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PLASTIC COATED SHOTGUN PELLETS

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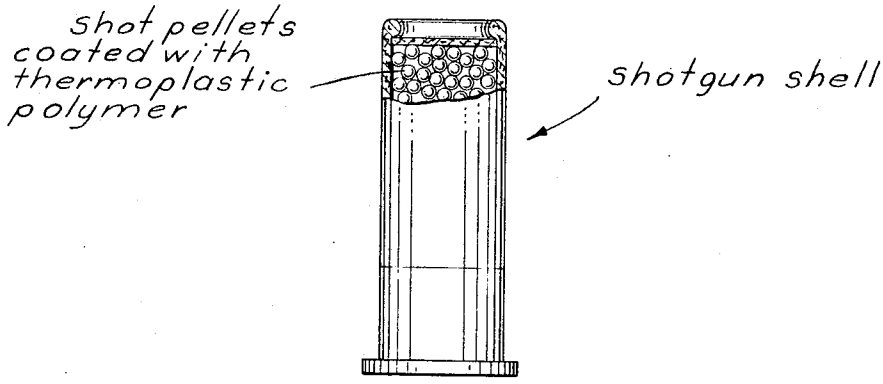


Fig. 1

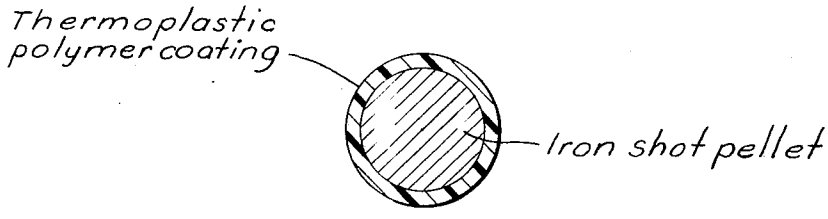


Fig. 2

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PLASTIC COATED SHOTGUN PELLETS

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ABSTRACT OF THE DISCLOSURE

The invention concerns iron shotgun pellets and shotgun shells containing such pellets which are coated with a fused normally solid thermoplastic polymer of polytetrafluoroethylene, polyethylene, polypropylene or a synthetic polyamide, useful for obtaining improved shot patterns and preventing extreme shotgun barrel wear. Also, the method concerns using shotgun pellets coated as above in order to obtain improved shot patterns.

This invention concerns plastic coated shotgun pellets and relates to shotgun shells containing plastic coated metal pellets.

It is common knowledge that in the use of a shotgun in the sports of hunting, skeet shooting, and trap shooting, the shot pattern is most important. This includes where the shot pellets fall in the target area, i.e. pattern uniformity, as well as how many pellets strike the target, e.g. pattern density.

It is known that a sleeve or tubular body casing of polyethylene inserted around the lead shot pellets in a shotgun shell acts as a cushion for the shot as it travels down the barrel of the gun, and prevents or substantially inhibits deformation of the shot that normally would contact the barrel and results in approximately a 4 to 10 percent improvement in pattern density. It is known that as a rule spherical shot produce more uniform patterns than do deformed shot.

It is also known that shotgun patterns are often non-uniform, the shot having a tendency to cluster and fall on the pattern board (or target) closely grouped together rather than uniformly spread out. This tendency results in patchy patterns or patterns with holes in them. Every shotgunner, and particularly trap and skeet shooters, would dearly love a shell that would avoid this tendency to patchiness or holes in the shot string.

An additional aspect to which this invention relates is that of a national conservation problem concerning the death by lead poisoning of great numbers of waterfowl, especially ducks and geese who, while bottom feeding in hunting areas, ingest the spent lead shot and grind it up in their digestive process thus causing lead poisoning. Efforts are being made to solve this problem and this tragic waste of our waterfowl.

One proposed solution has been the use of an inert plastic coating for lead shot pellets.

Another proposed solution is the use of a nontoxic metal as a substitute for the lead. So far, the most promising substitute appears to be iron or steel shot. The advantages of iron shot are that it would quickly rust away in water, and, even if it were to be swallowed by the ducks, it would not poison them. Also, tests have shown that up to a range of 40 yards, penetration with iron shot is often greater than that of lead shot in spite of the gravity differential between lead and iron of 11.35 and 7.85 respectively. This is probably due to a higher velocity imparted to the lighter iron shot by a given powder loading. Beyond about 40 yards the superiority of the heavier lead shot comes into play. However, especially in the case of skeet shooting and regulation trap shooting, the 40 yard limitation is unimportant since all targets are taken within a 40 yard range. The same could be

said of the average kill made by duck hunters. The big disadvantage of iron or steel shot is the extreme barrel wear produced as the relatively hard shot traverses the barrel. Although reduced barrel wear can be obtained by using a plastic sleeve or tubular body casing around the iron shot, this results in the disadvantage of producing a tighter pattern which is undesirable for some purposes such as skeet shooting where an open uniform pattern is needed.

It is an object of this invention to provide shotgun shell shot, e.g., iron or steel shot pellets, or predominantly iron or steel pellets, coated with a plastic. Another object is to provide iron or steel shot pellets coated with a plastic and suitable for use in the manufacture of shotgun shells which coated pellets inhibit and substantially prevent extreme barrel wear by substantially or completely eliminating contact between the barrel surface and the bare iron or steel shot. A further object is to provide shot pellets coated with a tetrafluoroethylene polymer. Still another object is to provide shot pellets coated with an aliphatic olefin polymer such as polyethylene or polypropylene. A still further object is to provide a method for improving the shot pattern of shotgun shells by coating the shot contained therein with a plastic which will not only protect the shot from deformation by contact with the barrel of the gun, but will also prevent deformation resulting from pressure contact between contiguous shot.

The foregoing and additional objects and cognate advantages and benefits of this invention are obtained by coating the shot pellets with a resinous thermoplastic polymer, e.g., polytetrafluoroethylene, polyethylene, polypropylene, or a synthetic polyamide resin.

In the drawings:

FIGURE 1 is a self-explanatory schematic partial section view of a shotgun shell containing shot pellets coated in accordance with the present invention.

FIGURE 2 is a self-explanatory enlarged cross-sectional elevational view of one of the coated shot pellets shown in FIGURE 1.

The polymers to be employed for coating the shot must provide sufficient lubricity between the shot and the inner surface of the barrel of the gun with which it comes in contact so that extreme barrel wear is prevented. The polymer coating of the shot contained in a shotgun shell must protect the shot not only from deformation caused by contact with the barrel of the gun, but also from deformation resulting from pressure contact between contiguous shot.

Among suitable polymers are the normally solid resinous thermoplastic homopolymers of tetrafluoroethylene, and copolymers consisting principally of from 85 to 99 percent by weight of tetrafluoroethylene and from 1 to 15 percent by weight of hexafluoropropene, and polymers such as polyethylene, polypropylene, and synthetic polyamide resins commonly known as nylon 6, nylon 66, or nylon 100. The homopolymers and copolymers of tetrafluoroethylene, known to the trade as "Teflon" TFE-fluorocarbon resins, are preferred because of their good lubricity characteristics, although polyethylene, polypropylene and synthetic polyamide resins are suitable.

The effect of extreme barrel wear by using plastic coated iron or steel shot can readily be determined by comparative tests, in which one or more shotguns using the plastic coated iron or steel shot are compared to one or more shotguns using the non-coated iron or steel shot. The effects on barrel wear can readily be observed and compared after a sufficiently large number of shells are fired. In each such test, it will be found that the plastic coated iron or steel shot produced no significant barrel wear, while the non-coated iron or steel shot produced

substantial or extreme barrel wear. It may be mentioned that hard, i.e., unannealed, iron or steel shot produce greater barrel wear than do soft or annealed iron or steel shot.

The improvement in shot pattern resulting from the use of plastic coated lead, iron or steel shot can also be readily determined by comparative tests. For example, by taking two substantially identical shotguns, placing two target boards containing a 30-inch diameter target circle at a range of from 25 to 40 yards, with one gun using shells containing plastic coated lead, iron, or steel shot and the other using similar but non-coated shot, and the firing of a sufficient number of shells at the targets, the improved shot pattern of the gun firing the plastic coated shot will be found. Not only will there be improvement in the number of shot in the target, i.e., the pattern density, but also an improvement in pattern uniformity will be found.

The coating of the lead, iron, or steel shot pellets with the thermoplastic resin to form an impervious film, coating, or layer of the fused polymer about 0.1 mil to 2.0 mils thick on the surface of the shot can be carried out in usual ways. The methods include dipping the pellets in a solution of the polymer in a solvent and evaporating the solvent to leave a residue layer of the polymer covering the individual shot pellets, or using a fluid bed technique such as contacting the heated lead, iron, or steel shot with the finely divided polymer in a fluid bed, or suspended in a counter-current stream of air wherein the pellets, falling for example by gravity, contact the powdered polymer which adheres thereto and the powder and pellet are subsequently heated or subjected to heating, e.g., by infrared lamps, such that the powdered polymer coating is fused to form a continuous coating on the individual shot. The polymer coating can be formed by tumbling the lead, iron, or steel shot in a drum with the powdered resinous polymer wherein the polymer and shot are heated to sinter the powder into a continuous protective coating, after which the coated shot are removed and heated to fuse the polymer. In general, the heating of lead shot pellets should not exceed a temperature of about 500° F., and is preferably carried out at temperatures not higher than about 480–485° F. in order to avoid distorting of the spherical shot pellets. Iron or steel shot can be heated at higher temperatures.

The following examples illustrate ways in which the principle of the invention can be applied, but are not to be construed as limiting its scope.

Example I

Number 4 lead shot intended for loading shotgun shells was cleaned of surface lubricants and oxide coating by shaking the shot in an aqueous slurry of a commercial kitchen cleaning powder for ten minutes, then washing the cleansed shot with water and drying the same. The cleansed shot were sprayed with an aqueous slurry of finely divided polytetrafluoroethylene and dried. The dried shot coated with the powdered polytetrafluoroethylene were heated in an air oven at 480–485° F. for one hour to fuse the polytetrafluoroethylene particles into a continuous coating, then were cooled to room temperature. The shot were sprayed with a second coating of an aqueous polytetrafluoroethylene slurry and were dried, and the dried powdered coating fused by heating the shot in an oven at 480–485° F. for one hour as was done previously. The shot had a continuous fused coating of polytetrafluoroethylene on the surfaces. These coated lead shot are loaded into shotgun shells, and tested by firing at target boards 40 yards away against shells containing non-coated lead shot. An improved shot pattern is found.

Example 2

Hard iron shot, intended for loading shotgun shells and corresponding in size to No. 6 lead shot, are immersed in a solution of polyethylene having a melt index of 5 dissolved in decalin at a temperature of 100° C., and are removed, the solvent is evaporated and the pellets dried. The dried pellets are found to have a continuous surface coating of polyethylene. The coated pellets are loaded into shotgun shells and tested against shotgun shells containing non-coated and hard iron shot. Two target boards are set up at 40 yards, one for each gun respectively using the polyethylene coated shot and the non-coated shot in the shells. After firing a sufficient number of shells, the coated shot is found to produce an improved shot pattern. Also, no extreme barrel wear is found after prolonged use of the coated shot, whereas extreme barrel wear is found in the gun using the non-coated and hard iron shot.

Example 3

Number 6 lead shot pellets are coated with "Zytel," a superpolyamide resin, and loaded into shotgun shells, and tested against shells containing non-coated lead shot. An improved shot pattern is produced with the coated shot fired at target boards 25 yards away.

Example 4

Iron shot of a size corresponding to No. 6 lead shot are coated with polypropylene, and loaded into shotgun shells. These are test fired against shells containing non-coated iron shot at targets 35 yards away. Extreme barrel wear is eliminated and an improved shot pattern results from the use of the coated iron shot.

I claim and desire to secure Letters Patent for:

1. Iron shot pellets suitable for loading shotgun shells having a protective surface coating of a fused normally solid resinous thermoplastic polymer, said polymer selected from the group consisting of polytetrafluoroethylene, polyethylene, polypropylene and a synthetic polyamide.

2. Shot pellets according to claim 1, wherein the polymer is polytetrafluoroethylene.

3. Shot pellets according to claim 1, wherein the polymer is polyethylene.

4. Shot pellets according to claim 1, wherein the polymer is polypropylene.

5. Shot pellets according to claim 1, wherein the polymer is a synthetic polyamide.

6. Shotgun shells containing iron shot pellets having a protective surface coating of a fused normally solid resinous thermoplastic polymer, said polymer selected from the group consisting of polytetrafluoroethylene, polyethylene, polypropylene and a synthetic polyamide.

7. Shotgun shells according to claim 6, wherein the polymer is polytetrafluoroethylene.

8. Shotgun shells according to claim 6, wherein the polymer is polyethylene.

9. Shotgun shells according to claim 6, wherein the polymer is polypropylene.

10. Shotgun shells according to claim 6, wherein the polymer is a synthetic polyamide.

References Cited

UNITED STATES PATENTS

2,257,878	10/1941	Brennan	102—92.5
2,772,634	12/1956	Oberfell	102—42
2,919,647	1/1960	Dear et al.	102—42
2,928,348	3/1960	Zisman et al.	102—93

OTHER REFERENCES

"Smokeless Shotgun Powders," by Wallace Coxe; E. I. Du Pont, 1935, pp. 60–62.

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