March 21, 1967 F. A. LAGE 3,309,994

SHOT SHELL

Filed March 29, 1965

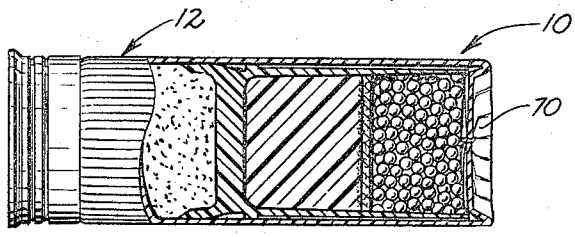


Fig. 1

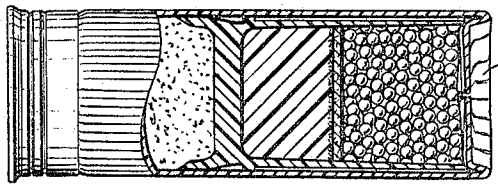


Fig. 2

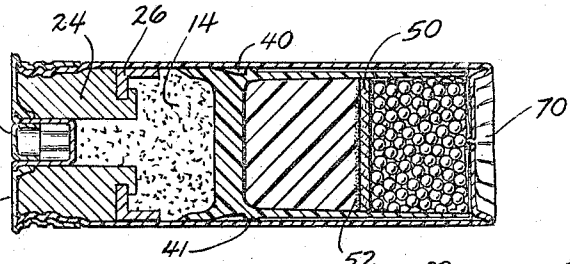


Fig. 3

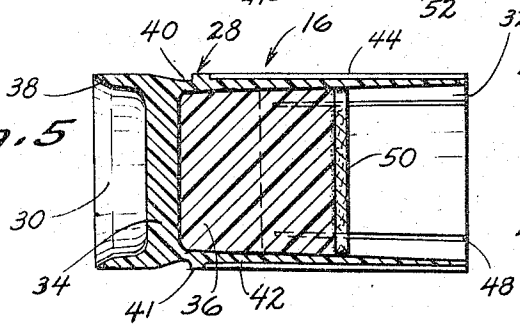


Fig. 5

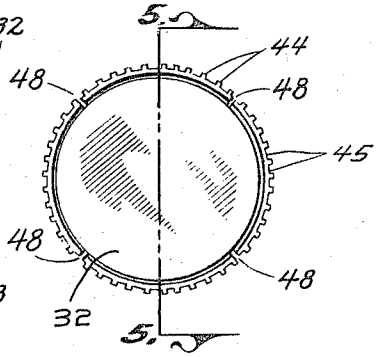


Fig. 6

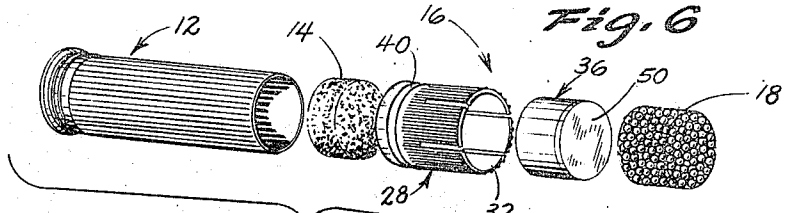


Fig. 4

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SHOT SHELL

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This invention relates to shot shells and the method of loading them and in particular to shot shells used in shotguns and hand loaded.

It is an object of this invention to provide a shot shell having a universal one column wad which will permit the loading of shells having different quantities of shot or shell casings which vary in length.

Another object of this invention is to provide a universal shot shell having a wad which serves as a cushion and eliminates excessive breech pressure due to cushion start-off.

Another related object of this invention is to provide a shot shell having a shot protector sleeve and wad which results in less shot deformation for better shot patterns and less recoil on the shooter's shoulder.

A still further object of this invention is to provide a shot shell having a universal shot protector sleeve which has a gas sealer groove which serves to permit expansion of the sleeve sidewall to reduce friction and to provide a seal against the passage of gas from the powder chamber in the shell.

A still further related object of this invention is to provide a shot shell having a shot protector sleeve and universal wad which may be preassembled prior to loading the shot shell and thereby minimize the steps and time required in the loading operation.

Another related object of this invention is to provide a shot protector sleeve which uses a universal wad formed from expanded plastics.

A further related object of this invention is to provide a shot protector sleeve having a universal wad formed from a plastic foam.

Another object of this invention is to provide a shot protector sleeve and wad which is very inexpensive to fabricate and easy to assemble in a shot shell.

A further object of this invention is to provide a shot shell and method of loading same which is simple in design, economical to manufacture and refined in appearance.

These and other objects will be apparent to those skilled in the art.

This invention consists in the construction, arrangements, and combination of the various parts of the device, whereby the objects contemplated are attained as hereinafter more fully set forth, specifically pointed out in the claims, and illustrated in the accompanying drawings, in which:

FIGS. 1 and 2 are similar views illustrating in cross-section the construction of shot shells having different quantities of shot but employing the same shot protector sleeve and wad unit;

FIG. 3 is a cross-sectional view similar to FIG. 1 but illustrating in further detail the base end of the shot shell;

FIG. 4 is an exploded view of the shot shell;

FIG. 5 is a cross-sectional view of only the shot protector sleeve and wad unit taken along line 5—5 in FIG. 4 on a reduced scale; and

FIG. 6 is a right end view of the shot protector sleeve and wad unit of FIG. 5.

An embodiment of this invention as illustrated in the drawings is generally referred to in FIG. 1 by the reference numeral **10** and is shown in FIG. 4 to include four basic components, a shot shell casing **12**, powder **14**, a shell protector sleeve and wad unit **16**, and the shot shell **18**.

The shell casing **12** includes a primer **20** in a metal base cup **22**. A support element **24** seats against the inner surface of the metal cup **22** and embraces the primer **20**. An annular sealing element **26** is seated against the top surface of the support element **24** and the powder **14** is positioned against the inner surfaces of the primer **20**, the support element **24** and the sealing element **26** as seen in FIG. 3.

The shot protector sleeve and wad unit **16** includes a sleeve **28** having a first cup chamber **30** for receiving the powder **14** and a second cup chamber **32** on the opposite side of a common bottom base wall **34** for supporting engagement with the inner end of a wad element **36**. The powder cup portion **30** is defined by an annular side wall having an outwardly tapering inner surface **38** for concentration of the explosive force of the powder **14** against the bottom base wall **34** and accordingly through the shot shell **10** to the shot **18**. An annular groove **40** is provided on the external surface of the protector sleeve **28** in the area of the bottom base wall **34** and serves to seal the casing **12** against the passage of the powder gases from the powder chamber **30**. An annular shoulder **41** forms one side of the groove **40**. The wad chamber **32** is defined by a cylindrical sleeve portion **42** having a sidewall which is uniformly tapered in thickness outwardly of the bottom base wall **34**. The added thickness of the side wall of the sleeve portion **42** adjacent the base wall **34** gives the shot protector sleeve additional strength in the area where the greatest stresses are concentrated during firing. Around the exterior of sleeve portion **42**, longitudinal ribs **44** and grooves **45** are formed to reduce friction in the gun barrel and thereby increase shot velocity while decreasing breech pressures. The side wall of portion **42** is provided with uniformly spaced apart longitudinal serrations **48** extending three quarters the full length of the portion **42** from the outer end thereof. The wad **36** is shown to have a disk element **50** secured to its outer end by adhesive **52** to prevent the shot **18** from denting the filler wad material.

The filler wad **36** disposed in the chamber **32** of the sleeve **16** is formed from an expanded plastic material. The material illustrated is a foam of polystyrene. Polystyrene foam of this type consists of many tiny non-interconnected cells. These foams have low densities, and low thermal conductivity and good structural strength. Polystyrene foam of the type employed in this invention may be obtained from the Dow Chemical Company under the name Styrofoam. The mechanical properties for expanded polystyrene foam (Styrofoam) are as follows:

Properties	Density, lb./cu. ft.		
	1.3	1.6	2.0
Mechanical (77° F.):			
Compressive yield strength, p.s.i.	10–20	15–25	25–35
Tensile strength, p.s.i.	30–5	50–70	80–100
Shear strength, p.s.i	15–25	25–35	35–45
Compressive modulus, p.s.i.	450–1,100	750–1,350	1,150–1,750
Bending modulus, p.s.i	200–750	650–1,200	1,200–1,900
Impact strength, in.-lb./in. of width	0.5–1.2	1.1–1.8	2.1–2.7
	(⅜ in. x ½ in. section)		

The foamed plastic used for the wad **36** having a low density may accordingly be readily compressed to whatever length desired depending on the amount of shot **18** used in the shot shell **10** as illustrated in FIGS. 1 and 2. Thus the plastic foam material makes it possible to fabricate a wad **36** which is universal in its application.

Prior to loading the shot shell **10**, the shell protector sleeve and wad units **16** are assembled and then inserted as a unit into the casing **12** of the shot shell **10**. First then in the loading of the shot shell **10** the powder **14**

is inserted into the casing **12** and the shot protector sleeve and wad unit **16** then inserted thereagainst with the powder **14** moving into the chamber **30** of the sleeve **28**. Next the shot **18** is deposited into the chamber **32** onto the cardboard disk element **50**. Next, force is applied to the shot **18** to compress it into the casing **12** such that the end of the casing **12** may be crimped inwardly as illustrated at **70**. Again it is noted that the expanded wad material **36** is self-compensating and compresses however much is necessary to give the desired length for the amount of shot **18** used.

When the shot shell **10** is fired, the powder **14** explodes and concentrates its forces against the inner side walls of the chamber **30** and expands the sleeve **28** such that the annular groove **40** expands forcing the shoulder **41** outwardly against the inner surface of the shell casing **12** and thus presents a seal which prevents the escape of gases from the powder chamber **30**. The shot protector sleeve **28** and the shot **18** remain substantially intact until a short distance from the end of the gun barrel thereby controlling the concentration of the shot **18** and thus its velocity and pattern. Moreover, it is apparent that there is no need for using different wads for different loading operations or on the other hand several wads as a single wad of expanded foam **36** cut from a piece of stock material, expanded foam plastic material, will be suitable for all loading situations. Also it is to be appreciated that by use of an all plastic wad unit **16**, excepting the cardboard disc **50**, the weight of the wad unit is substantially lower and consequently carries less recoil and gives greater shot velocity.

Some changes may be made in the construction and arrangement of my shot shell and method of loading same without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim:

1. In a shot shell, a shot shell casing, a quantity of powder at one end of said shot shell casing, a shot sleeve adjacent said powder and said shot sleeve being closed at one end and open at the opposite end, said shot sleeve having an annular groove formed in the external surface thereof adjacent said closed one end, said shot sleeve including a shot wad adjacent said closed end; a quantity of shot disposed at least partially within the open end of said shot sleeve and being adjacent the other end of said shot shell casing; and said sleeve including a sidewall serrated longitudinal and uniformly decreasing in thickness.

2. In a shot shell, a shot shell casing, a quantity of powder at one end of said shot shell casing, a shot sleeve adjacent said powder and said shot sleeve being closed at one end and open at the opposite end, said shot sleeve having an annular groove formed in the external surface thereof adjacent said closed one end, said shot sleeve including a shot wad adjacent said closed end; a quantity of shot disposed at least partially within the open end of said shot sleeve and being adjacent the other end of said shot shell casing; and said sleeve including a sidewall serrated longitudinally and uniformly decreasing in thickness, an annular shoulder formed on the exterior of said sleeve sidewall and forming a portion of the sidewall of said annular groove, said annular shoulder being disposed on the side of said groove opposite said closed one end of said sleeve.

3. In a shot shell, a shot shell casing, a quantity of powder at one end of said shot shell casing, a shot sleeve adjacent said power and said shot sleeve being closed at one end and open at the opposite end, said shot sleeve having an annular groove formed in the external surface thereof adjacent said closed one end, said shot sleeve having longitudinally extending ribs and grooves fromed on the exterior thereof, said longitudinally extending ribs and grooves extending from adjacent said annular groove outwardly of said closed one end, said shot sleeve including a shot wad adjacent said closed end; a quantity of shot disposed at least partially within the open end of said shot sleeve and being adjacent the other end of said shot shell casing.

4. In a shot shell, a shot shell casing, a quantity of powder at one end of said shot shell casing, a shot sleeve adjacent said powder, said shot sleeve being closed at one end and open at the opposite end, said shot sleeve including a shot wad adjacent said closed end; said shot wad being formed of expanded plastic material and being completely enclosed in said sleeve, a quantity of shot disposed at least partially within the open end of said shot sleeve on said shot wad and being adjacent the other end of said shot shell casing, said shot sleeve being uniformly longitudinally serrated from its open end along a substantial length of said sleeve, said serrations in said shot sleeve providing sleeve sidewall portions, and said sleeve sidewall portions being uniformly flared outwardly towards the opened end of said sleeve.

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