PATENT SPECIFICATION

Application Date: Aug. 12, 1935. No. 22733/35. **461,253**

Complete Specification Left: Aug. 12, 1936.

Complete Specification Accepted: Feb. 12, 1937.

PROVISIONAL SPECIFICATION

Improvements in or relating to Shot Gun Cartridges

We, HORACE AINLEY ROBERTS, of 9, Lindley Moor, Huddersfield, in the County of York, and WILLIAM DICKSON, of Ivythorpe, Streetly. in the County of Warwick, both British Subjects, do hereby declare the nature of this invention to be as follows:—

This invention relates to the manufacture of shot gun cartridges and particularly to improved means for closing the mouth of the cartridge case.

Hitherto the card or disc, hereinafter referred to as the overshot card, which is used to close the mouth of the cartridge case and to retain the shot in place, has been held in position by turning or folding over the edge of the mouth of the case, after the card has been placed in position, the turning over of the edge being such that, a retaining rim is formed and this rim presses on top of the card and seals the end of the cartridge.

The present invention has for its object, to provide cartridges of high ballistic efficiency, in which the mouth of the cartridge case is closed in a simple and effective manner to provide a completely waterproof seal.

According to the present invention the tubular portion of the cartridge case and the end closure therefor constitute an integral unit, both consisting at least in part of a suitable plastic material and being formed in the desired manner by the application of heat and/or pressure. The said plastic material should be non-brittle and highly waterproof and capable of being shaped by a moulding operation. Thus for example thermoplastic materials, such as those containing cellulose esters or ethers together with suitable plasticisers and fillers. may be used. The arrangement is preferably such, that, a card is interposed between the shot and the layer of plastic material to prevent the latter adhering to the said shot, and the thickness of the whole or part of the plastic covering material is adjusted to provide the desired release or breech pressure.

The closure may consist of the same material as the cartridge case and may be formed by crimping and folding over the tube end, or the necessary material may be introduced as a separate plastic disc or a small quantity of moulding powder which is pressed and moulded into position.

One method of carrying our invention into effect is illustrated in the accompanying drawings in which:—

Figure 1 is a sectional elevation of a cartridge constructed in accordance with our invention.

Figure 2 is a perspective view of the cartridge showing one stage in the mouth closing operation.

Figure 3 is a diagrammatic part sectional elevation of an apparatus for carrying out the final closing operation.

Referring to the drawings the numeral 1 denotes a cartridge case which is made of a plastic material as described containing cellulose esters or ethers together with one or more plasticisers, e.g. triphenyl phosphate, tricresyl phosphate, diamyl-tartrate or di-ethyl-phthalate, and a suitable filler. The cartridge is provided with a priming cap 2 and is loaded with a powder charge 3, a wad 4 and a shot charge 5. In the process of manufacture an overshot card 6 is inserted in the cartridge and the end of the case is crimped into the form of a short truncated cone 7 as shown in Figure 2 by means of a suitable crimping tool not shown in the drawing.

In order finally to close and seal the mouth of the cartridge, the latter is placed in a suitable supported metal die 8 as shown in Fig. 3 the base of the cartridge being supported by a removable packing block 9 which allows the cartridge to be inserted and removed from the die. The die is maintained at normal room temperature by means of cooling water which is circulated through channels 10. A concentric punch 11 which is suitably guided by means, not shown in the drawing, is lowered in the direction of arrow "A" and is pressed into firm contact with the crimped edge of the case. The punch 11 is heated by passing steam through channels 12 and the heated punch causes the thermo-plastic material to soften and flow over the overshot card 6 thus sealing the mouth of the cartridge

[*Price* 1/-]

with a layer of homogeneous material of substantial thickness.

The end portion of the punch is provided with a projecting annular ring 13 which forms an annular groove 14 in the closed end of the case. The thickness of the material between the overshot card and the bottom of the ring is readily adjusted by regulating the length of the cartridge case allotted for turnover or varying the depth of the projecting ring 13 to give any desired bursting pressure.

When the heated punch 11 has been in contact with the end of the case for a sufficient length of time to cause softening and flow of the material, the steam supply to the punch is cut off and a quantity of cold water is circulated through the channel 12, thus chilling and setting the thermoplastic material and enabling the cartridge to be removed from the die.

It will be understood that by using a constant pressure on the punch 11 each cartridge case will be loaded to a definite and uniform loading pressure, thus resulting in constant and unvarying ballistics over long and varying conditions of storage.

In an alternative method of closing the mouth of the cartridge case in accordance with the present invention the ends of the case are turned over in the normal manner, and the turned over edge subjected to pressure and heat in the manner previously described so that the plastic material is made to flow over the whole surface of the overshot card to form a homogeneous layer. If desired the annular groove may be omitted, and a uniform layer of material is obtained the thickness of which is adjusted by determining the length of the cartridge case allotted for turnover to give the desired bursting pressure.

In a further modification a separate plastic disc or a quantity of moulding powder may be used, which is placed on top of the overshot card and bonded to the side walls of the cartridge case by the application of pressure and heat, without the end of the case being crimped or turned over. Alternatively, a composite disc of plastic material and paper or cardboard may be used, the paper portion of the composite disc being adapted to contact with the shot to prevent the latter adhering to the plastic material during the bonding operation.

While it is preferred to construct the tubular portion of the cartridge case wholly of waterproof plastic material, it will be understood that the tubular portion may be composed of paper or other suitable material in which the tube or the end part thereof is impregnated with a suitable thermo-plastic material. The impregnating material may be applied to the ends of the tube and to the upper portion of the overshot card either before or after the turn over or crimping operation, and the mouth of the case is then subjected to heat and pressure, with or without the addition of more plastic material, in order to bond the plastic material firmly into a homogeneous mass in the manner previously described. The solvent of the impregnating material may be evaporated before the cartridges are inserted in the die or during the heating oepration.

If desired the end of the punch which comes into contact with the mouth of the case may be suitably embossed with letters or figures denoting the trade mark, shot size or the like.

By way of comparison it may be mentioned that cartridge cases made in accordance with the present invention, after having been immersed in water for twenty four hours, showed no appreciable signs of swelling and the powder moisture remained within the specified limits, whereas the known type of cartridge having a paper tubular portion with standard turned over end and waterproofed by dipping in a solution of waterproof material showed distinct signs of swelling, and the powder moisture exceeded the specified amount.

Dated the 12th day of August, 1935.
WILLIAM MORRIS.
Solicitor for the Applicants.

COMPLETE SPECIFICATION

Improvements in or relating to Shot Gun Cartridges

We, HORACE AINLEY ROBERTS, of 9, Lindley Moor, Huddersfield, in the County of York, and WILLIAM DICKSON, of Ivythorpe, Streetly, in the County of Warwick, both British subjects, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the manufacture of shot-gun cartridges and particularly to improved means for closing the mouth of the cartridge case.

Hitherto the mouth of the cartridge case has been closed and the shot retained in

position with the aid of a cardboard disc (hereinafter referred to as the " over-shot card ") which is held in position by turning or folding over the edge of the mouth of the case in such a manner that a retaining rim is pressed on to the disc. Cartridges made in this manner, however, have been found subject to deterioration owing to the fact that under certain conditions moisture permeates into the interior of the cartridge which not only causes swelling of the wads but also affects the moisture content of the powder charge with deleterious effects upon the ballistics of the cartridge.

Cartridges made from rolled paper tubes which are closed in the manner described, have been waterproofed in various ways, usually by dipping the loaded cartridge in a waterproofing lacquer. Unless special precautions are taken, however, the film of lacquer is liable to crack and its waterproofing properties are destroyed. It has been proposed to waterproof the end closure by covering the overshot card and the crevice between the card and the turned-over edge of the case with a coating of waterproof material, e.g. shellac or cellulose varnish. It has been found that cartridges treated in this manner are not entirely satisfactory, since the lacquer does not always form an efficient bond between the paper tubular portion and the overshot card, with the result that small cracks are formed which permit a certain amount of moisture to enter the cartridge case with consequent deleterious results. It has also been proposed to make the tubular portion of the cartridge case from an entirely waterproof material such as celluloid, but the use of highly inflammable material such as celluloid in this art is to be deprecated. Proposals have also been made to mould the tubular portion and the head of the cartridge case from plastic materials having waterproof properties, but these proposals have not described any solution of the problem of providing a completely waterproof end closure for the cartridge.

The present invention has for its object to provide cartridges of high ballistic efficiency in which the cartridge case and closure thereof are formed in a simple and effective manner to provide a completely waterproof assembly.

The present invention consists in a shotgun cartridge including a moulded tubular portion consisting of a substantially non-inflammable waterproof plastic material, the mouth of which is sealed by a waterproof plastic closure, either integrally moulded or bonded to the said tubular portion, or firmly united thereto with the aid of an auxiliary waterproof adhesive joining the plastic material of the closure and the plastic material of the tubular portion. The plastic material, in addition to being highly waterproof, should be non-brittle and capable of being shaped by a moulding operation. Thus, for example, thermo-plastic materials, such as those containing cellulose ethers, or cellulose esters such as cellulose acetate, together with suitable plasticisers and fillers, may be used. In particular we prefer to employ the compositions described and claimed in pending British Application No. 25957/35 (Serial No. 457,294). The arrangement is preferably such that the plastic material extends in an unbroken manner throughout the whole of the tubular portion and end closure, which thus constitute an integral unit. This may be carried out by softening the plastic material of the side walls of the tubular portion and the end closure by the application of heat and/or a solvent, pressure being preferably applied to complete the bonding action.

Alternatively, the tubular portion and the end closure may be moulded in the form of a single cup-shaped unit, and in this case the flanged base portion which is made separate from the tubular portion is joined to the latter in a water-proof manner, after the cartridge case has been loaded, by means of a suitable cement or by softening the contacting portions by the application of heat or a solvent. In a further alternative method of carrying out our invention, the end closure is united with the tubular portion of the case by turning over the side walls of the case on to a plastic disc and sealing the joint so formed with a waterproof cement or adhesive between the contacting surfaces.

It will be understood that our invention is not limited to cartridge cases in which the end closure is formed wholly of plastic material as the end closure may comprise a disc formed partly of a plastic composition and partly of cardboard or like material. Where a composite disc is used, however, it is essential that the plastic side wall of the case shall be bonded with or made to adhere to the plastic portion of the said disc. The moulded side walls of the case, moreover, may be reinforced with paper, fabric or other suitable material. Furthermore, the invention is not limited to the use of the same plastic material for the tubular portion and the end closure, as different plastic materials may, if desired, be used for these two parts of the case provided that the bond between the components is waterproof and sufficiently strong to provide the necessary ballistic properties of the cartridge.

Various methods of carrying out our invention are illustrated in the accompanying drawings in which:—

Figure 1 is a sectional elevation of a cartridge constructed in accordance with our invention.

Figure 2 is a perspective view of the cartridge showing one stage in the mouth closing operation.

Figure 3 is a diagrammatic part sectional elevation of an apparatus for carrying out the final closing operation.

Figure 4 is a sectional elevation of the mouth of a cartridge showing a groove formed in the tubular portion of the case.

Figure 5 is a sectional elevation of the mouth of a cartridge showing an annular groove formed in the end closure.

Figure 6 is a sectional elevation of the mouth of a cartridge showing an alternative form of end closure.

Figure 7 is a sectional elevation of the mouth of a cartridge showing yet a further form of end closure.

Figure 8 is a sectional elevation of a cartridge showing an alternative construction.

Referring to Figures 1 to 3 of the drawings, the numeral 1 denotes a cartridge case which is moulded in a suitable pressure moulding or injection moulding press, not shown in the drawing, from a non-inflammable plastic material of the kind described containing cellulose ethers, or esters such as cellulose acetate, together with one or more plasticisers, e.g. triphenyl phosphate, tricresyl phosphate diamyl tartrate or di-ethyl-phthalate and a suitable filler, e.g. french chalk. The cartridge is provided with a priming cap 2 and is loaded with a powder charge 3, a wad 4 and a shot charge 5. In the process of manufacture an overshot card 6 is inserted in the cartridge and the end of the case is crimped into the form of a short truncated cone 7, as shown in Figure 2, by means of a suitable crimping tool, not shown in the drawing.

In order finally to close and seal the mouth of the cartridge, the latter is placed in a suitably supported metal die 8, as shown in Figure 3, the base of the cartridge being supported by a removable block 9 which allows the cartridge to be inserted into and removed from the die. The die is maintained at normal room temperature by means of cooling water which is circulated through channels 10. A concentric punch 11, which is suitably guided by means of guides 12. is lowered in the direction of arrow "A" and is pressed into firm contact with the crimped edge of the case by means of either a dead weight, a suitable weighted lever mechanism or a hydraulic ram, not shown on the drawings. The punch 11 is heated by passing steam through channels 13 and the heated punch causes the thermoplastic material to soften and flow over the overshot card 6, thus sealing the mouth of the case with an end closure 14 (Figure 1) consisting of a layer of homogeneous material of substantial thickness.

When the heated punch 11 has been in contact with the end of the case for a sufficient length of time to cause softening and flow of the material, the steam supply to the punch is cut off and a quantity of cold water is circulated through the channels 13, thus chilling and setting the thermoplastic material and enabling the cartridge to be removed from the die. The punch 11 is reduced in diameter at its extremity 15 to provide a step, the purpose of which is to form an upstanding flange 16 at the end of the cartridge case, as shown in Figure 1. The flat annular surface of the punch 11, indicated by the numeral 17 of Figure 3, is arranged to contact with the edge of the flange 16 so that a smooth square edge free from any moulding flash is provided.

The bursting pressure of the cartridge may be adjusted by varying the thickness of the material above the overshot card. This may conveniently be carried out by regulating the length of the cartridge case allotted for turn-over. It will be understood that as the turned-over portion is spread over the whole area of the end of the case a comparatively large variation in the length of the turned-over portion results in quite a small variation in thickness of the plastic material covering the overshot card. Thus, any small variation in the length of the turned-over portion such as may occur in practice due to inequalities in the depth of the wad, or in the quantity of powder or shot charge, affects the thickness of the plastic covering to such a small extent that the bursting pressure is unaffected and remains constant for any given setting of the turnover and the loading pressure.

In order to locate definitely the position at which bursting of the cartridge takes place, a peripheral groove 18 may be provided in the side wall of the case, as shown in Fig. 4. This may be conveniently carried out after the sealing operation by means of a revolving cutter or like tool. The depth of the groove may be regulated to give any desired bursting pressure, the provision of such a groove ensures that a particularly clean cut edge is formed at the end of the case after firing. Instead of making the groove in the side wall of the case this may be provided in the end closure, as shown at 19, in Fig. 5. This groove may conveniently be formed dur-

ing the sealing operation by providing a projecting annular ring (not shown) on the end of the punch 11. If desired, the end of the punch which comes into contact with the mouth of the case may be suitably embossed with letters or figures denoting the trade mark, shot size or the like.

It will be understood that the apparatus illustrated diagrammatically in Figure 3 may be adapted to seal the ends of a number of cartridges by arranging a plurality of punches which are operated simultaneously in conjunction with a corresponding number of dies. Our improved method of closing the mouth of the cartridge may be further adapted to mass production methods by feeding the cartridges automatically and in succession into the dies by means of a suitable conveyor system.

Instead of crimping the end of the case to provide the necessary turn-over this may be accomplished by turning over the edge in the normal manner with the aid of a rotary turn-over tool, the turned-over edge being subjected to pressure and heat in the manner previously described. so that the plastic material is made to flow over the whole surface of the overshot card to form a homogeneous layer.

In an alternative method of closing the mouth of the cartridge case in accordance with the present invention the ends 20 of the case are shaped as shown in Figure 6, and a plastic disc 21 is inserted above the overshot card 6. A solvent is applied to the periphery of the disc and the edge, as indicated at 22 on the drawing, the purpose of the solvent being to bond the side walls and the disc together. Where plastic materials containing cellulose esters or ethers are used a solvent such as acetone or methylene chloride may be employed. Instead of employing a plastic disc, a quantity of moulding powder may be used which is treated with a solvent and applied to the top of the overshot card to form a homogeneous layer which is bonded to the side walls of the case. Alternatively, the side walls of the case may be turned over and a solvent employed to soften the material and enable same to flow over the whole surface of the end of the case, pressure being preferably applied to complete the bonding action. In an alternative method heat and pressure may be used to effect the bonding action of either a separate plastic disc or a moulding powder and, if desired, the end closure may be moulded or bonded with the side walls of the case without the latter being crimped or turned over. Where a separate plastic disc is used this may be bonded to the side walls of the case by the application of a heated punch before turning over the free end of the case, the said end being subsequently turned over to provide a rounded off finish. Where a moulding powder is used this may be united with the side walls of the case by means of an injection moulding operation which is carried out by placing the end of the case in a suitably shaped mould and injecting heated plastic material therein under pressure.

In a further modification, as shown in Figure 7, an auxiliary waterproof adhesive, as indicated at 23, is used to secure the turned over portion 20 to the plastic surface of the disc 24. It is essential for the formation of a satisfactory waterproof seal that the two surfaces in contact with the adhesive shall consist of plastic material.

Although a cardboard overshot card is shown in the foregoing drawings, this may be omitted provided that a suitable plastic material is chosen for the end closure which does not adhere to the shot charge.

In a still further modification, as shown in Figure 8, the tubular portion denoted by the numeral 25 is moulded in the form of a single cup shaped unit with the end closure 26. In a case of this kind the method of loading is inversed, the shot charge 5 being inserted first, followed by the wad 4 and finally by the powder charge 3. The cartridge is completed by attaching the base portion 27 containing the percussion cap 2. The base portion is preferably made of moulded plastic material which is firmly bonded to the side walls of the tubular portion 25 by softening the contacting surfaces 28 with a suitable solvent. Where the plastic material of the tubular and base portions is of the thermo hardening type which is not readily soluble, an auxiliary adhesive may be used to unite the parts together.

We have found that the ballistics of shot gun cartridges made in accordance with our invention are constant and unvarying over long periods of service when in hot moist climates, this being due largely to the fact that a completely waterproof case is obtained. By way of comparison it may be mentioned that such cartridges, after having been immersed in water for twenty four hours, showed no appreciable signs of swelling and the powder moisture remained within the specified limits, whereas the known type of cartridge having a paper tubular portion with standard turned-over end and waterproofed by dipping in a solution of waterproof material, showed distinct signs of swelling and the powder moisture exceeded the specified amount. Moreover, our method of manufacture enables the loading

pressure applied to the shot and powder charges and also the bursting pressure of the cartridge to be readily and accurately controlled, which factors contribute to the increased ballistic efficiency of the cartridge.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A method of manufacturing shot gun cartridges which includes the steps of moulding a tubular portion from a substantially non-inflammable waterproof plastic material, and sealing the mouth of the cartridge with a waterproof plastic closure, either by moulding or bonding the said closure integrally with said tubular portion, or by joining the plastic material of of the closure and the plastic material of the tubular portion with the aid of an auxiliary waterproof adhesive.

2. A method as claimed in Claim 1 in which the end of the tubular portion of the cartridge case is crimped or turned inwards and the crimped or turned-in portion subjected to the action of heat and/or a solvent, preferably under pressure, to cause the plastic material to flow over the whole of the end of the case thereby forming a homogeneous closure.

3. A method as claimed in Claim 1 in which a separate disc pre-formed wholly or partly of plastic material is united with the tubular portion of the case by the application of heat and/or a solvent.

4. A method as claimed in Claim 1 in which an added quantity of plastic moulding powder is subjected to heat and/or the action of a solvent to form an end closure homogeneously bonded to the tubular portion of the cartridge case.

5. A method as claimed in Claim 4 in which the end closure is formed by means of an injection moulding operation.

6. A method as claimed in Claim 2, in which for the purpose of controlling the bursting pressure, the length of the cartridge case turned over is predetermined in order to afford a suitable thickness of the end closure.

7. A method as claimed in any of the preceding claims in which a groove is formed either in the periphery of the tubular portion or in the end closure to locate the position at which bursting of the cartridge takes place.

8. A method as claimed in Claim 1 in which a plastic disc is inserted in the mouth of the cartridge and the end of the tubular portion of the case is turned over and the contacting surfaces of the turned-over portion and of the disc are firmly cemented together by means of an auxiliary waterproof adhesive.

9. A method as claimed in Claim 1 in which a separate preformed disc consisting partly of plastic material and partly of cardboard or like material is united with the tubular portion of the case by joining the plastic material of the disc and the plastic material of the tubular portion with the aid of an auxiliary waterproof adhesive.

10. A method as claimed in any of the preceding claims in which the base of the cartridge and the tubular portion together are integrally moulded.

11. A method as claimed in Claim 1 in which the tubular portion and the end closure are moulded in the form of a single cup-shaped unit, the head portion, containing the percussion cap, being made separate from the tubular portion and being joined to the latter, after the cartridge case has been loaded, by means of a waterproof cement or by softening the contacting portions by the application of heat or a solvent.

12. A shot gun cartridge including a moulded tubular portion consisting of a substantially non-inflammable waterproof plastic material, the mouth of which is sealed by a waterproof plastic closure, either integrally moulded or bonded to the said tubular portion, or firmly united thereto with the aid of an auxiliary waterproof adhesive joining the plastic material of the closure and the plastic material of the tubular portion.

13. A shot gun cartridge as claimed in Claim 12 in which the plastic material of the end closure and the plastic material of the tubular portion constitute an integral unit so that the waterproof plastic material extends in an unbroken manner throughout the said closure and tubular portion.

14. A shot gun cartridge as claimed in Claims 12 and 13 including a disc of cardboard or the like between the shot and the end closure for the purpose of preventing adhesion between them.

15. Apparatus for the manufacture of shot gun cartridges comprising a mould for forming the tubular and base portions of the cartridge case, means for crimping or turning over the mouth of the said case after loading, a die for receiving the said case, means for cooling said die, a punch adapted to contact with said mouth of the case and means for heating and cooling said punch.

16. Apparatus as claimed in Claim 15 including means for bringing the punch into contact with the mouth of the case under a predetermined constant load.

17. Apparatus as claimed in Claims 15

pressure applied to the shot and powder charges and also the bursting pressure of the cartridge to be readily and accurately controlled, which factors contribute to the increased ballistic efficiency of the cartridge.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A method of manufacturing shot gun cartridges which includes the steps of moulding a tubular portion from a substantially non-inflammable waterproof plastic material, and sealing the mouth of the cartridge with a waterproof plastic closure, either by moulding or bonding the said closure integrally with said tubular portion, or by joining the plastic material of of the closure and the plastic material of the tubular portion with the aid of an auxiliary waterproof adhesive.

2. A method as claimed in Claim 1 in which the end of the tubular portion of the cartridge case is crimped or turned inwards and the crimped or turned-in portion subjected to the action of heat and/or a solvent, preferably under pressure, to cause the plastic material to flow over the whole of the end of the case thereby forming a homogeneous closure.

3. A method as claimed in Claim 1 in which a separate disc pre-formed wholly or partly of plastic material is united with the tubular portion of the case by the application of heat and/or a solvent.

4. A method as claimed in Claim 1 in which an added quantity of plastic moulding powder is subjected to heat and/or the action of a solvent to form an end closure homogeneously bonded to the tubular portion of the cartridge case.

5. A method as claimed in Claim 4 in which the end closure is formed by means of an injection moulding operation.

6. A method as claimed in Claim 2, in which for the purpose of controlling the bursting pressure, the length of the cartridge case turned over is predetermined in order to afford a suitable thickness of the end closure.

7. A method as claimed in any of the preceding claims in which a groove is formed either in the periphery of the tubular portion or in the end closure to locate the position at which bursting of the cartridge takes place.

8. A method as claimed in Claim 1 in which a plastic disc is inserted in the mouth of the cartridge and the end of the tubular portion of the case is turned over and the contacting surfaces of the turned-over portion and of the disc are firmly cemented together by means of an auxiliary waterproof adhesive.

9. A method as claimed in Claim 1 in which a separate preformed disc consisting partly of plastic material and partly of cardboard or like material is united with the tubular portion of the case by joining the plastic material of the disc and the plastic material of the tubular portion with the aid of an auxiliary waterproof adhesive.

10. A method as claimed in any of the preceding claims in which the base of the cartridge and the tubular portion together are integrally moulded.

11. A method as claimed in Claim 1 in which the tubular portion and the end closure are moulded in the form of a single cup-shaped unit, the head portion, containing the percussion cap, being made separate from the tubular portion and being joined to the latter, after the cartridge case has been loaded, by means of a waterproof cement or by softening the contacting portions by the application of heat or a solvent.

12. A shot gun cartridge including a moulded tubular portion consisting of a substantially non-inflammable waterproof plastic material, the mouth of which is sealed by a waterproof plastic closure, either integrally moulded or bonded to the said tubular portion, or firmly united thereto with the aid of an auxiliary waterproof adhesive joining the plastic material of the closure and the plastic material of the tubular portion.

13. A shot gun cartridge as claimed in Claim 12 in which the plastic material of the end closure and the plastic material of the tubular portion constitute an integral unit so that the waterproof plastic material extends in an unbroken manner throughout the said closure and tubular portion.

14. A shot gun cartridge as claimed in Claims 12 and 13 including a disc of cardboard or the like between the shot and the end closure for the purpose of preventing adhesion between them.

15. Apparatus for the manufacture of shot gun cartridges comprising a mould for forming the tubular and base portions of the cartridge case, means for crimping or turning over the mouth of the said case after loading, a die for receiving the said case, means for cooling said die, a punch adapted to contact with said mouth of the case and means for heating and cooling said punch.

16. Apparatus as claimed in Claim 15 including means for bringing the punch into contact with the mouth of the case under a predetermined constant load.

17. Apparatus as claimed in Claims 15

and 16 in which the end of the punch is provided with a stepped portion adapted to form an upstanding flange at the end of the cartridge case.

18. A method and apparatus for making shot gun cartridges substantially as hereinbefore described with reference to the accompanying drawings.

19. Shot gun cartridges whenever manufactured by the process claimed in any of Claims 1 to 11.

Dated the 12th day of August, 1936.

WILLIAM MORRIS,
Solicitor for the Applicants.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1937.

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