W. G. BOND.

GUN WAD.

APPLICATION FILED JULY 30, 1920.

1,358,279. **Patented Nov. 9, 1920.**

Fig. 1.

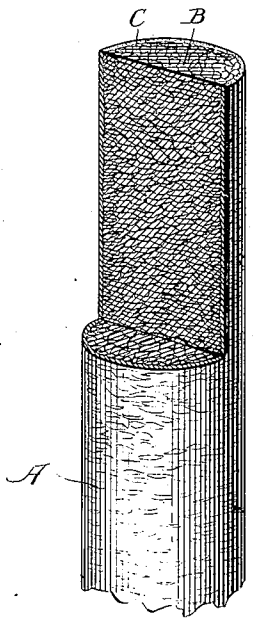


Fig. 2.

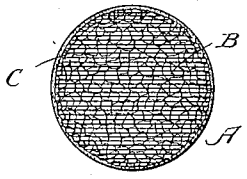
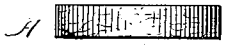


Fig. 3.



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GUN-WAD.

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To all whom it may concern:

Be it known that I, WILLIAM G. BOND, a citizen of the United States, residing at Wilmington, in the county of New Castle and State of Delaware, have invented certain new and useful Improvements in Gun-Wads; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to improvements in gun wads and particularly to the wads which are interposed between the powder charge and shot charge of a shell adapted for use in trap and field shooting.

The exacting demands of modern sportsmen is such that to supply factory ammunition every effort of the manufacturer must be bent toward securing more highly satisfactory results, both with respect to the pattern made by the charge of shot and with respect to the penetration at given ranges and, from a ballistic standpoint, the keeping qualities of the loaded shells becomes an additional important consideration. It is well known that the pattern and penetration are both profoundly affected not only by the character of the powder or explosive employed, but by the method of loading and the character of the wad or wads interposed between the powder and shot charges. The keeping qualities of the shell depend largely upon the character of the wad employed to protect the powder, and this in turn profoundly affects the results obtained when the shells have been kept under varying conditions of humidity, inasmuch as the powder may either absorb moisture or lose its volatile content.

It has been demonstrated that a relatively thick and somewhat elastic wad should be interposed between the powder and shot and this has given rise to the common practice of employing a felt wad or wads at this point, the edges of such wads being greased or provided with a semi-solid unctuous compound of some kind, but such wads leave much to be desired, both in the economy of production and in the results secured with their use. This has given rise to many efforts to produce a more satisfactory wad. Such efforts have resulted in the suggestion of the use of comminuted cork with a binding material, but no one has apparently, prior to this time, devoted sufficient time and inventive effort to a solution of the problems to enable them to produce a wad which will give entirely satisfactory results.

In accordance with the present invention the wad is preferably composed of comminuted cork, the particles of which are bound together by an insoluble binder of an elastic or flexible nature, while the particles of cork themselves are more or less impregnated with a hygroscopic substance or liquid which will preserve the inherent elasticity of the particles when subjected to either atmospheric conditions or to the contact of absorbent substances under such pressure as may be developed in the loaded shell. Such hygroscopic substance preserves the powder in its original condition or prevents it from change due to external hygroscopic conditions. Furthermore, the characteristics of the wad are such,—partly due to the process of manufacture and partly due to the mechanical handling to which it is subjected—that the cork particles are arranged in flake-like formation; that is to say, they are practically of normal dimension laterally of the axis of the wad and of less dimension axially of the wad, and in proximity to and at the periphery they are somewhat more dense and held under greater pressure by the binder than at the center of the wad. With all of these characteristics it is found that important and more satisfactory results may be attained if the periphery of the wad is formed by a surface which may be characterized as a molded surface and if the flat faces of the wad are formed by cut surfaces, and inasmuch as the desirable characteristics so obtained lend themselves favorably to an economical and satisfactory method of production, the result is that highly satisfactory wads may be placed upon the market at a minimum cost, all having uniform characteristics.

Referring to the accompanying drawings,—

Figure 1 is a perspective view of a rod of comminuted cork having the internal characteristics hereinbefore referred to and with an external coating of wax, a portion of said rod being shown in longitudinal section.

Figs. 2 and 3 are a face and edge view, respectively, of a completed wad which has been cut from the rod illustrated in Fig. 1.

The practical operation of producing wads in accordance with the present invention as practised by me at this time, involves a series of steps which may be briefly described as follows, no claim herein being made for the process or machine, inasmuch as the latter constitute separate inventions which it is not desired to claim herein. The comminuted cork having been freed from foreign undesirable matter, such as grit or hard particles, is suitably treated with a composition embodying glycerin, gelatin, water and paraffin, together with a coagulant, such, for example, as formalin, the proportions of cork, glycerin, gelatin, water and paraffin preferably employed being, for example, fifteen pounds of cork, four and one-half pounds of glycerin, one and one-half pounds of gelatin, three pounds of water, one-half pound of paraffin, and a sufficient quantity of formalin to coagulate and set the gelatin to form an efficient binder. The prepared granulated cork, when treated with the ingredients above mentioned, presents the appearance of substantially dry highly elastic granules. The material is now fed gradually into one end of a tube and out of the other end under a considerable pressure, preferably obtained through the reciprocatory action of a plunger, although other equivalent means may be employed, and during its passage through the tube it is subjected first to a cooling zone, then to a relatively long heating zone, and, finally, to a second cooling zone, and at the end of the heating zone or thereabout, it is allowed to expand slightly in a direction transversely of the axis of the rod, this being usually accomplished by slightly tapering the tube for a short distance intermediate two portions of different diameters. In its passage through the tube, the cork particles are subjected to the heaviest pressure at that point which is located a short distance back of the enlargement, and this is also the point where the heat penetrates the column of particles throughout and operates to make effective the binder material for uniting the particles. As the rod or column of cork moves into the area of larger diameter, it expands longitudinally to a greater extent than laterally, but, inasmuch as the pressure on the particles has been largely confined to longitudinal pressure, the particles still retain a more or less flake-like formation, but it is found that the elasticity is greatest in a longitudinal direction, due to the greater expansion in that direction and the apparent resistance of the particles to compression edgewise, owing to their being bound on all sides by adjacent particles and to the action of the binder at the peripheral surface. It is also found that the particles in proximity to the peripheral surface are somewhat more dense and harder than those throughout the inner portion of the column or rod, and apparently the peripheral particles are under tension while the inner particles are held under compression thereby. This is shown by the fact that a longitudinal strip cut from the interior of a rod or column will elongate more than a similar rod or strip cut from the peripheral portion, or a strip which embodies both the central and peripheral portions will curl outwardly when left free from external influences.

The flake-like formation of the particles is illustrated at B in Fig. 1 where the rod or column of cork A has been cut to show a longitudinal section as will be readily appreciated by comparing this sectional formation with the transverse sectional formation shown in Fig. 2.

Those particles which lie nearest the periphery, as indicated at C, are somewhat more dense and harder than those lying near the center.

Preliminary to the severing of the rod into wads of the desired thickness, the column or rod is dipped in a bath of melted paraffin so as to provide a thin, uniform surface coating, which will close the pores and any possible interstices that may be left in the molded surface and after the paraffin has hardened the rod or column is severed into wads of the desired thickness, usually about three to five sixteenths of an inch thick. In performing this operation it will be noted that the resultant wads are formed with molded peripheral surfaces and cut faces and this is the condition in which they are preferably supplied for use.

Wads formed in the way described are found to give a better pattern than wads heretofore provided. They do not blow to pieces on emerging from the gun barrel, nor do they blow through the charge of shot. It has been found that for the same gage of gun wads of somewhat larger diameter than felt wads may be economically employed so as to more completely fill the gun barrel without danger of swelling the shells in loading, and the indications are that with the use of such wads higher chamber pressure may be utilized, or, what is equivalent thereto, the use of nitro or other high explosive powders will become possible without introducing undesirable characteristics in the action of the charge on the pattern but with the desirable result of increased penetration.

The use of a hygroscopic substance such as glycerin preserves the elasticity of the cork and the normal condition of the powder under practically all conditions of atmosphere and use, and while glycerin is the preferred liquid, it is obvious that other substances having the characteristics of preventing the undue elimination of water from the cork or of supplying a hygro-

scopic medium thereto, may be employed without departing from the present invention, and such substances may be employed in wads of other material than comminuted cork.

What is claimed is:

1. A gun wad having an elastic body with a hygroscopic substance incorporated therein.

2. A gun wad composed of comminuted elastic material containing a hygroscopic substance and an insoluble flexible binder uniting the particles.

3. A gun wad composed of comminuted elastic material containing a hygroscopic liquid substance and an insoluble flexible binder uniting the particles.

4. A gun wad composed of comminuted cork containing a hygroscopic liquid, and an insoluble flexible binder uniting the particles.

5. A gun wad composed of comminuted cork with the particles united by a flexible binder, said wad having a mold formed peripheral surface and cut faces.

6. A gun wad composed of comminuted cork particles united by a flexible binder, said particles being of flake-like formation with their average greatest dimension transversely of the axis of the wad, said wad having a molded peripheral surface and cut faces.

7. A gun wad composed of comminuted cork particles united by a flexible insoluble binder, those particles located in proximity to the periphery of the wad being of greater density and hardness than those particles located centrally of the wad.

8. A gun wad composed of comminuted cork particles with the particles united by a flexible insoluble binder, the particles in proximity to the periphery of the wad being under tension, and the particles in proximity to the center being under compression transversely of the axis of the wad.

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