Feb. 8, 1966 D. S. FOOTE ETAL 3,233,546

SHOTSHELL DESIGN

Filed Jan. 30, 1964 2 Sheets-Sheet 1

Fig. 1.

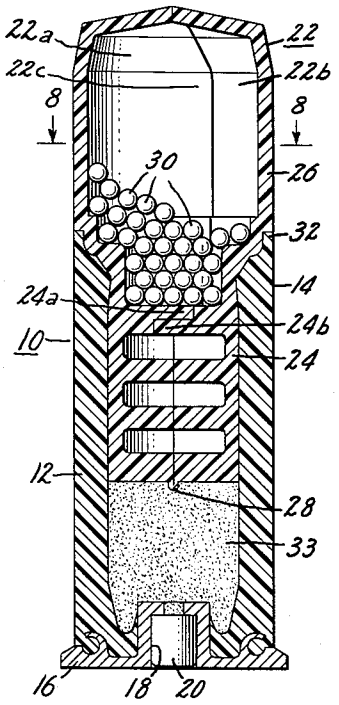


Fig. 2.

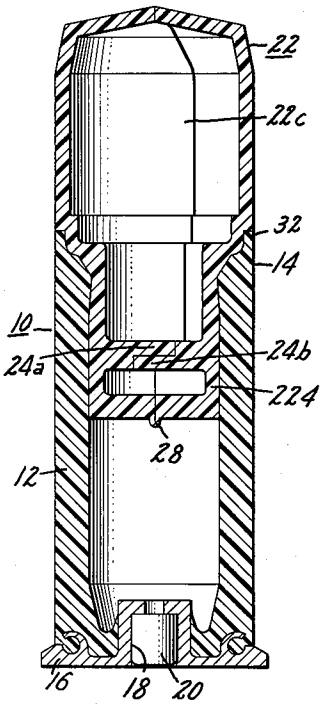


Fig. 3.

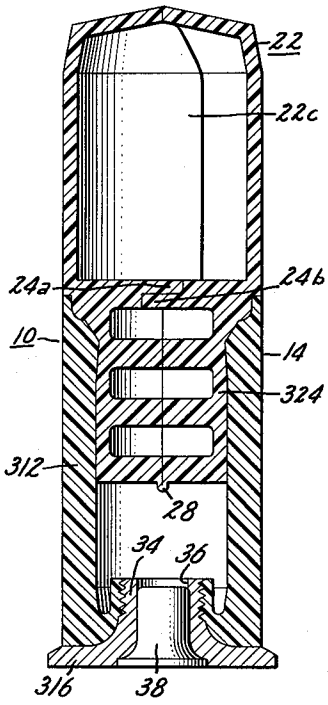


Fig. 4.

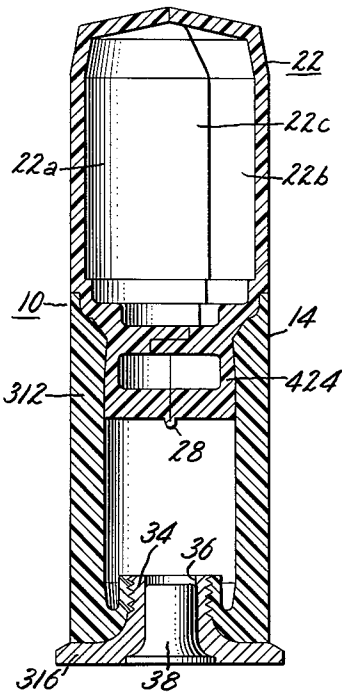
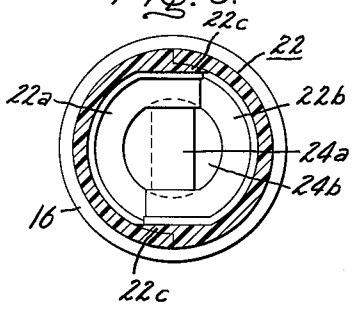


Fig. 8.



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Fig. 5.

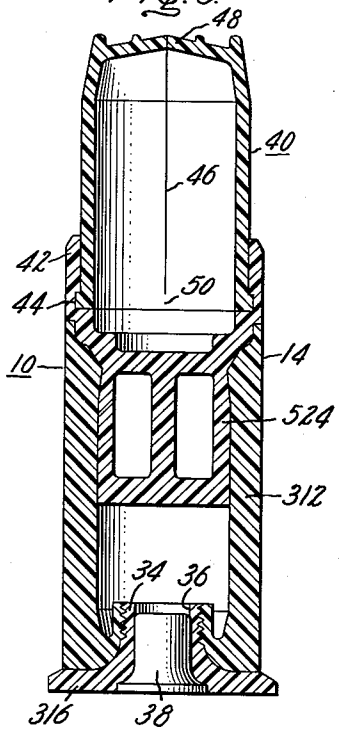


Fig. 6.

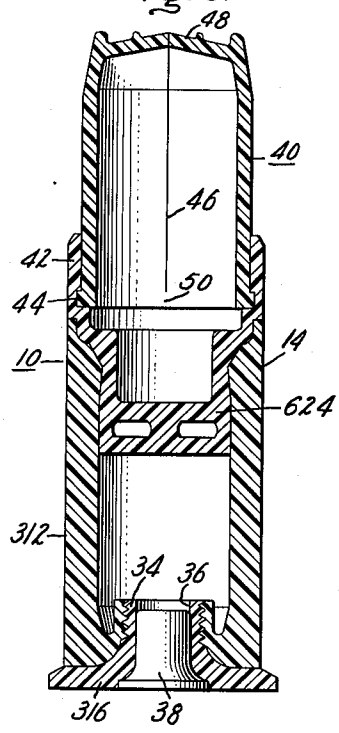
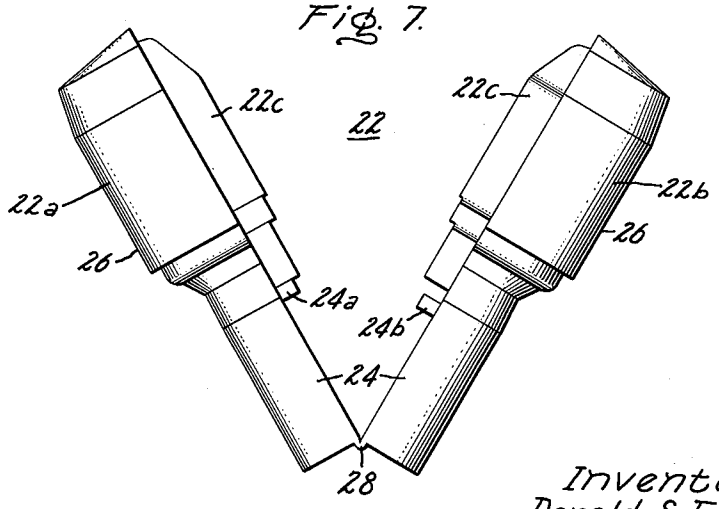


Fig. 7.



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SHOTSHELL DESIGN

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7 Claims. (Cl. 102—42)

This invention relates to improvements in shotgun shells and more specifically to an improved, low-cost plastic shotshell.

Although plastic shotshells have been known for some time, it is only recently that they have been available in large commercial quantities. The advantages of plastic shotshells over paper or metal shotshells has been discussed at length in trade publications, prior patents, etc. and need not be discussed here. The great majority of plastic shotshells available on the market today, however, have high tensile strength and have their molecular structure oriented, as explained in Patent Number 3,103,170, issued to R. A. Covington et al. It can be appreciated that considerable effort and expense is involved in making such high tensile strength plastic shotshells.

A major problem with the economical, injection-molded type of plastic shotshell has been tearing or stretching of the shotshell body caused by indentation of the relatively soft plastic by the shot pellets which upon firing move forwardly and radially to "drag" the body and cause tensile failure.

The figures show several variations of thick-wall-clam closure design. All of the shotshell designs exhibit a common principle in that the great majority of shot pellets are outside of the shotshell body. In order to accomplish this design change without violating shotshell loaded length specifications, it is necessary to use a shell casing of far shorter length than present conventional designs.

In a magazine-fed shotgun, especially the automatic type, the fired shell casing, in addition to being extracted from the chamber, must be completely ejected from the breech. If this is not accomplished, the extracted shell will obstruct the feeding of the next round into the chamber, thereby preventing the firing of a second shot. Although shotgun ejection means vary considerably from gun to gun, in general the shell is withdrawn from the chamber by the extractor attached to the bolt, and is struck on the opposite side of the rim from the extractor as the bolt approaches its most rearward position. The energy from the blow causes the fired shell to pivot about the extractor, releasing itself from the extractor and ejecting from the port provided in the shotgun receiver. The effectiveness of this action has been found to correlate with the fired shell center-of-gravity location. Considerable testing involving thousands of rounds has shown ejection failures with shells possessing a center-of-gravity approx. .500 or more from the face of the head to occur very rarely in any other than defective guns. When the center-of-gravity figure falls below the .500 value the frequency of ejection failures begins to increase. The .500 figure, however, should not be considered a sharp line of demarcation between successful shell ejection and ejection failure. For example, a shell with a center-of-gravity location .460 from the face of the head will function satisfactorily in many guns, but experience has shown that the frequency of failures in occasional guns in the field will be high enough to result in an excessive number of customer complaints. Still lower center-of-gravity locations result in a higher frequency of ejection failures in a greater number of guns. This required center-of-gravity location restriction would prohibit the simple shortening of a conventional shell casing. For this reason, a thick-wall shell casing must be utilized in order to compensate for the center-of-gravity change caused by shortening the shell length.

At the present time, a conventional shotshell comprises a body casing whose unloaded length is approximately 2¾" although magnum loads utilize casings up to approximately 3" long. Paper casings generally have a wall thickness of approximately .030" although plastic casings on the market generally vary from about .017" to .035". In general, a conventional shotshell would include a metal head, usually either brass or steel.

By utilizing a zinc die cast head as shown in FIGURE 1 and fully explained in Patent Number 3,099,958, issued to B. K. Daubenspeck et al., it is possible to decrease the overall casing length to approximately 1.700" and increase the wall thickness to approximately .125" in order to locate the center of gravity of the empty shotshell about .500" from the face of the head, the minimum distance required for satisfactory shell ejection.

FIGURES 3–6 show the use of a light plastic head, preferably "Delrin." By reducing the head weight, it is now possible to shorten the shell casing even further (to about 1.450") while still maintaining the .500" center-of-gravity location. If desired, however, the shell length with the plastic head can be left the same as with the zinc die cast head, and a reduction in wall thickness to approximately .080" can be made with the same resultant center-of-gravity location. This thickness, however, is still substantially greater than present conventional shotshells, as explained above.

Although brass or other metal heads can be used, economics seem to favor a zinc die cast head or the light plastic head. Obviously, with a heavier metal head, the center-of-gravity problem with a shortened body casing becomes more serious thus necessitating either a longer shell or a heavier wall thickness.

In addition to providing a low cost, reloadable shell, the present invention also includes all of the advantages generally associated with the use of shot liners. Thus, the shot container effectively prevents the shot from becoming deformed while being explosively projected through the gun barrel, since the shot liner prevents the shot from coming in contact with the barrel. Barrel leading thus, also is decreased. Finally, by keeping the shot pellets together until after the shot container leaves the barrel and the liner hinges to fall away from the shot, more uniform and consistent patterns are achieved. This is more fully explained in copending application Number 306,026, filed September 3, 1963.

It is the object of this invention to provide an economical injection-molded plastic shotshell which will function satisfactorily in present-day shotguns.

It is another object of this invention to provide a low-cost plastic shotshell having a body casing which has a considerably shorter length and a thicker wall portion than conventional shotshell bodies.

It is another object of this invention to provide a shotshell in which the major portion of the shot is outside the shotshell body casing.

It is still another object of this invention to provide a shotshell having a unitary member which functions as a cushioning means-shot container-closure means.

It is still another object of this invention to provide a shortened shell having increased body wall thickness which permits the shortening of the shell without sacrificing the center-of-gravity location required for satisfactory shell ejection.

Other objects and advantages will be obvious from reading the accompanying specification, claims, and drawings in which:

FIGURE 1 shows an elevational view of a shotshell incorporating the invention having a zinc die cast head

and designed to accommodate a shot load of approximately 1⅛ ounces of shot.

FIGURE 2 shows a shotshell similar to FIGURE 1 except that the cushioning means is changed to accommodate a shot load of approximately 1¼ ounces of shot.

FIGURE 3 shows an elevational view of a shotshell utilizing a light plastic head and a shot load of 1⅛ ounces.

FIGURE 4 is similar to FIGURE 3 except that the shot load is 1¼ ounces.

FIGURE 5 shows a modified shotshell wherein the cushioning means is not hinged and the shot load is 1⅛ ounces.

FIGURE 6 is similar to FIGURE 5 except for a 1¼ ounce shot load.

FIGURE 7 shows a hinged cushioning-container-closure member in an opened position.

FIGURE 8 shows a cross-sectional view of line 8—8 in FIGURE 1.

Two types of closure-shot containers are shown in the drawings. Both are specifically designed for the thick-walled shotshell in that both have a section which fits into the relatively small shell inside diameter and an expanded portion outside of the shell which is sufficiently large to seal the shotgun bore, thus, preventing leakage of the powder gases past the shot container.

In each of the figures, a shotshell **10** is shown to include a body casing **12** made by injection molding a low tensile strength plastic. In one particular injection molded linear polyethylene plastic used to make shotshells under the present invention, the tensile strength was between 8000 to 9000 p.s.i. A casing having this low tensile strength will ordinarily tear off at the mouth upon firing, so that reloading of the shell is impossible. Actually, linear polyethylene plastic up to about 17,000 p.s.i. longitudinal tensile strength will generally exhibit some degree of mouth cut off, especially when hard shot is used.

Body casing **12** is open at the mouth end **14** and closed off at the rear by a head portion **16**. In FIGURES 1 and 2, the head portion **16** is made of zinc molded integrally with the body casing as explained in Patent Number 3,099,958. A primer cavity **18** is formed in the head and a primer **20** inserted therein.

Inserted in the mouth end of the shotshell body casing and held therein by means of an interference fit, is a unitary, molded cushioning-shot container-closure member **22** made of plastic or any other suitable material. Unitary member **22** includes a reduced diameter cushioning section **24** whose diameter is slightly larger than the inside diameter of the body casing **12**, so that the cushioning section **24** can be pushed into the open end of the body casing and held there by means of an interference fit, a snap-on or some other means. An enlarged outer shot container-closure portion **26** has at least a section of its portion of a sufficiently large diameter to seal the shotgun bore. In FIGURES 1–4, the portion outside the casing proper has a diameter substantially the same as the outside diameter of the body casing. Obviously, the entire portion outside the body casing **12** need not be the same diameter as the body casing.

Unitary member **22** comprises two half sections **22***a* and **22***b*, connected together by a hinge **28** and adapted to have portions **24***a* and **24***b* over-lap to provide a lower support means for the shot pellets **30**. One half section may be provided with a skirt (**22***c*) on each side which overlaps the inside edge of the other half, thus providing a means to prevent side movement of one section with respect to the other, as well as aiding in preventing any leakage of powder gases into the shot column.

The upper end of body casing **12** has a narrow lip **32** formed thereon which is flexible enough to be forced against the bore of the barrel to act as a gas seal.

Upon firing, the propellant powder **34** ignites and explosively projects unitary member **22** out of the shotshell body casing and through the shotgun barrel. Upon leaving the barrel, the two half sections **22***a* and **22***b* open up and pivot about hinge **28** and fall away from the enclosed shot load. The shot pellets **30**, which have been protected from the heat of the gas as well as the abrasive action of the gun barrel, are free to move in their own trajectories towards the target without any interference from any shell front end crimp or top wad or by any shot container which may get in the way of the shot pellets.

FIGURE 2 shows essentially the same as FIGURE 1 except that the cushioning section **224** has been modified in order to accommodate more shot pellets.

The shotshell of FIGURE 3 is essentially the same as FIGURE 1 except that a light plastic head **316** is substituted for the zinc head **16**. Head **316** is attached to the shotshell body casing **312** by means of a threaded projection **34** which screws into the lower breech end of the body casing **312**. An opening **36** in the threaded projection **34** holds a primer **38** which differs somewhat from primer **20**.

Body casing **312** is shorter than casing **12** because the decrease in the weight of the head **316** permits less casing weight to balance the head weight in locating the center-of-gravity the required distance from the face of the head. Thus, the configuration of cushioning section **324** varies slightly from its counterpart **24**.

FIGURE 4 is essentially the same as FIGURE 3 except that cushioning section **424** has been revised slightly to permit accommodation of a greater shot load.

The body casing and head of FIGURES 5 and 6 are the same as FIGURES 3 and 4. However, FIGURE 5 shows a modified cushioning-shot container-closure means. Instead of having a unitary member which performs all three functions, FIGURES 5 and 6 show two separate elements, a lower cushioning section **524**, which again has a reduced diameter in order to fit and be held within the open mouth end of body casing **312**, and a shot container-closure member **40**, which is similar to the clam closure disclosed in copending application 306,026. The lower cushioning section **524** includes an end portion **42** which flares outwardly from the reduced diameter portion to provide the necessary diameter to properly seal the gas from escaping past the slightly narrower container-closure member **40**. The upper container-closure member is detachably connected to the lower cushioning section **524** by a groove and detent means **44**. It should be appreciated that the cushioning section can be attached to the container-closure section on the inside as well as on the outside, as shown. In either case, it is necessary to provide a section having sufficient diameter (about as much as the diameter of the body casing) in order to properly seal and prevent the explosive gases from escaping around the outside of the shot container-closure member.

FIGURE 6 is similar to FIGURE 5 except that the cushioning section **624** has been modified to accommodate a greater shot load.

FIGURES 5 and 6 each show the lower cushioning section to be solid, i.e., non-hinged. The shot container-closure **40** includes a slit means **46** which extends down opposite container-closure walls and across the top of the front end closure member **48**. An unslit portion **50** is left on each side to act as hinge means.

Upon being explosively projected out of the gun barrel, the container-closure member **40** opens up like a clam shell to pivot on hinge means **50** and permit the enclosed shot pellets to proceed uninterruptedly on their way towards the target.

It is obvious that other modifications can be made incorporating the inventive concept explained herein.

What is claimed is:

1. A shotshell comprising a thick-walled plastic shotshell casing, said casing having an open-ended mouth at

one end and a head at the opposite end thereof, a combination shot container-closure cushioning means having a lower cylindrical section including a cushioning means which is inserted within the open-ended casing mouth to interference fit the inside diameter of the thick-walled shotshell casing, and a closure portion attached to said lower cylindrical section and projecting forwardly of said casing, said lower cylindrical section and closure portion defining a cavity therein in which a plurality of shot pellets are positioned so that the major portion of the pellets are located outside of the casing mouth prior to firing, said thick-walled plastic shotshell casing having a wall thickness of at least about .080" so that the center-of-gravity of the empty shotshell is located approximately .500" or greater from the rear end of the shell head in order to facilitate fired shell ejection from automatic shotguns.

2. A shotshell as recited in claim 1 wherein said plastic shotshell casing is made of a soft, injection-molded plastic which experiences stretching or tearing of the shell body when the shot pellets, upon firing, indent the soft plastic, upon moving forward to drag the body and cause tensile failure.

3. A shotshell as recited in claim 1 wherein said combination shot container-closure-cushioning means includes two hinged longitudinal sections and means on the longitudinal edges of said hinged sections to limit transverse movement of one section relative to the other and to prevent leakage of powder gases into the shot column.

4. A shotshell comprising a thick-walled plastic shotshell casing having an open-ended mouth at one end and a zinc die cast head at the other end, shell closure-shot container means which includes a tubular section of sufficiently large diameter to seal the shotgun bore, and a cylindrical section of lesser diameter than said tubular section which fits the inside diameter of the thick-walled shotshell casing, said shell casing having a shortened length which cooperates with said shell closure-shot container means to position the great majority of shot pellets outside of the shell casing, said shell casing having a wall thickness of about 0.125", said thick-walled structure cooperating with said zinc head and the shortened plastic casing to locate the center of gravity of the empty shotshell about 0.500" from the zinc head.

5. A shotshell comprising a thick-walled plastic shell

casing having a tensile strength less than about 17,000 p.s.i. whose mouth end would ordinarily cut off upon firing a conventional load of shot pellets, a head portion at the rear end of the shell casing, means confining a plurality of shot pellets and positoned so that the great majority of the pellets are located beyond the mouth end of the casing, said means including a tubular section of sufficiently large diameter to seal the shotgun bore and a cylindrical section of lesser diameter than said tubular section which fits the inside diameter of the thick-walled shotshell casing, said thick-walled casing having a wall thickness of at least about 0.080" depending on the length of the shell casing and the material of which the head portion is made, the final determination of head portion material, casing wall thickness, and casing length designed to position the center of gravity of the empty shotshell at about 0.500" from the rear end of the head portion.

6. A shotshell comprising a casing made of a plastic material having a tensile strength less than about 17,000 p.s.i. whose mouth end would ordinarily exhibit some degree of body mouth cut off upon firing a conventional load of shot pellets, a head portion connected to said casing, a preassembled shot container-closure-cushioning means inserted and releasably held within the mouth end of said casing and extending outwardly therefrom so that the large majority of shot pellets is positioned outside of the casing mouth, said casing having a length ranging from about 1.450"–1.700" and wall thickness of between about 0.080"–0.125" in order to position the center of gravity of the empty shotshell casing and head portion approximately about 0.500" from the head portion.

7. A shotshell as recited in claim 6 wherein said preassembled shot container-closure-cushioning means comprises a lower cushioning section having an end portion to which a container-closure member is detachably secured.

References Cited by the Examiner

UNITED STATES PATENTS

225,463	3/1880	Coloney	102—42
3,099,958	8/1963	Daubenspeck et al.	102—43 X

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