OVER-SHOT WAD FOR SHOTHELLS

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OVER-SHOT WAD FOR SHOTHELLS

A closure wad for a shotshell consists of a radially extending annular segment and a relatively hard plastic forming the closure wad. The closure wad includes a plurality of ribs extending radially of said closure wad.

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1 Claim, 5 Drawing Figures

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ABSTRACT

An improved end closure for the mouth of a shotshell having a case formed from relatively hard plastic comprising an over-shot wad of relatively soft, yieldable plastic formed in the shape of a disc and having a beveled or angled peripheral edge against which the mouth end of the shell case is bent or crimped inwardly a very short distance in abutting and restraining engagement therewith. The disc-shaped closure wad includes an annular wall segment of extended length on which said beveled surface is formed, said annular wall segment having a substantial thickness and being reinforced by a plurality of ribs extending radially of said closure wad.
OVER-SHOT WAD FOR SHOTHELLS

BRIEF SUMMARY OF THE INVENTION

This invention is directed to an improved end closure for a shotgun shell, and particularly for shotshells having a shell case made from relatively hard, substantially non-resilient plastic such as polycarbonate or polycarbonate mixed with other plastic materials such as polyethylene or rubber. There is a growing trend towards the use of plastic shotshell cases, and polycarbonate has proven to be particularly effective for this purpose because of its strength and molding qualities. However, these particular qualities, and especially the hardness, and relative non-resilience of polycarbonate either alone or in combination with other plastics and rubber pose particular problems in effecting a proper closure for the mouth of the shell case over the shot charge.

Attempts to form a conventional star crimp type of end closure on a relatively hard, plastic shotshell case have not provided satisfactory results. Not only is it quite difficult to form the mouth end of such a plastic case into a star crimp configuration, but also because of the limited resilience and yieldability of the hard plastic, the cramped mouth of the plastic shell case does not open completely upon firing of the shotshell, thereby presenting a restricted opening to the outward passage of the wad column and shot charge. This produces an undesirable ballistic effect and also frequently results in the tearing or shearing of the relatively hard mouth of the plastic shell case. The life of such plastic shell cases having a substantial closure crimp of any kind is thus greatly limited for reloading purposes.

Having in mind the foregoing problems and disadvantages associated with prior efforts to form adequate closure means at the mouth end of relatively hard, plastic shell cases, I have developed a unique and improved closure arrangement particularly characterized by minimum deformation or crimping of the mouth of the plastic shell case and minimum resistance to the outward passage of the shot charge and wad column.

These basic objectives are realized by utilizing a closure wad having a relatively thin, transverse web section which overlies the short charge and an annular, peripheral wall segment of increased thickness provided with a beveled or angled surface around its outer periphery against which a very short length of the end of the shell case is bent or crimped inwardly.

As a particularly advantageous and significant feature of my shotshell end closure, the aforesaid beveled surface on the closure wad is given such an angle and configuration as to control and limit the inward crimping or bending of the end of the shell case so that the retainer lip or bead formed by the crimping projects transversely inwardly of the shell case a minimum distance, preferably not exceeding the wall thickness of the shell case. The crimping or bending of the mouth of the shell case is thus of such a limited magnitude as to pose no substantial problem of work-hardening and damage to the mouth of the shell case during repeated reloadings. Also, the minimum inward projection of the cramped end of the shell case offers substantially no obstruction or restriction to the outward passage of the shot charge and wad column with the result that there is little deleterious affect on shot pattern and substantially no likelihood of damage to the hard, non-resilient mouth of the shell case as it is opened by the emission of the shot charge and wad column upon firing.

A further beneficial aspect of my improved end closure wad resides in the provision of a plurality of radially extending ribs on both sides of the central web section of the wad, the ribs terminating at their outer ends in supporting engagement with the aforesaid annular wall segment. The ribs lend strength and rigidity to the annular wall segment so that it will not be deformed inwardly an undue amount during the crimping of the casing mouth and thereby permit the crimped retainer lip on the case to be bent over beyond the limited, desired angle. The ribs also catch the air upon firing and thereby cause the closure wad to be spun laterally away from the path of the shot charge.

The closure wad of the aforesaid configuration is preferably formed as a unitary structure from a relatively soft, yieldable plastic such as polyethylene, whereby the wad will not shatter upon firing and may be deformed slightly, as required to fit it snugly into the open end of the shell case.

These and other objects and advantages of my improved over-shot wad will become readily apparent as the following description is read in conjunction with the accompanying drawings wherein like reference numerals have been used to designate like elements throughout the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevation view, partially in section, showing the closure and over-shot wad of the invention in place in a shell case;

FIG. 2 is a top, plan view of the shot shell end closure of FIG. 1;

FIG. 3 is a vertical, section view taken along lines 3-3 of FIG. 2 and showing the over-shot wad and shotshell end closure on an enlarged scale;

FIG. 4 is a top, plan view of the over-shot wad of this invention; and

FIG. 5 is a vertical section view of the over-shot wad taken along lines 5-5 of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The over-shot wad end closure of this invention has been particularly designed for use with all plastic shotshell with the purpose of providing a plastic shotshell which may be manufactured on a high volume, production basis with relative ease and simplicity and which is so constructed and assembled as to withstand multiple firings and reloadings. A fully loaded and assembled all plastic shotshell incorporating the improved over-powder wad of this invention is shown in FIG. 1. The shotshell includes a tubular casing 1 having an integral base wall 2 at one end thereof. Casing 1 is preferably molded from relatively hard plastic material such as polycarbonate manufactured by General Electric Company under the trade name "Lexan." Polycarbonate mixed with other plastic materials such as polyethylene or natural or synthetic rubber may also be used. Base wall or head 2 is formed integrally with casing 1 during an injection molding operation so as to thereby provide a one-piece casing and base wall structure. A peripheral flange 4 on base wall 2 serves as a contact and strike element for an ejection mechanism in a shotgun.

Base wall 2 of tubular casing 1 is provided with an aperture 6 through which primer 8 extends in a relatively loose, non-binding fit therewith. A slightly larger diameter recess 10 in the bottom face of base wall 2 serves as a seat for the rim 12 of primer 8. Primer 8 is held in place by a plastic base wad 14 having an axially extending, central cavity 16 within which primer 8 is tightly fitted so as to be retained in the desired position. The shock and pressure transmitted by the detonating primer is absorbed substantially entirely by plastic base wad 14 which is formed from yieldable and resilient plastic material such as polyethylene, thereby preventing the transmission of potentially damaging forces and shock waves to the lower end of hard, plastic casing 1 and its base wall 2. The structure and arrangement of base wad 14 and the manner in which it engages and retains primer 8 are described in detail in my co-pending U.S. Pat. application filed on Apr. 21, 1969 under Ser. No. 817,860, and entitled "PLASTIC SHOTGUN SHELL." For purposes of this disclose, it will suffice to say that base wad 36 is of generally cylindrical configuration and seats snugly into the bottom or base end of tubular casing 1 in the manner shown in FIG. 2 with its bottom surface bearing flush against flat, inner surface 18 of base wall 2. A plurality of longitudinally spaced rings 20 are provided around the outer periphery of base wad 14 at its upper end, rings 20 terminating at relative sharp edge portions 22 to thereby define a plurality of spaced teeth in vertical cross section as shown in FIG. 1. Teeth or edge portions 22 of rings 20 engage the inner wall surface...
of tubular casing 1 and assist in holding base wad 14 in place. The upper end of base wad 14 is dished inwardly and is defined by concave top wall 24 which cooperates with over-powder wad 26 to form the space within which propeller charge 28 is contained.

It is to be noted that base wad 36 need not necessarily include rings 20 defining teeth 22, and glue could be used to assist in holding base wad 36 in place with or without peripheral teeth.

Over-powder wad 26 is a part of a wad column which preferably takes the form of a unitary, one-piece plastic column and shot cup designated generally by reference numeral 30. Unitary plastic element 30 is moldable from pliable and yieldable plastic such as polyethylene, and includes transversely extending over-powder wad 26 at its lower end. Depending from over-powder wad 26 is a powder enclosing and sealing skirt 32, preferably comprised of radially spaced annular walls 33 and 34. A plurality of spacing and sealing discs or rings 36 extend transversely outwardly from center post 38 of unitary over-powder wad and shot cup 30 and bear against the inside surface of tubular casing 1 at their outer ends. The upper end of unitary, plastic member 30 is comprised of shot cup 40 of cylindrical configuration which extends upwardly along the inside walls of tubular casing 1 to a point adjacent the top end thereof. A shot charge consisting of a plurality of pellets 42 is contained within shot cup 40.

The closing and sealing of the upper, free end of the shotshell opposite base wad 2 poses particular problems when using a shell case 1 made from relatively hard plastic such as polycarbonate or polycarbonate in combination with other plastic or rubber materials. The hardness and limited resilience of polycarbonate resins from which shell casing 1 is preferably molded make it difficult to form or bend the end of the casing mouth to provide a closure over the shot charge; and because of these same properties of the relatively hard, plastic case, closure formed on the end of the case will not normally have sufficient flexibility to open as quickly and completely as is required for the proper release of the shot charge and wad column under the force of the expanding propellant charge. For example, a full-fold conventional type of closure clip wherein the mouth end of the shell casing is folded over on itself in a complete 180° fold, or the well known star clip type of end closure wherein the end of the case is crimped inwardly to provide a plurality of pie-shaped sections covering the entire end of the shell casing over the shot charge would offer such resistance to opening upon firing of the shot shell as to restrict the passage of the shot charge and wad column from the shell casing. The presence of any such substantial crimping of the plastic casing to form an end closure would be unsatisfactory for shot patterns and tear and deformation of the mouth of the shell casing by the outward force of the discharging shot charge and wad column acting on the substantially unyielding closure clip.

Moreover, any substantial closure clip utilized on a hard, plastic shot-shell case will substantially lessen the life of the shell casing for reloading purposes because of the work-hardening and eventual breaking or cracking of the mouth of the shell case which will be caused by the repeated opening and closing of the mouth of the case in firing and reloading.

To overcome these difficulties, I utilize a plastic closure wad across the mouth of the shell case over the shot charge in combination with a very slight crimp on the mouth of the casing. Over-shot wad and end closure 44 is shown most clearly in FIGS. 4 and 5, and includes a substantially planar, central web section 45 which is quite thin, as may be noted in FIG. 5. The thickness of web section 45 measured along the longitudinal axis of closure wad 44 is on the order of 0.030 inches, thereby minimizing the mass and weight of wad 44. Extending around the periphery of central web or wall section 45 is an annular wall segment 46 which projects longitudinally of wad 44 beyond at least one face of web section 45. In the preferred embodiment of my closure wad 44 which I have shown, annular wall segment 46 extends beyond both sides or faces of web section 45 in a direction parallel to the longitudinal axis thereof so as to define an elongated peripheral wall of cylindrical configuration. The upper, peripheral outer surface of annular wall segment 46 is inclined or angled to thereby present a beveled surface 48. A similar beveled surface 49 is formed around the outer periphery of the lower end of annular wall segment 46. Beveled surfaces 48 and 49 are inclined at a predetermined angle so as to control and limit the extent to which the upper end of tubular casing 1 may be crimped or bent over into contact therewith, in a manner hereinafter explained with respect to FIG. 1. It is to be noted that peripheral wall segment 46 has a thickness measured along a line extending radially of planar web section 45 which is substantially greater than the thickness of web section 45. I have found that the thickness of annular wall segment 46 should be approximately at least twice that of web section 45 in order to impart the requisite strength to wad 44 and particularly to wall segment 46. Wall segment 46, and the entire structure of wad 44 is further strengthened by the use of a plurality of radially extending ribs 50 which project from planar web section 45 at right angles thereto and terminate at their outer ends in supporting engagement with annular wall segment 46. A similar set of ribs 51 is provided on the underside of central web section 45. Over-shot wad 44 is preferably molded as an integral piece incorporating planar web section 45, annular wall segment 46 and ribs 50 and 51. Polyethylene, or a similar volatile, deformable and resilient plastic material is utilized to form wad 44.

When wad 44 is inserted in the upper, open end of tubular casing 1 in the manner shown most clearly in FIG. 3, the plastic material from which it is molded will permit it to yield or deform slightly as required to obtain a snug, sealing fit with the inner wall surface of the mouth of casing 1. Straight, outer wall surface 52 of annular wall segment 46 will be disposed in abutting, sealing contact with the inside surface of casing 1. Peripheral wall segment 46 of wad 44 extends longitudinally of casing 1 a sufficient distance to insure a good seal. Central web section 45 of wad 44 extends transversely of casing 1 in overlying engagement with shot charge 42; and the lower end of annular wall segment 46 abuts against the top of shot cup 40. The extended length of annular wall segment 46 bearing against the inner surface of tubular casing 1, as well as the contact of wall segment 46 with shot cup 40 insures the proper positioning of wad 44 within the mouth of case 1 and prevents wad 44 from canting or tipping. Since closure wad 44 is provided with the same configuration on both sides thereof, including identical beveled surfaces 48 and 49 and ribs 50 and 51, there is no need to orient wad 44 with one side thereof facing upwardly or downwardly when it is inserted within tubular casing 1. This greatly simplifies the assembly of wad 44 within the shotshell both during factory loading and reloading in the field.

After closure wad 44 has been inserted over shot charge 42 in the aforesaid manner, the closure of the mouth or open end of tubular casing 1 is completed by crimping or bending a very short length of the end thereof inwardly and inwardly into abutting contact with beveled surface 48 or 49. Inclined or beveled surfaces 48 and 49 thereby serve as a rest or stop limiting the degree and extent to which the end of casing 1 may be crimped inwardly. The crimp end portion of casing 1 is indicated by reference numeral 54 in FIGS. 1 and 2 and serves as a bead or retaining lip by virtue of its overlying, restraining engagement with annular wall segment 46 of wad 44. Beveled surfaces 48 and 49 are formed at a predetermined angle which will provide for only a very slight inward crimping of retaining lip 54 on the end of tubular casing 1. Preferably, the angle at which lip 54 is bent or formed from section 45 of casing 1 does not exceed 45°. Such a very minimal length of the outer end of casing 1 is crimped that when bent inwardly through an angle of less than 45°, retaining lip or bead 54 formed thereby will project transversely inwardly by a distance not greater than the wall thickness of tubular case 1. The substantial thickness given to annular wall segment 46, and the additional strength
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imported thereto by radially extending ribs 50 and 51 insures that wall segment 46 will have sufficient strength and rigidity to resist the inward force applied thereto during the crimping and forming of retainer lip 54 on the end of casing 1. Thus, the degree of inward bending or crimping of the mouth of casing 1 is determined and closely controlled by the angle of inclination of beveled surfaces 48 and 49, which would not be the case if annular wall segment 46 were not given sufficient strength in the aforesaid manner. Any inward deflection or deformation of wall segment 46 would of course permit retainer lip 54 to be bent inwardly a greater extent and degree than desired, and the close control over the magnitude of the crimp sought by means of the particular angle and configuration given to beveled surfaces 48 and 49 would be lost. Ribs 50 and 51 are particularly effective in preventing the inward deflection of annular wall segment 46 during the crimping operation.

When inserted in the mouth of plastic case 1 in the manner shown in FIGS. 1 and 3, over-shot wad 44 serves to seal the mouth of case 1 as well as to contain and restrain shot pellets 42. This is accomplished by the abutting contact of planar web section 45 with the shot charge, as well as by downwardly depending ribs 51 which assist in preventing movement of the shot pellets 42 with respect to each other. This is an important feature in that any rattling or rolling of the shot pellets against one another causes flattening and deformation of the pellets with a resultant harmful affect on the shot pattern achieved upon firing of the shotshell.

When primer 8 is detonated in a shotgun, the outward forces generated by the ignition and combustion of propellant charge 28 will impel the wad column in the form of one-piece plastic over-powder wad and shot cup 30 and shot charge 42 out of tubular casing 1. The mouth of casing 1 will be opened by over-powder wad 44 as it passes outwardly in front of shot charge 42 and shot cup 40. Because of the very minimum closure crimp formed on the end of casing 1, retainer lip or bead 54 formed thereby will offer a minimum amount of resistance to the outward passage of the wad column and shot charge. Retainer lip or bead 54, being formed in an inwardly and upwardly inclined conical configuration conforming to the shape of beveled surfaces 48 or 49 and projecting transversely inwardly only a very short distance, will be forced fully open very quickly and easily by the upward force exerted thereon by closure wad 44. This is in contrast with the incomplete opening of plastic shell cases achieved with prior art closure arrangements wherein the outer end of the shell case is folded completely in a hem or is formed into an integral star crimp extending all of the way across the top of the shot charge. When a hard, plastic case is fully crimped in such a manner, difficulty is encountered in opening the crimped mouth because of the unyielding and nonresilient nature of the plastic material. Incomplete opening of the casing mouth not only causes damage to the crimped portion thereof but also interferes with the shot pattern. As the shot charge passes through the restricted opening of the shell casing it strings out in an undesirable pattern. Also, the over-powder wad will be squeezed and bow inwardly as it passes out of the restricted opening at the mouth of the shellcasing, thereby permitting gas from the detonated propellant charge to leak between the overpowder wad and the gun barrel. Any gas passing thereby into the shot charge will of course disturb the shot pattern. These difficulties are eliminated by the use of my improved over-shot wad 44 having beveled surfaces on the periphery thereof against which a very short crimped length of the shell casing abuts as a retainer lip. Because retainer lip 44 is fully opened upon the firing of the shotshell, shot charge 42 as well as sealing discs 36 and over-powder wad 26 will pass freely through the mouth of casing 1. Since discs 36 and over-powder wad 26 remain fully extended, they will be maintained in effective sealing engagement with the inside of the gun barrel. Disc-shaped closure wad 44, being made of soft, unbreakable polyethylene material stays in one piece as it moves down the barrel ahead of the shot charge. After leaving the gun barrel, wad 44 is blown off to one side out of the trajectory line of the shot charge as the wind is caught by projecting ribs 50 or 51. Ribs 50 and 51 thus serve an additional function as pressure vanes with the air caught between adjacent ribs 50 or 51 and the adjacent surfaces of web 45 and web section 48 acting on these ribs or vanes to spin wad 44 laterally to one side out of the path of the shot charge.

It is also important to note that the minimum amount of closure crimp formed on the mouth of casing 1 and the control of the crimping operation achieved by virtue of the crimp stop afforded by beveled surfaces 48 or 49 greatly simplifies the closing of the shotshell both during initial factory loading and reloading in the field. Since short retainer lip 54 does not become work-hardened and torn or damaged either upon firing or during the crimping operations, the lift of plastic casing 1 for reloading purposes is greatly extended.

What I claim is:

1. A closure, and over-shot wad for a shotshell comprising: a disc-shaped plastic member having a substantially planar, central wall section; and an elongated, peripheral wall segment projecting from said central, planar section in a direction parallel to the longitudinal axis thereof, the peripheral, edge surface of at least one end of said elongated wall segment being beveled at a predetermined configuration to serve as a stop for a retaining lip formed at the mouth of a shell case by crimping a very short length of the end of said case inwardly over said over-shot wad, said peripheral wall segment projecting beyond both sides of said planar, central section and is beveled around the peripheral edge surface of both ends thereof; and further including a plurality of ribs projecting from both sides of said central, planar section at substantially right angles thereto and formed integrally therewith, said ribs extending generally radially outwardly to the end portions of said peripheral wall segment and thereby serving as reinforcing and strengthening members therefor, said ribs having substantially the same thickness as said peripheral wall segment in a direction parallel to the axis at each side of the disc-shaped plastic member.

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