

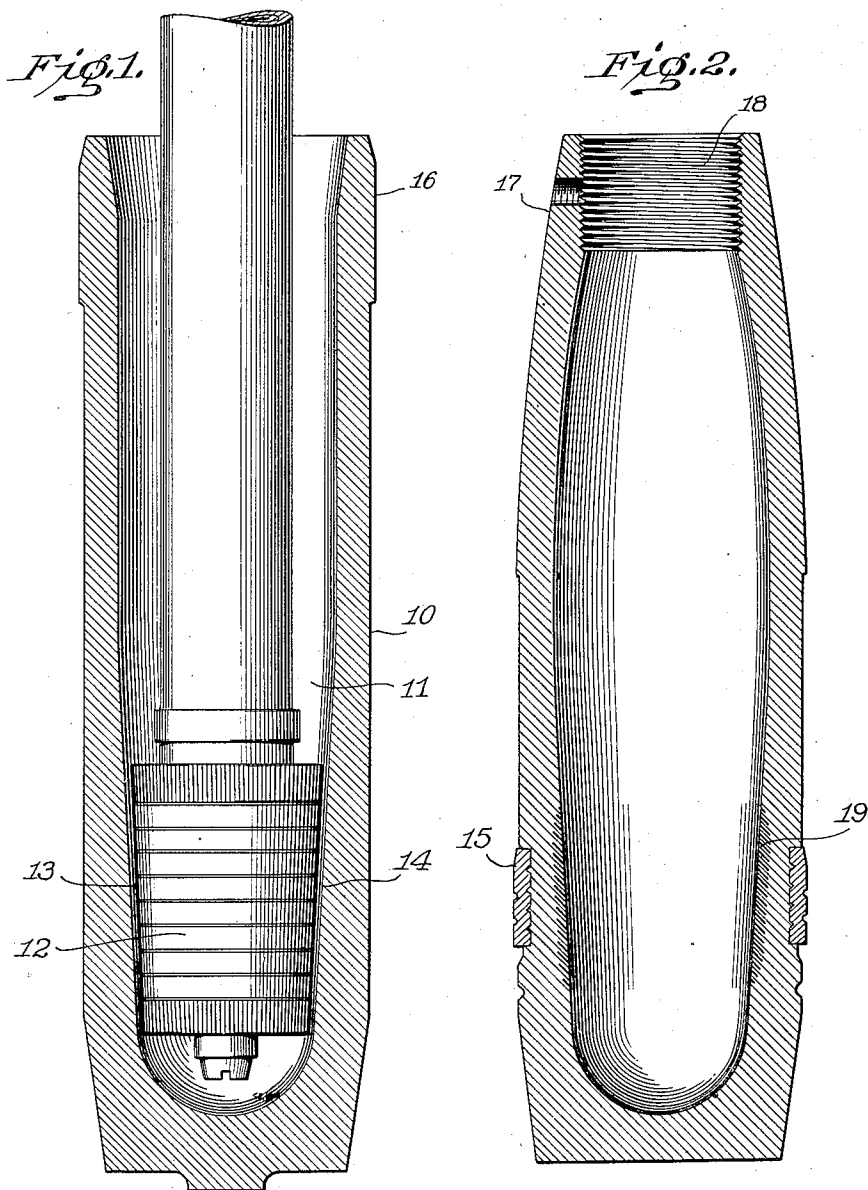
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REINFORCED EXPLOSIVE PROJECTILE

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REINFORCED EXPLOSIVE PROJECTILE

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1 Claim. (Cl. 102-56)

This invention relates to explosive shell bodies and their manufacture and has for its object to reinforce the shell body against fracture adjacent and radially beneath the rotating band. Another object is to harden a radially and longitudinally localized portion of the shell body. A further object is to strengthen a portion of the shell body by making it stronger and more dense than the other integral portions.

Referring to the drawing;

Fig. 1 shows the shell body and a heater within the same, and

Fig. 2 shows the same shell body after it has been strengthened and the nose reduced in diameter.

The explosive shell body 10 is of the usual type, being provided inside with the space 11 for reception of an explosive charge.

The interior ballistic stresses upon the projectile and especially upon its rotating band and the portions of the shell body adjacent thereto are so great as to be in danger of fracture prematurely. This invention strengthens the shell body adjacent and radially beneath the rotating band in order to reduce the danger of such premature fracture.

Specifically this is accomplished by the provision of a series of inducing coils 12 supplied with high frequency electric current for the purpose of rapidly heating the inner surface of the shell body by electromagnetic induction. Since the inner surface of the shell body beneath the rotating band is slightly tapered as shown the external surface 13 of the coils 12 is made to a similar taper and located close to the internal periphery 14 of the shell body. As is well known in the art of inductive heating it may take only two seconds to supply enough heat for the inner surface of the shell body to be brought to a hardening temperature. Promptly after being heated the heated portion is quenched by means of some suitable type of quenching fluid. In order to quench the heated surface the water or other fluid used may be supplied from some well known type of quench head located within the inducing head and adapted to function upon the prompt removal of the inducing head. Or if desired the quenching fluid may be supplied to the heated walls through or between the inducing convolutions as is also known in the art. The important thing is for the quenching to be effected promptly and before the high temperatures induced in the interior surface of the shell body have a chance to be transmitted by conduction through the full radial depth of the body. When the heating is

rapid and the quenching immediate the hardened portion 15 will be found to be localized both radially and longitudinally of the shell body beneath the portion in which the rotating band 16 is located.

After the hardening operation the forward portion 16 of the shell body is reduced in diameter to provide the usual ogive 17 in a manner well known in this art, interior screw threads 18 being provided for reception of a fuse or other device. The circumferential recess for reception of the rotating band may be formed either before or after the hardening operation described above.

When the hardening is rapid the hardened portion 15 will be found to be of a radial depth which is only a minor portion of the full radial depth of the shell body. This hardening operation strengthens the shell body beneath the rotating band and makes the hardened portion more dense than the rest of the shell body. This increased density for the hardened portion is believed to be due to both a grain growth and also to a compacting action exerted upon the hot somewhat plastic portion which tends to expand, but tension in the radially outer unheated portion tends to oppose expansion of the heated inner portion. The length and radial depth of the hardened portion may be changed from the dimensions illustrated. The hardened portion preferably should not extend throughout a major portion of the radial depth of the shell body. If the hardened portion extended through the full depth of the body the recess for the rotating band would be found to be difficultly formed with any usual cutting tool and would probably require being formed with a rotating abrasive tool.

Though only a single form of the invention is illustrated and described the invention is not limited thereto but may be embodied in various forms as desired. As various changes in construction and arrangement of parts may be made without departing from the spirit of the invention as will be apparent to those skilled in the art, reference will be had to the appended claim for a definition of the limits of the invention.

The hardening preferably takes place with the shell body having its hardened portion raised above the open end far enough for water or other quenching liquid to flow out by gravity.

As used in the appended claim the term "shell" is intended to be generic to any type of explosive projectile and includes shot and shrapnel, as well as shell.

What is claimed is:

A metallic ordnance shell having an annular

wall defining an explosive-containing chamber and provided with a circumferential recess in the external surface thereof circumscribing said chamber, and a shell-rotating band in said recess, said shell being of the type wherein during firing from a gun that portion of the wall which is surrounded by said band is subjected to heavy radially acting pressures tending to collapse the same, the portion of said wall for at least the axial extent surrounded by said band being constituted of integral inner and outer annular layers of metal of different hardness and stress

characteristics, each layer being of substantially uniform radial depth, the outer layer being of a predetermined hardness and under a state of residual tension and the inner layer being of a predetermined hardness greater than that of said outer layer and under a state of residual compression, said layers together providing said surrounded portion with a resistance to collapse failure which is greater than would exist in the absence of said layers of different characteristics.

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