interfaces of the cylindrical members producing an induced high thermal resistance thereat, or a combination of these two thermal control means.

The specific nature of the invention as well as other aspects and advantages thereof, will clearly appear from the following description of the preferred embodiments which are illustrated in the attached drawing.

## BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a longitudinally cross-sectioned view of a firearm barrel in which a ceramic coating of low thermal conductivity is applied to the outer surface of the inner liner;

FIG. 2 is a view of an alternative embodiment similar to FIG. 1, and showing combinations of knurled surfaces at the interfaces along with other interface surfaces having a coating of thermal resistant material applied thereto; and

FIG. 3 is a transverse cross-section of another embodiment of a barrel having a plurality of cylindrical members in nested relationship and including knurled surfaces at the interfaces and more than one of the surfaces thereat coated with a low thermal conductive material.

## DESCRIPTION OF A PREFERRED EMBODIMENT

Shown in FIG. 1 is a firearm barrel 12 having a tubular liner or core 14 with a bore 16 for the discharge of a cartridge therein. Core 14 is fabricated preferably from a material such as stellite or titanium capable of retaining its hardness at the elevated temperatures reached during prolonged firing bursts. Barrel 12 also comprises a supporting outer sleeve 18 of a material

such as steel, which gives strength and rigidity to core 14 and so maintains the accuracy of barrel 12 and prevents it from rupturing as a consequence of the high temperatures produced therein.

Before insertion into sleeve 18, the outside surface of core 14 is integrally coated, as by flame spray or other well-known means, with a material 20 which has low thermal conductivity. For example, ceramic zirconium oxide applied to the outside surface of core 14 by flame spray to a thickness of the order of 0.030 inch has proven effective. Other oxides from the group including zirconium and magnesium are suitable alternates. While only two cylindrical members are shown, it is possible to fabricate barrel 12 from a plurality thereof in nested coaxial relationship.

With barrel 12 fabricated as described, it has been found that the external temperature thereof is considerably less than that reached by a conventional barrel under similar firing conditions, so that the stresses in sleeve 18 remain below that level at which the conventional barrel would be expected to rupture. Also, thermal expansion of barrel 12 is minimized to reduce seizures thereof with its bearing support when mounted for reciprocating operation.

Barrel 22, shown in FIG. 2, is similar to barrel 12 except that instead of a coating of low thermal conductive material being applied integrally to the outside surface of core 24, outside surface 28 thereof is roughly textured, as by knurling, to produce high thermal resistance at its contact with the inner surface of sleeve 26 when inserted therein. Other textured treatments of the surfaces of core 24 or sleeve 26 can also be used to produce thermal resistance at the interface thereof.

Shown in FIG. 3 is a barrel 30 which comprises a combination of coatings 32 similar to coating 20 and textured surfaces 34 which are similar to textured surface 28 to produce a barrel in which radial distribution of temperature from bore 36 can be controlled as desired.

It will be recognized by those skilled in the art, that the present invention can be applied with equal effect to the inside surface of the sleeve 38 alone or any combination of applications to the surfaces of the sleeve and liner 40 at the interfaces thereat or at the interface surface of the liner alone.

Although particular embodiments of the invention have been shown and described in detail herein, it is possible that other variations may be devised within the spirit and scope of the present invention and the following claims are intended to include such variations.

## I claim:

1. In a barrel comprising a plurality of cylindrical members in coaxial nested relationship forming interface surfaces therebetween, the addition of induced means for resisting the radial distribution of heat through said barrel, said means comprising a rough surface texture formed on at least one of such interface surfaces.

2. The invention as defined in claim 1 wherein said one of said surfaces comprises the outside surface of that member disposed adjacent to the longitudinal axis of said barrel.

3. The invention as defined in claim 1 wherein said one of said surfaces comprises the inside surface of that member having contact with the member disposed adjacent to the longitudinal axis of said barrel.

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4. The invention as defined in claim 1 wherein said rough surface texture is formed on both of said interface surfaces.

5. In a barrel comprising a plurality of cylindrical members in coaxial nested relationship forming interface surfaces therebetween, the addition of induced

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means for resisting the radial distribution of heat through said barrel, said means comprising a combination of a coating of low thermal conductivity on one of said interface surfaces and a rough surface texture formed on the other one of said interface surfaces.

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