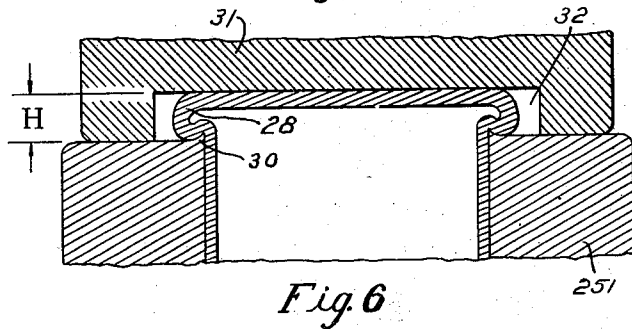
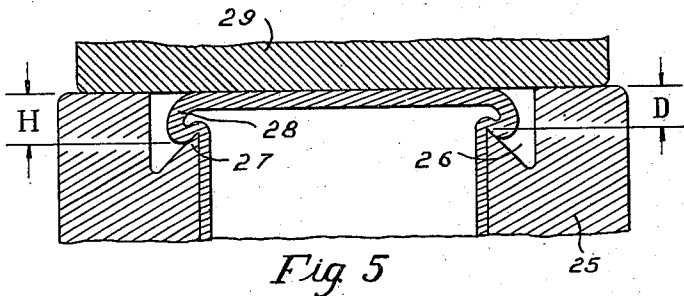
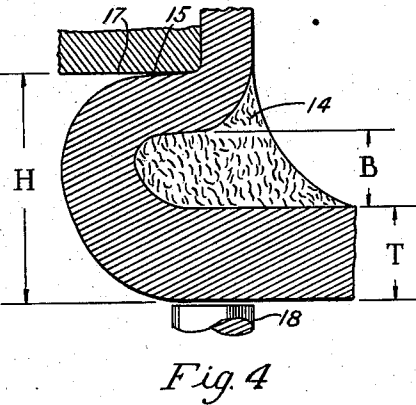
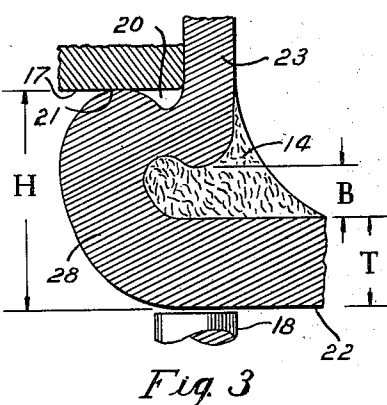
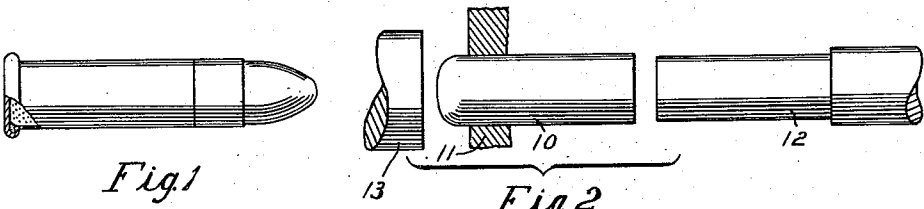


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This invention relates to ammunition, particularly to the cases or shells of rimfire cartridges, and contemplates an improved construction and method of manufacture enabling or facilitating greater flexibility in the choice of metals, metal thickness and metallurgical properties for such shells.

In the drawings:

Fig. 1 shows, partly in section, a rimfire cartridge embodying one aspect of the present invention.

Fig. 2 shows diagrammatically certain equipment ordinarily used in the heading of rimfire shells.

Fig. 3 is a fragmentary enlarged section of a primed rimfire shell embodying the present invention and including a diagrammatic representation of a fragment of a firearm chamber mouth and a firing pin.

Fig. 4 is a view, substantially similar to Fig. 3, of a fragment of a conventional rimfire shell, shown for the purpose of comparison.

Fig. 5 is a fragmentary sectional view of a rimfire shell in operative relation with one form of die and bunter used in the practice of the invention.

Fig. 6 is a view generally similar to Fig. 5, showing a modified form of die and bunter.

In the manufacture of rimfire shells, a cup or shell blank 10 (Fig. 2), trimmed to a desired length and having a somewhat arcuate head, is pushed into position in and projecting from a die 11 by a punch or heading stem 12 shouldered to engage the mouth of the cup or shell blank, as indicated. The blank thus held in the die is impacted by a bunter 13, flattening and widening the head of the hollow rim configuration shown in Fig. 4. Subsequently, a primer composition 14 is spun into the hollow rim. In use, the narrow face 15 of the rim adjacent the cylindrical body 40 is engaged with the flat face 17 of the chamber mouth, and with the loaded cartridge in this position ignition of the priming composition 14 is secured by the impact of a firing pin 18 on the opposite side of the rim. The impact of the firing pin forces the rim metal inward, crushing and frictionally igniting the portion of the priming composition 14 thereunder, the opposite face of the hollow rim, backed by the solid metal of the chamber mouth 17 serving as an anvil to sup-

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port the priming composition during the firing pin impact.

Rimfire shells of the type above described were for a great many years chiefly made from copper or alloys of high copper content, such as gilding metal (95% copper, 5% zinc), dimensions were long ago empirically determined with reference to this relatively soft low tensile strength metal, and guns for the cartridge were designed accordingly. Gilding metal shells are ordinarily drawn from stock of a thickness T (Figs. 3 and 4) of about .020". In the drawing of the shell the thickness of the metal in the flat portion of the head remains substantially unchanged, while the thickness of rim and body is reduced in drawing in substantially the proportions illustrated in Figs. 3 and 4. For the conventional shell shown in Fig. 4, the total head thickness H is only slightly less than the gun "head space" (distance from chamber mouth to bolt face) and is fully determined by the metal thickness T, the thickness of the bridge B of priming composition between the head and the interior of the fold or rim, and the somewhat reduced thickness of metal between the bridge B and the face 15 of the rim adjacent the body.

The enormous number of rimfire arms now in the hands of the public designed for a certain head space and a given firing pin blow renders it impracticable to alter either of these values. The conventional head space must be maintained, and a sensitivity adequate to insure ignition of the priming by a standard firing pin blow must be maintained. These limitations have rendered it difficult to make rimfire cases of metals of hardness, elasticity and strength properties differing substantially from those of relatively soft gilding metal. With brass and particularly various steels, strength considerations do not require the same metal thickness used for copper, and such a metal thickness becomes undesirable, because these less deformable metals do not transmit the firing pin blow with the force necessary to insure primer ignition. When an attempt is made to use a thinner metal, the head thickness being determined as above set forth, the bridge thickness B is increased, and again sensitivity difficulties are encountered. Prior to the present invention the relation of bridge thickness to impact sensitivity has not been fully recognized.

The present invention provides a head structure for rimfire cartridges which is of such configuration that bridge thickness and sensitivity are substantially independent of metal thickness, hardness, tensile strength or other properties. The novel construction is best illustrated in Fig. 3. The exterior face of the rim adjacent the body, instead of extending outward substantially at a 90° angle to the body and being joined thereto by a very small radius, describes a compound curve, being displaced downward toward the planar part of the head in a hollow or trough 20, and outwardly therefrom curving back in the direction of the shell mouth to form the lobed or ear-shaped rim identified generally by numeral 28. The interior of the hollow rim is of generally corresponding configuration, though somewhat altered by the metal thickness gradient. The head thickness H is the distance from uppermost part 21 of the compound curve to the planar face 22 of the head, while the bridge thickness B is determined by depth of the downward fold or trough 20 between the chamber face engaging part 21 and the body 23. By the use of this construction, the head thickness H can be maintained, and, regardless of metal thickness, any desired bridge thickness B can be secured. The optimum bridge thickness has been found to be from .006" to .008", and successful cartridges have been made with steels of a thickness as low as .015". The depth of the trough or re-entrant curve 20 will, of course, vary with the metal thickness. It has likewise been found that, a proper bridge thickness being maintained, sensitivity is substantially independent of metal treatment and hardness. There is thus available a flexibility in the selection and treatment of metal for which there is a need in securing correct properties in other parts of the shell.

One form of apparatus for making the shell illustrated in Fig. 3 is shown in Fig. 5. The die 25, replacing the conventional die 11 shown in Fig. 2, is formed with a recess 26 terminating adjacent the shell receiving bore in a projection 27, the end of which has the configuration necessary to form the trough 20. The recess 26 enables the flow of metal past the projection to form the lobed or ear-shaped rim 28. The bunter 29 may be of conventional construction similar to that identified as 13 in Fig. 2, and so mounted as to enable contact of its end face with the end face of die 25. The dimension D between the end of the projection 27 and the face of the bunter, hence the flat face of the shell head, is thus fully determined, and the head thickness H is determined by the protrusion of the shell blank (see Fig. 2) beyond the end of projection 27.

A modified form of die and bunter are shown in Fig. 6. The mouth of die 251, replacing the conventional die 11 shown in Fig. 2, is not recessed but is provided with an annular projection 30 surrounding the shell receiving bore and a clearance outside of this projection to permit the formation of the lobed rim 28. The bunter 31 is adapted to engage the die face and is provided with a recess 32 of a depth which determines the head thickness H, while bridge thickness is fully determined by the height of the projection 30. Obviously the bunter 29 could be used with similar results by the provision of suitable means to limit the extent of movement thereof and thus control over-all head thickness.

It will be obvious that the invention enables a control of bridge thickness which is independent of metal thickness and is wholly new to the art.

I claim:

1. A rimfire cartridge shell comprising a tubular body having one end open and a closed head formed integrally about the other end, said head having a hollow rim projecting annularly beyond the periphery of the body and projecting longitudinally in the direction of the open end of the body in overlapping relation to a portion of the tubular body, the interior of the hollow rim being in continuous communication with the interior of the tubular body.

2. A rimfire cartridge shell comprising a tubular body arranged to be inserted in the chamber of a firearm barrel, and a hollow rim integral with said tubular body projecting laterally beyond the periphery thereof and arranged to engage a portion of the chamber mouth defining end face of said barrel, the interior of said hollow rim being in continuous communication with the interior of the body of said shell and said rim being characterized by a given total exterior thickness in a direction parallel to the axis of the chamber throughout a given annular region spaced uniformly radially outwardly from the body of the shell and further characterized by a total exterior thickness less than said given thickness when measured in the same direction throughout an annular zone between said given annular region and the periphery of the body of the shell.

3. A primed rimfire cartridge comprising a tubular body adapted to contain a propellant powder and arranged to be inserted in the chamber of a firearm barrel; a folded rim integral with said tubular body projecting laterally beyond the periphery of the body and arranged to engage a portion of the chamber mouth defining end face of a firearm barrel, the interior of said folded rim being in continuous communication with the interior of the tubular body; and a priming composition contained within said folded rim in continuous communication with the interior of the tubular body, said rim and the priming composition contained therein being each characterized by a given thickness in a direction parallel to the axis of the tubular body throughout a given annular region spaced uniformly outwardly from the periphery of the body; and each further characterized by a thickness less than said given thickness when measured in the same direction throughout an annular zone between said given annular region and the periphery of the tubular body.

4. A rimfire cartridge shell comprising a tubular body open at one end and a head integral with and closing the opposite end of said body, said head comprising an interior hollow rim opening to the interior of said shell and adapted to contain a priming composition, said rim further comprising an exterior gun barrel chamber mouth engaging portion joined to and intersecting the exterior periphery of said tubular body in an arc substantially greater than 90°, an annular portion of said chamber mouth engaging portion of the rim being nearer than the said opposite end of the body portion to the said open end.

5. A rimfire cartridge shell comprising a tubular body having one end open and a closed head formed integrally about the opposite end; said head including a hollow primer composition containing rim opening throughout its periphery to the interior of said body, projecting annularly beyond the periphery of said body and projecting longitudinally in the direction of the open end in overlapping relation to the tubular portion of the body.

6. A rimfire cartridge shell comprising a hollow body having a tubular portion with an open forward end and having a closed rear end intersecting and integral with said tubular portion; said closed end defining a head having a hollow primer composition containing rim opening throughout its periphery to the interior of said body, projecting annularly beyond the periphery of said tubular portion and projecting longitudinally in the direction of the open end in overlapping relation to the said tubular portion.

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