May 20, 1969 F. A. LAGE 3,444,777

METHOD FOR LOADING A SHOT SHELL

Filed March 20, 1967 Sheet 1 of 2

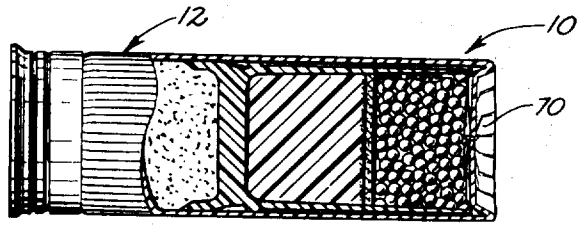

Fig. 1

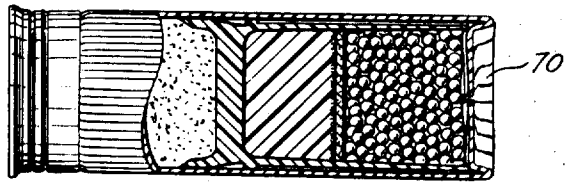

Fig. 2

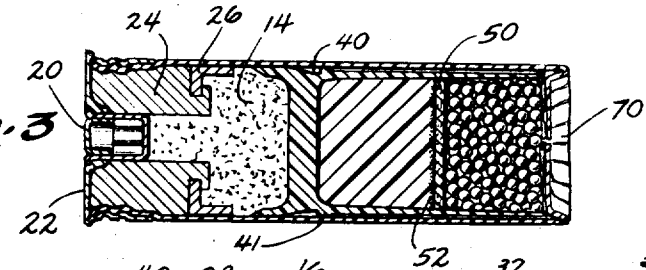

Fig. 3

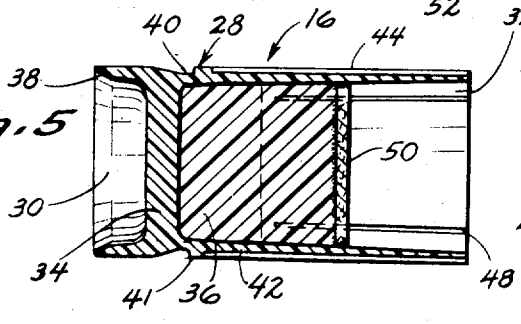

Fig. 5

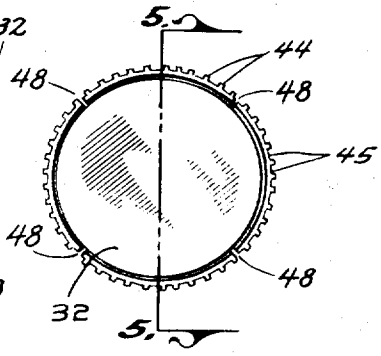

Fig. 6

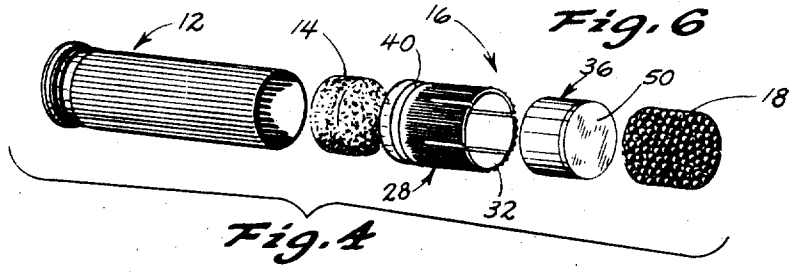

Fig. 4

INVENTOR
FREDERICK A. LAGE
BY Dick, Zarley, McKee & Thomte
ATTORNEYS

May 20, 1969 F. A. LAGE 3,444,777

METHOD FOR LOADING A SHOT SHELL

Filed March 20, 1967 Sheet 2 of 2

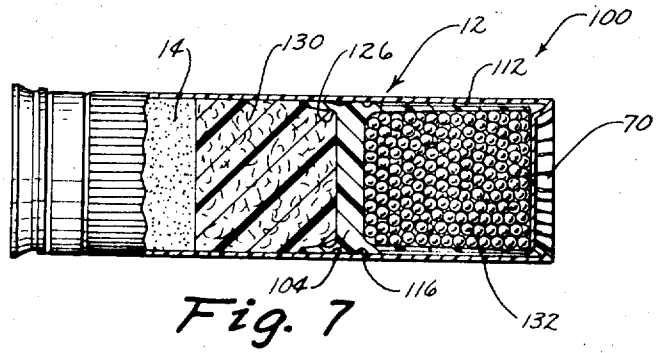

Fig. 7

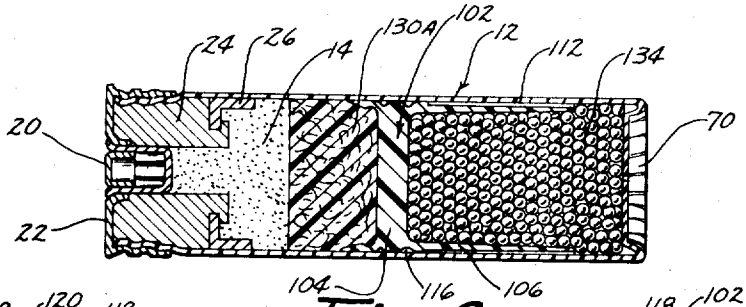

Fig. 8

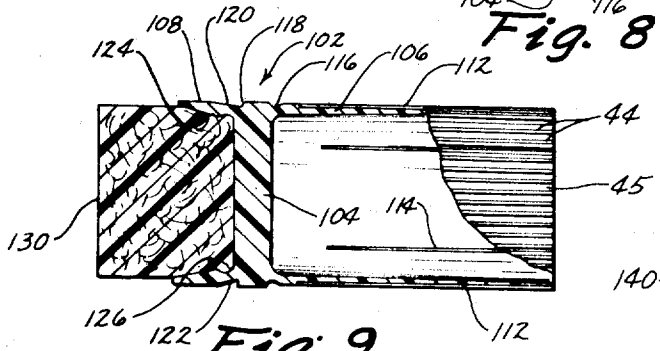

Fig. 9

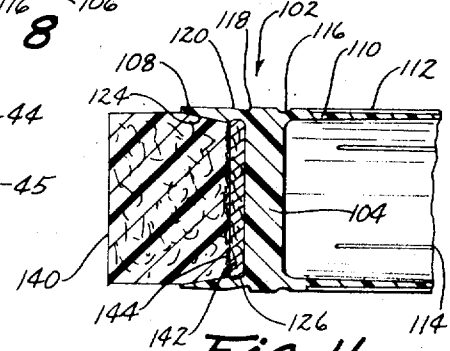

Fig. 11

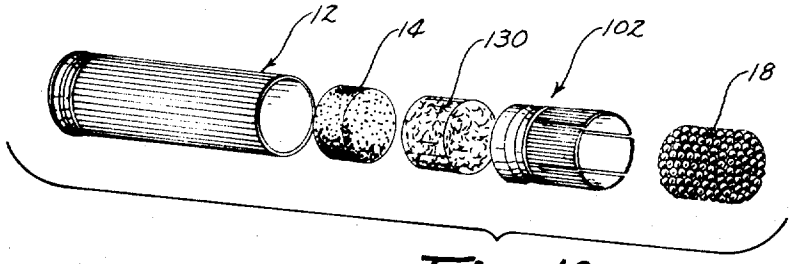

Fig. 10

INVENTOR
FREDERICK A. LAGE
BY
Dick, Zarley, McKee & Thomte
ATTORNEYS

United States Patent Office 3,444,777 Patented May 20, 1969

3,444,777

METHOD FOR LOADING A SHOT SHELL

Frederick A. Lage, Gladbrook, Iowa 50635

Continuation-in-part of application Ser. No. 443,480, Mar. 29, 1965. This application Mar. 20, 1967, Ser. No. 624,379

Int. Cl. F42b 33/02, 7/08

U.S. Cl. 86—23 3 Claims

ABSTRACT OF THE DISCLOSURE

The method for loading a shotgun shell including powder, an elongated wad of expanded plastic secured to a sleeve element holding shot shell wherein the elongated wad of expanded plastic is subjected to a compressive force through the quantity of shot sufficient to reduce the overall length of the components in the shot shell casing such that the outer end of the casing may be closed onto the shot. In one embodiment, the elongated wad of expanded plastic is on the shot side of the sleeve and in the second embodiment the elongated wad of expanded plastic is on the powder side of the sleeve opposite the shot. The sleeve and wad of elongated plastic are the same for all shot shell loading operations regardless of the quantity of shot to be loaded.

This is a continuation-in-part of my co-pending application, Ser. No. 443,480 filed Mar. 29, 1965 now Patent No. 3,309,994 entitled Shot Shell and Method of Loading Same.

The common practice in loading shotgun shells is to select a wad of nonresilient material having the length which combined with the column of shot will fill the interior of the shell casing. Depending on the pattern desired in shooting the quantity of shot will be varied and thus under conventional practices a different length of wad is required. Also, sometimes the length of the shell will vary and thus require a different length wad to fill out the interior of the shell casing. Furthermore, conventional loading practices do not provide the efficiency and accuracy in assembling the components that is desired.

The shot shell and method of loading the shot shell of this invention provides a universal sleeve and wad of elongated expanded plastic which may be used in any loading operation regardless of the quantity of shot being used or the length of the shell casing because the expanded plastic will compress as much as is required to close the end of the shot shell casing. Accordingly, only one inner sleeve and shot wad having expanded plastic is required for all loading operations thus obviously greatly simplifying the loading of shot shells. In applicant's first embodiment the wad of expanded plastic is placed on the side of the shot in the sleeve and in the second embodiment the expanded plastic wad is placed on the powder side of the sleeve opposite the shot. In either case, the shot sleeve is preassembled with the wad of expanded plastic and thus may be easily dropped into the shot shell casing. An annular groove on the inner bottom end of one of the sleeve portions is provided for gripping the adjacent end of the wad of expanded plastic or a non resilient disc element secured to the plastic to hold the elongated wad of plastic in the sleeve portion. On the exterior of the sleeve an annular groove is provided which serves to seal the interior of the casing against gas transfer.

This invention includes other improvements in the shot sleeve concerning elongated serrations around the periphery thereof and a series of elongated ribs and grooves

which have been more fully covered in applicant's co-pending application identified above.

Preferably, the expanded plastic is of the foam type as it has the best mechanical properties for use in a shot shell loading operation and under shooting conditions.

These and other features and advantages of this invention will become readily apparent to those skilled in the art upon reference to the following description when taken into consideration with the accompanying drawings, wherein:

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 well;

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;

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

FIG. 7 is a side elevation fragmentary view of an alternate embodiment this invention wherein the wad of expanded plastic is on the powder side of the sleeve;

FIG. 8 is a side elevation view similar to FIG. 7 but showing a substantially larger quantity of shot being loaded and consequently the expanded plastic having been compressed to compensate for this difference in shot quantity;

FIG. 9 is a side elevational fragmentary cross-sectional view of the shot sleeve with the wad of expanded plastic secured in one of the sleeve portions;

FIG. 10 is an exploded view of the shot shell and its component parts prior to being assembled; and

FIG. 11 is a fragmentary cross-sectional side elevation view of the shot sleeve similar to FIG. 9 but showing a non resilient disc element secured to the elongated wad of expanded plastic which in turn is held in a sleeve portion on the sleeve unit.

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 forces 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 side-

wall 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 disc 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:

	Density, lb./cu. ft.		
Properties, Mechanical (77° F.)	1.3	1.6	2.0
Compressive yield strength, p.s.i.	10–20	15–25	25–35
Tensile strength, p.s.i.	30–45	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
	(¾ 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 disc 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 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.

An alternate embodiment of the invention is shown in FIGS. 7–11 and is referred to generally by the reference numeral **100**. It includes the outer shell casing **12** and a primer **20** in a metal base cup **22**. Also, an internal support element **24** is provided which seats against the inner surface of the metal cup **22** and embraces the primer **20**. An annular sealing ring **26** is seated aaginst the top surface of the support element **24** and the powder **14** is positioned against the inner surface of the primer **20**, the support element **24** and the sealing ring **26** as seen in FIG. 8. This structure corresponds to the structure in FIG. 3.

A shot protector sleeve unit **102** has a transversely extending separation wall **104** with oppositely extending sleeve portions **106** and **108**. The sleeve portion **106** is provided on its exterior with longitudinally extending ribs and grooves **110** and **112** respectively to reduce the friction in the gun barrel and thereby increase the shot velocity while decreasing breech pressures. Also, the sidewall of the sleeve portion **106** is provided with uniformly spaced apart longitudinal serrations **114** extending three quarters the full length of the sleeve portion **106** from the outer open end thereof.

An annular gas sealing groove **116** is provided at the inner end of the sleeve portion **106** adjacent the end wall **104**.

The oppositely extending sleeve portion **108** includes on its exterior an annular shoulder **118** which cooperates with a annular tapered surface **120** to form an annular groove **122** which also functions as a sealing groove for gases and is located adjacent the inner end of the sleeve portion **108**.

The sleeve portion **108** has an inner side wall **124** which tapers diametrically inwardly and towards the transversely extending end wall **104**. The inner surface **124** terminates in an annular groove **126** which in turn merges with the adjacent surface of the end wall **104**.

As seen in FIG. 9, a cylindrical length of expanded plastic wad material **130** is press-fitted into the sleeve portion **108** and the annular groove **126** serves to lock the connection between the wad and the sleeve portion. The properties of the expanded plastic material are such that they will compress when the wad is being inserted into the interior of the sleeve portion **108** and then expand to fill the annular groove **126**.

In assembling the shot shell **100** it is seen that the powder **14** is first placed in the bottom or base end of the casing **12** and in a separate step the expanded plastic wad material **130** is inserted in the bottom sleeve portion **108** of the sleeve unit **102** and then the resulting unit as seen in FIG. 9 is inserted into the casing **12** against the powder **14**. Next, the shot **18** is inserted into the casing and into the sleeve portion **106**. In FIG. 7 a quantity of shot **132** is seen and in FIG. 8 a larger quantity of shot **134** is used in the same size shot shell casing **12**. The difference between the units in FIG. 7 and FIG. 8 is that the expanded plastic wad material **130** has been compressed substantially in length as seen by the wad **130A** in FIG. 8. Accordingly, the sleeve unit **102** has moved inwardly in the shot shell casing **12** toward the base end. It is readily appreciated that any quantity of shot **132** or **134** for example could be used in the shot shell of this invention.

In FIG. 11 an alternate embodiment of the expanded plastic wad element is shown and referred to by the reference numeral **140** and differs from the wad unit **130** by the fact that a disc **142** of relatively non compressible material is secured by adhesive **144** to the inner end of the wad **140** and is matingly locked into the annular groove **126** in the sleeve portion **108**. It is apparent that a better mechanical lock is provided between the sleeve unit **102** and **140** by the use of the non compressible disc element **142** which thus minimizes inadvertent separation of the two components.

It is also noted that the powder material **14** may engage directly the outer end surface of the expanded plastic foam wad **130** and thus as seen in FIG. 8, one disc element has

been eliminated since the shot **132** seats against the bottom dividing wall **102**.

It is stressed that by the use of the expanded plastic wad of this invention on either side of the sleeve wall **102** against the shot or against the powder the total length of the components before assembly will be substantially greater than the length of the components after being subjected to a compressive loading force since the expanded plastic will compress to give the effective length corresponding to the length of the shot shell casing. Hence, the expanded plastic wad has universal application in shot shell loading when used as hereinabove described.

I claim:

1. The method of loading a shot shell, comprising, placing a quantity of powder in the base of a shot shell casing, inserting an open end shot sleeve having an elongated wad of expanded plastic material disposed therein into said casing, inserting a cylindrical quantity of shot into said sleeve, the effective axial length of said quantity of said powder, sleeve, expanded plastic and shot being substantially greater than the effective axial length of the casing interior, applying a compressive force to said shot, compressing and permanently deforming said expanded plastic wad by said compressive force to a sufficient length for closing the open end of said shot shell casing onto said shot.

2. The method of claim **1** wherein said elongated wad of expanded plastic material is placed in said shot shell casing between said shot sleeve and said powder.

3. The method of claim **1** wherein said elongated wad of expanded plastic material is placed in said shot shell casing between said shot sleeve and said shot.

References Cited

UNITED STATES PATENTS

3,099,958	8/1963	Daubenspeck et al.	102—42
3,221,658	12/1965	Devaux	102—95
3,266,421	8/1966	Commerford	102—95 X
3,309,994	3/1967	Lage	102—42

FOREIGN PATENTS

1,186,659	2/1959	France.
1,408,820	7/1965	France.

OTHER REFERENCES

Smokeless Shotgun Powders (herein referred to as SSP) by Wallace H. Coxe; E.I. duPont de Nemours & Company, Inc., Wilmington, Del.; 1933; pp. 75–80 required (copy in 102—42 publications).

ROBERT F. STAHL, *Primary Examiner.*

U.S. Cl. X.R.

102—42, 95