May 17, 1960 F. R. SEAVEY 2,936,709

AMMUNITION

Filed Dec. 16, 1952 2 Sheets-Sheet 1

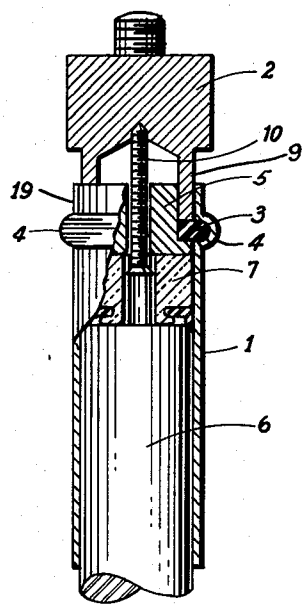


Fig. 1

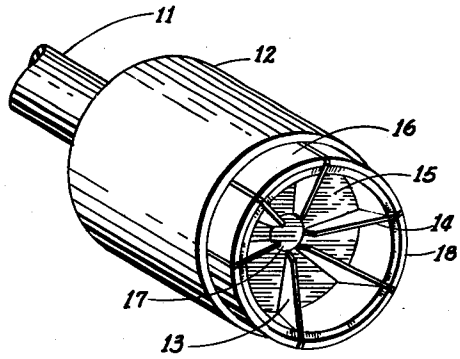


Fig. 2

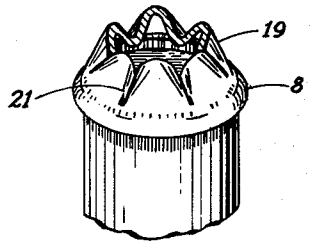


Fig. 3

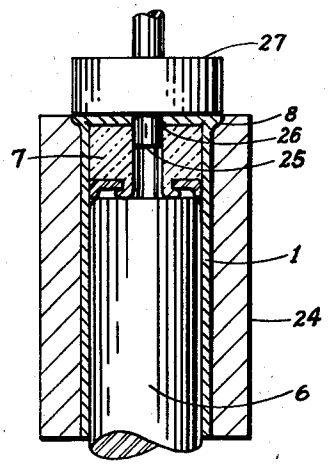


Fig. 4

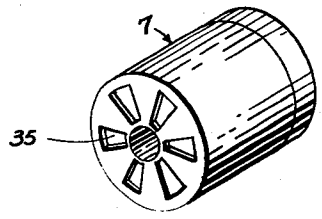


Fig. 8

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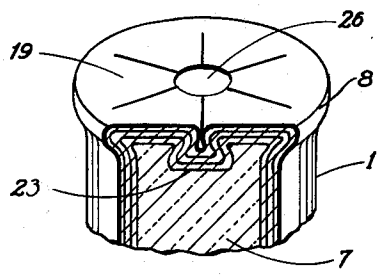


Fig. 5

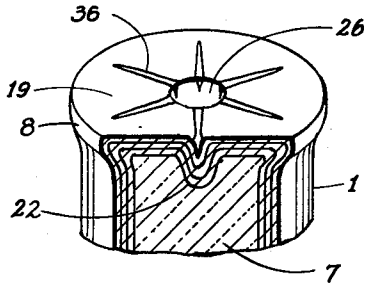


Fig. 6

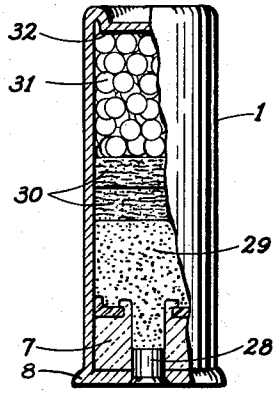


Fig. 7

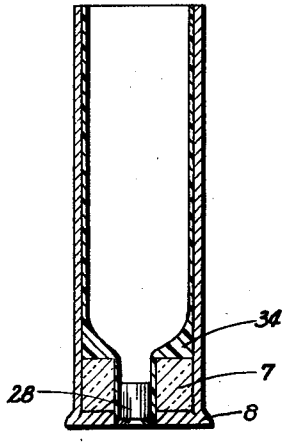


Fig. 9

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2,936,709

AMMUNITION

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Application December 16, 1952, Serial No. 326,211

6 Claims. (Cl. 102—44)

This invention relates to ammunition and more particularly to a novel gun cartridge and a method for making the same.

Shotgun cartridges having cases made from various materials such as metals, plastics or synthetic resins and papier maché have been proposed, heretofore, but do not function properly in a gun so it has been the custom in practice to make the case from a relatively pliant and resilient laminated paper tube having a metallic head which closes one end of the tube. The cartridge having a laminated paper tube and metallic head is not entirely satisfactory, however, because the head thereof is sometimes pulled from the tube by the gun's extraction mechanism, leaving the tube in the gun's chamber. In some instances too, the tube becomes separated from the head by breaking or "cutting-off" in the region adjacent the open end or mouth of the head when the cartridge is fired which often results in failure of the gun's extractor to remove the entire fired cartridge from the gun chamber. A condition of this kind is hazardous as it is possible to insert and fire a cartridge in a gun without knowing that a tube from a fired cartridge is in the gun's chamber. This is particularly true with a gun which automatically replaces a fired cartridge case in the gun's chamber with an unfired cartridge from the gun's magazine. As a result, serious injury has been experienced by shooters who have inadvertently fired a cartridge in a gun obstructed by a tube from a previously fired cartridge. Furthermore, a constant but unsuccessful endeavor has been made during the last three or more decades to develop a suitable or improved and less expensive substitute for the shotgun cartridge case having a paper tube and a metallic head.

It is therefore an object of this invention to provide a novel gun cartridge devoid of the disadvantages of heretofore known cartridges. It is another object of this invention to provide an improved cartridge in which the metallic head is eliminated. A further object of this invention is to provide a novel and improved cartridge case having the advantages of the prior paper cartridge case but devoid of the disadvantages inherent therewith. A still further object is to provide a method for making a novel gun cartridge case having a cylindrical paper body. Another object is to provide an improved and less expensive shotgun cartridge case.

Other objects will become apparent from the following description and accompanying drawing in which:

Figure 1 is an elevation view, partly in section, of a laminated paper tube shown in conjunction with apparatus suitable for use in one step of a process embodying this invention;

Figure 2 is a perspective view of apparatus suitable for use in another step of such process;

Figure 3 is a fragmentary perspective view of a laminated paper tube having one end thereof partially closed in accordance with an embodiment of this invention;

Figure 4 is a fragmentary view illustrating, partly in section, apparatus suitable for pressing the end of a tube to impart the contour of a cartridge head thereto;

Figure 5 is a fragmentary perspective view partially in section illustrating the head structure of one embodiment of this invention;

Figure 6 is a perspective view, partly in section, illustrating the head of another embodiment of this invention;

Figure 7 is an elevation, partly in section, of a loaded cartridge representing an embodiment of this invention;

Figure 8 is a perspective view of a basewad suitable for an embodiment of this invention; and

Figure 9 is a longitudinal view in section, of another embodiment of this invention having a plastic liner on the inner wall thereof.

The foregoing objects and others are accomplished in accordance with this invention, generally stated, by providing a gun cartridge case having a cylindrical body and a head integral therewith, both formed from a laminated paper tube. In accordance with the method for making a gun cartridge case provided by this invention, an annular flange is formed in the sidewalls of a cylindrical paper tube and the unflanged end of the tube remaining adjacent the flange is closed by forming a series of radial creases in the tube wall, folding the tube wall inwardly and forming reentrant folds or box plaits at each crease to accommodate that portion of the tube wall which is in excess of that required to close the end of the tube and pressing the end closure to impart the external contour of a cartridge head thereto. The cartridge case thus formed has an extraction flange distending from the tube wall adjacent to a plaited end closure having a plurality of segments joined by reentrant folds. The reentrant folds and segments preferably form box plaits or inverted box plaits and the term "box plaits" is used herein to include both of these type plaits. The paper tube utilized in this invention is formed by any conventional rolling method, is preferably convolutely wound and is of sufficient length that both the tubular body and head can be formed therefrom. The cartridge case and particularly the head thereof are preferably coated or impregnated with a resinous or the like coating composition before forming the head or after the head has been formed. A "laminated paper tube" as used herein and in the appended claims is one such as is formed by winding a sheet of paper about a mandrel using a suitable adhesive as a binder between the various convolutions of paper.

In order to better described and to further claritfy this invention, the following is a detail description of embodiments thereof with reference to the accompanying drawing:

A sheet of conventional type paper is convolutely wound and the resulting tube is dried, mechanically sized and burnished and impregnated with paraffin wax in accordance with conventional practice. A conventional soya protein water type paste is utilized as the binder in rolling the tube. The laminated tube is cut prior to impregnating with paraffin to a length equal to that required for the body of the cartridge case plus an additional length from which the head will be formed. For instance, for a 12 gauge shotgun cartridge case about 2¾ inches in length, a tube about 3 inches long is preferred.

In forming the cartridge head a laminated paper tube **1** having a conventional wound paper basewad **7** positioned therein is placed on a stationary punch **6** as shown in Figure 1 and a second punch **2** movable relative to punch **6** is inserted in the opposite end of tube **1** to a position adjacent the bottom of basewad **7**. Punch **2** is provided with an insert **5** slidably mounted about bolt **10** fixed on the body of the punch and is also provided with an annular distendable washer or rubber-member **3** about

and partially embedded in insert 5 and below the punch pressing ring extension 9. With insert 5 resting on basewad 7, punch ring 9 is moved into tube 1 to compress rubber member 3 between parts 9 and 5 of punch 2 and expand it as shown in Figure 1 to form annular bulge or external flange 4 in tube 1.

After punch 2 is withdrawn from tube 1 creases 21 are formed in that end portion of tube 1 extending above flange 4 by means of cup-like punch 11, shown in Figure 2. Creases 21, as shown in Figure 3 define truncated triangular segments 19 and the end of tube 1 is thus converted into the truncated-conical form shown in Figure 3. Punch 11 is composed of six blades 13 extending radially from the periphery of center shaft 17 through sleeve 16 which is in turn enclosed in annular housing 12 to form the cup-shaped head of punch 11. Sleeve 16 is composed of six substantially equal parts each forming part of the cup bottom 15 integral with the sidewalls thereof. The end of shaft 17 is flush with bottom 15. The leading edges 14 of blades or creasing tools 13 are flush at their outer ends with the exposed edge 18 of sleeve 16 and slope therefrom at an angle of about 45 degrees towards center shaft 17. The edges of blades 13 thus extend perpendicularly to bottom 15 from the end of shaft 17 until they intersect sloping edge 14.

In succeeding steps of the process, the truncated conical end of tube 1 is pressed between still another punch 27 and punch 6 while confined in die 24 as shown in Figure 4 to bring the outer wall of segments 19 of tube 1 into a plane substantially perpendicular to the tube wall and such that flange 4 forms the peripheral edge or extraction rim thereof. Pin 25 extends from punch 27 into primer cavity 26 to prevent movement of the paper into this area.

After withdrawal of tube 1 from punch 6 and die 24, the resulting head of the tube including the consolidated flange 8 is submerged for about 5 minutes in a solution containing about 40 parts phenol formaldehyde resin and about 60 parts ethyl alcohol. The phenol formaldehyde resin utilized to prepare the solution is of the type which has been catalyzed with ammonia and dehydrated. A solution thereof containing about 60 parts phenol formaldehyde resin and about 40 parts ethyl alcohol has a viscosity of about 300–400 centipoises at 25° C. Durez Resin 11897 manufactured by Durez Plastics and Chemicals, Incorporated, North Tonawanda, New York is an example of a trade product having the foregoing characteristics. The thus impregnated tubes are dried at about 250° F. for about fifteen minutes before pressure molding in suitable apparatus by conventional methods at about 290° F. for about 3 minutes. A primer assembly 28 (Figures 7 and 9) is inserted in primer pocket 26 and the resulting cartridge case is charged with propellant 29, wads 30 and projectiles 31 and the open end thereof is closed by folding the sidewalls of the tube 1 inwardly to form an integral end closure 32 similar to that disclosed in U.S. Patent 2,582,124, as shown in Figure 7.

When the tube wall is creased and folded inwardly in accordance with this invention to form the cartridge case head, the portion of the tube wall in excess of that required to close the end of the tube is pressed into a series of reentrant folds or box plaits which result in a relatively thick head structure and thus contribute to added strength and rigidity. A diagrammatic view, expanded somewhat to better illustrate the contour assumed by the paper in forming the reentrant folds or plaits 23 is shown in Figure 5. This view illustrates the structure of the head near the primer pocket. The reentrant folds 23 at that point are relatively wide resembling a box plait. At the periphery of the cartridge case head, on the other hand, no excess tube wall exists so no plaits are formed and the width of the plaits thus decreases from a wide box plait adjacent the primer pocket or cavity 26 to a termination of the plait adjacent the periphery of the cartridge head leaving rim 8 uncreased and thus well adopted for cartridge extraction. It is to be noted that the segments 19 extend to and form the walls of cavity 26 thus completely enclosing the basewad within the cartridge case.

In Figure 6, as well as in Figure 5, the reentrant folds 23 and 22 are shown extending into a notch in the basewad 7, such as 35 shown in Figure 8.

In the embodiment of Figure 6 the notch or recess 35 is of sufficient depth that the fold 22 is not appreciably flattened out like it is in the embodiment of Figure 5. While locking the head to the basewad in this way adds strength to the construction of the cartridge case, notches 35 can be eleminated and the preliminary folds 21 can be compressed between segments 19 and the bottom of basewad 7.

It has been found that the cartridge case provided by this invention has many advantages over the cartridge cases heretofore proposed. For example, since the cartridge case head is integral with the tube wall, the danger of firing a cartridge in a gun whose barrel is obstructed by the tubular body of a previously fired cartridge is eliminated. Also, the novel head structure described above is sufficiently rigid to support the priming assembly and prevent depression thereof by the gun's firing pin and to prevent the attendant failure of the priming composition to be initiated by the blow of the firing pin. The cartridge of this invention due to its laminated head structure is more easily extracted from the gun than the prior art cartridges molded from papier maché. The extraction rim of the cartridge of this invention is sufficiently rigid and strong that it is not deformed by the extraction mechanism of the gun, while the head of the molded cartridge case is frequently deformed or torn by the extraction mechanism. In addition, the cartridge provided by this invention can be produced at a lower cost than cartridges having a metallic case or metallic headed cartridge case. The cartridge of this invention is particularly advantageous during an era when metals are not in sufficient supply for all types of manufactures.

While, in the foregoing embodiments, a paper tube having its various laminations bound together with a soya protein adhesive is utilized, pastes containing casein, starch or the like or one of the various plastics or resinous materials such as, for example, ethyl cellulose, polyethylene, urea formaldehyde, phenol formaldehyde, melamine formaldehyde, cellulose acetate, polystyrene, a polyester or the like or mixtures thereof can be utilized as the binder. One of the foregoing resinous materials can also be utilized for impregnating the head in preference to the phenol formaldhyde described in the foregoing embodiment, if desired. In fact, if a resinous binder is utilized in forming the tube, the impregnating and setting step can, in most instances, be eliminated, particularly if the external surface of the tube is coated with the resinous material. Likewise, if a resinous binder is used paraffin impregnation can usually be eliminated. Moreover, it is contemplated that a cartridge case can be formed by winding a resinous coated, for example, polyethylene coated paper about a mandrel, inserting a basewad therein and heating the resulting assembly under pressure in a die to bind the various laminations of the tube together and to bind the sidewalls of the basewad to the inner wall of the tube. The subsequent operations for forming the head would then be similar to those described in the foregoing in connection with the other embodiments.

By "resinous material" is meant any suitable binder, including one or more of a paste, adhesive, plastic and natural or synthetic resin.

While a basewad provided with a cupped overlay as disclosed by Schuricht and Hindrichs in U.S. Patent 2,144,780 is illustrated in the drawing and is preferred to insure obturation, other types of basewads, such as those wound from crepe paper or paper impregnated or coated with asphaltum or the like which provide suffi-

cient obturation can be utilized. The basewad 7 is preferably bound to the head of the cartridge case with a resinous material such as one chosen from the group listed as suitable for binding the various laminations of the tube together.

In the embodiment shown in Figure 9, the shot gun cartridge case is formed in accordance with the process described hereinbefore except that a continuous layer of polyethylene 34 is molded over the inner wall of the tube, and the exposed surfaces of the basewad. This layer of polyethylene adds rigidity to the cartridge case and forms in combination with the basewad 7 an improved seal against the gases reaching the portion of the cartridge adjacent the head thereof. This plastic liner may be molded and inserted into the tube and sealed to the walls of the tube and to the wad by the application of heat or is preferably formed in situ. When the tube walls and head structure are impregnated with a resinous material, it is of course advantageous to form the liner 34 simultaneously with the impregnation. Other resins such as, for example, ethyl cellulose, polystyrene and the like can be utilized in forming the liner 34. Likewise, liners which extend only over the exposed surfaces of the basewad or extend over the basewad and only over a part of the tube wall extending from the basewad are advantageous for some purposes.

Although six creases are formed in the tube wall in the foregoing embodiments, the number thereof can be decreased or increased and the width of the resulting plait varied as required. Likewise, the end of the cartridge case can be folded over the projectile charge to form an end closure integral with the cartridge case wall as shown in Figure 7 or the end can be closed with a cardboard wad held in place by a conventional roll type crimp or breakable wad. While the segments 19 are shown in Figure 5 as abutting with each other, the plaits may be formed in such manner that the segments do not abut as shown at 36, Figure 6 and the depression therebetween can be filled with the resinous material.

In addition to the foregoing modifications in the embodiments described herein, other variations can be made within the skill of the art without departing from the scope and spirit of this invention.

Having thus described the invention, what is claimed and desired to secure by Letters Patent is:

1. A gun cartridge case having a cylindrical body and a head including an extraction rim formed integrally from fibrous material and comprising a tube having an annular outwardly extending fold of said tube adjacent one end forming substantially all of said rim about the periphery of the head and having a plurality of re-entrant folds in said tube between said end and said annular fold and externally planar segments joining said folds, said segments abutting with each other and terminating short of the center of said cylindrical body and said folds also terminating short of said center and defining together with said segments a centrally located opening and a surrounding end closure, a primer received in said openings, said segments forming an exterior surface perpendicular to said body and substantially flush with said rim and said re-entrant folds extending inwardly and longitudinally beyond said rim in a radial direction, and a base wad in the cylindrical body for securing said segments and folds together in head configuring relationship, said base wad abutting the inner side of the end closure and having indentations, said folds meshing with said indentations and embedded therein, whereby said case has a substantially rigid head structure including said primer and rim all resisting unfolding outwardly during cartridge firing.

2. The cartridge case of claim 1 wherein at least the rim, segments and re-entrant folds are impregnated with a resinous material.

3. The process of manufacturing a gun cartridge case comprising crimping a fibrous tube to form an external circumferentially extending flange adjacent one end of said tube but spaced therefrom, longitudinally creasing a portion of said tube between said end and flange at a plurality of circumferentially equally spaced portions while folding said tube and portion inwardly to compress said flange and form internal reentrant folds with sufficient longitudinal extension to adapt said folds for securement, said folds being joined by abutting truncated circular sectors, each of said folds and sectors terminating short of the center of said tube to form a primer opening and each of said sectors having exterior surfaces lying in a plane perpendicular to the central axis of said tube and flush with said compressed flange to form a rimmed flat cartridge head structure adapted to receive a primer in said opening, and joining at least said internal folds to a basewad within said tube by compressing said folds within meshing indentations formed in the end of said basewad for securing said end sectors against unfolding outwardly during cartridge firing.

4. The process of manufacturing a gun cartridge case comprising crimping a fibrous tube to form an external circumferentially extending flange adjacent one end of said tube but spaced therefrom, longitudinally creasing a portion of said tube between said end and flange at a plurality of circumferentially equally spaced portions while folding said tube and portion inwardly to compress said flange and form internal reentrant folds with sufficient longitudinal extension to adapt said folds for securement, said folds being joined by abutting truncated circular sectors, each of said folds and sectors terminating short of the center of said tube to form a primer opening and each of said sectors having exterior surfaces lying in a plane perpendicular to the central axis of said tube and flush with said compressed flange to form a rimmed flat cartridge head structure adapted to receive a primer in said opening, and joining at least said internal folds to means within said tube for securing said end sectors of said head structure against unfolding outwardly during cartridge firing, said step of joining being accomplished by pressing the creased and inwardly folded end portion of the tube sufficiently into said means within said tube to impart the external configuration of a rimmed flat cartridge head and simultaneously secure said end portion to said means.

5. The process of claim 4 wherein the fibrous tube is of laminated paper and wherein the joining step includes impregnating the cartridge head structure with a resinous material.

6. The process of claim 5 wherein the laminations are coated with resinous material and wherein the joining step is accomplished by pressing at elevated temperature after impregnation with resinous material.

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