

- [54] METAL COATED PLASTIC CARTRIDGE CASE AND METHOD OF MANUFACTURE
- [75] Inventor: Lester E. Burgess, Swarthmore, Pa.
- [73] Assignee: Gulf & Western Industrial Products Company, Grand Rapids, Mich.
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Primary Examiner—Robert F. Stahl
 Attorney—Meyer, Tilberry & Body

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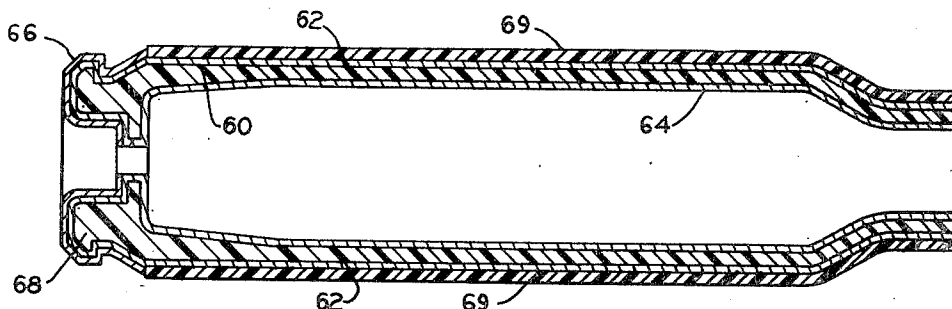
[57] ABSTRACT

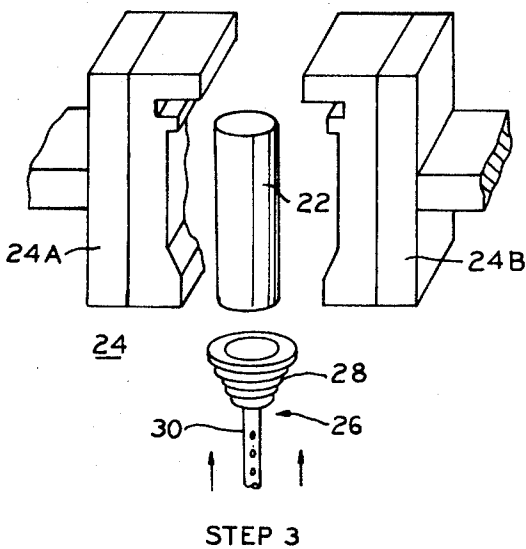
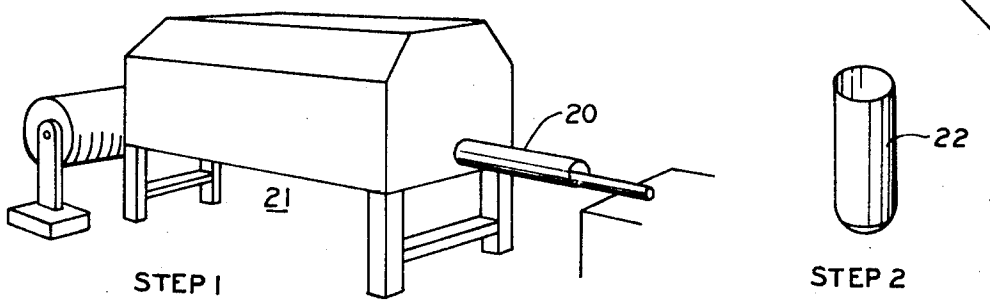
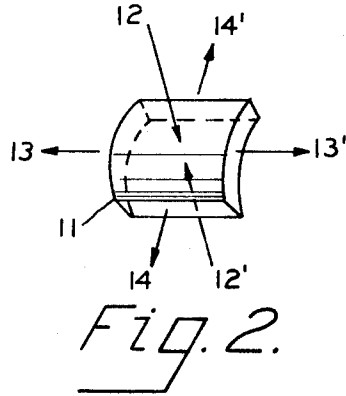
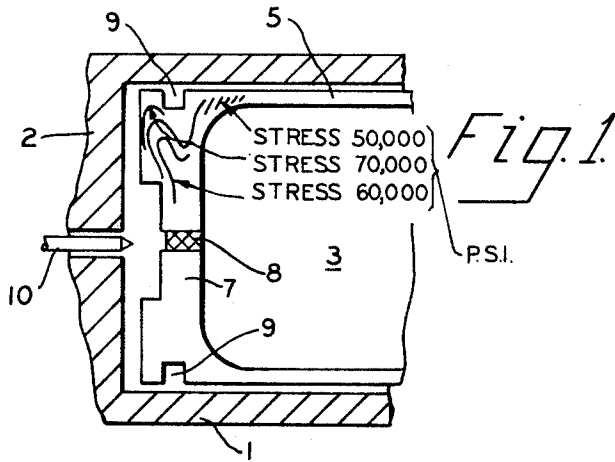
A metal-plated plastic cartridge case. A film of metal, preferably between 0.05 to 0.1 mils thick is plated onto a plastic cartridge case to increase the strength of the case and to provide it with other favorable characteristics such as abrasion and burn-through resistance and lubricity. The plastic case may comprise a filled or a fiber reinforced plastic. A plated metal skin preferably 5 to 7 mils thick may also be employed in conjunction with non-reinforced plastic cases to increase the strength of the case in critical areas. The invention also concerns a method of manufacturing a metal-plated cartridge case wherein a thermo plastic resin combined with a two-stage thermosetting resin and molded into a cartridge case blank, taking care not to achieve a permanent set. The blank is then molded into a cartridge case, preferably by compressing the extractor area and blow-molding the remainder of the cartridge case. Alternatively, the blank may be formed by extrusion or resin solvent solution impregnation of a sleeve reinforcement. In either case, the finished molded cartridge case is then metal plated to the required thickness of metal.

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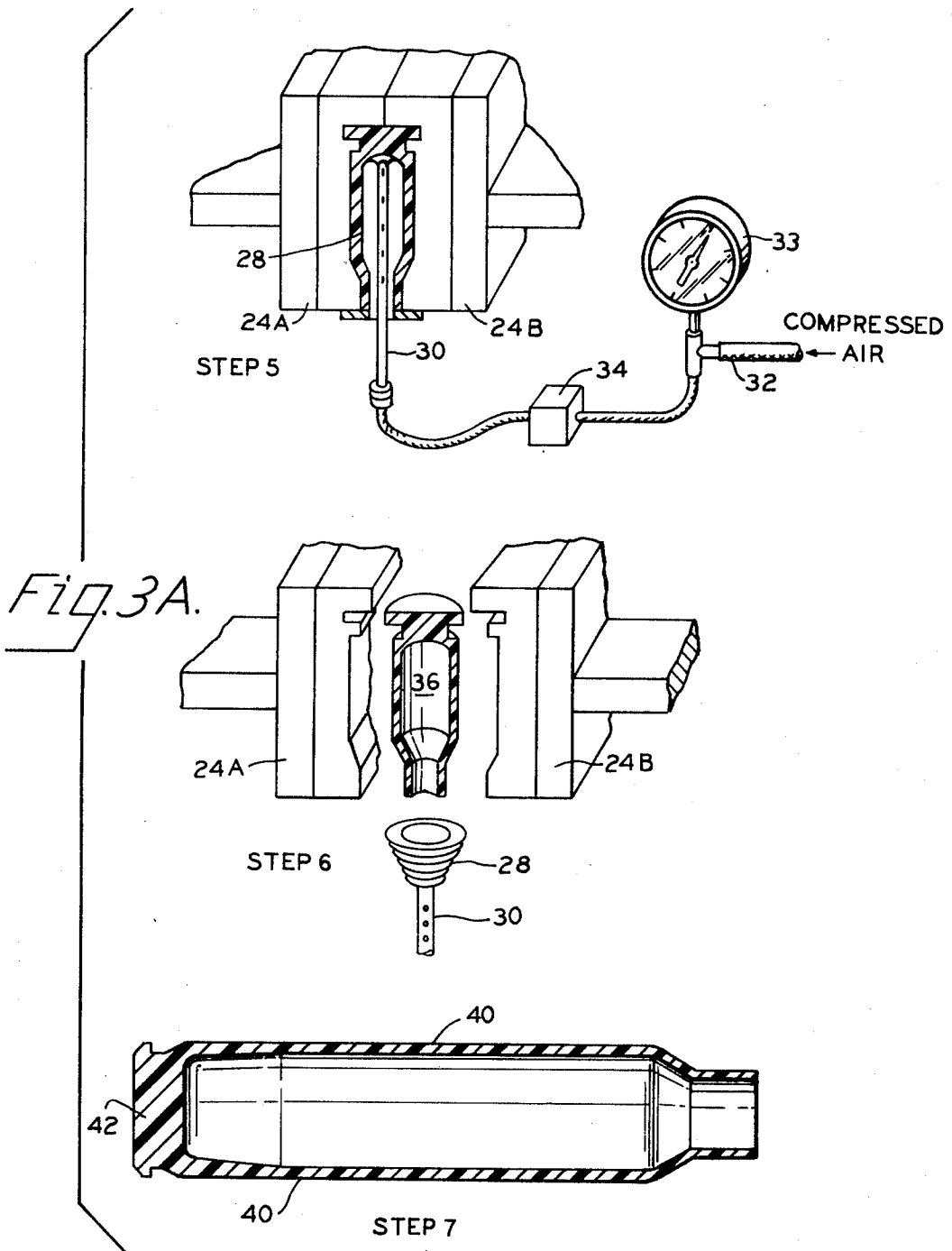
5 Claims, 7 Drawing Figures





INVENTOR
LESTER E. BURGESS

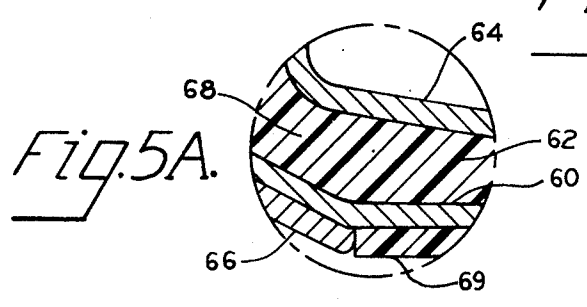
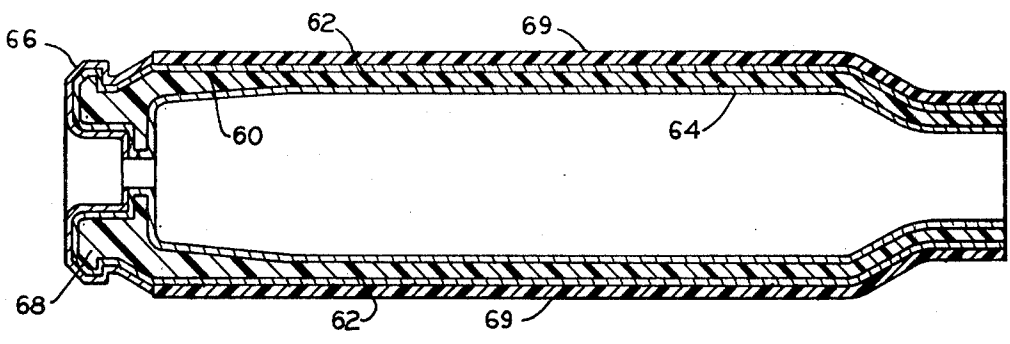
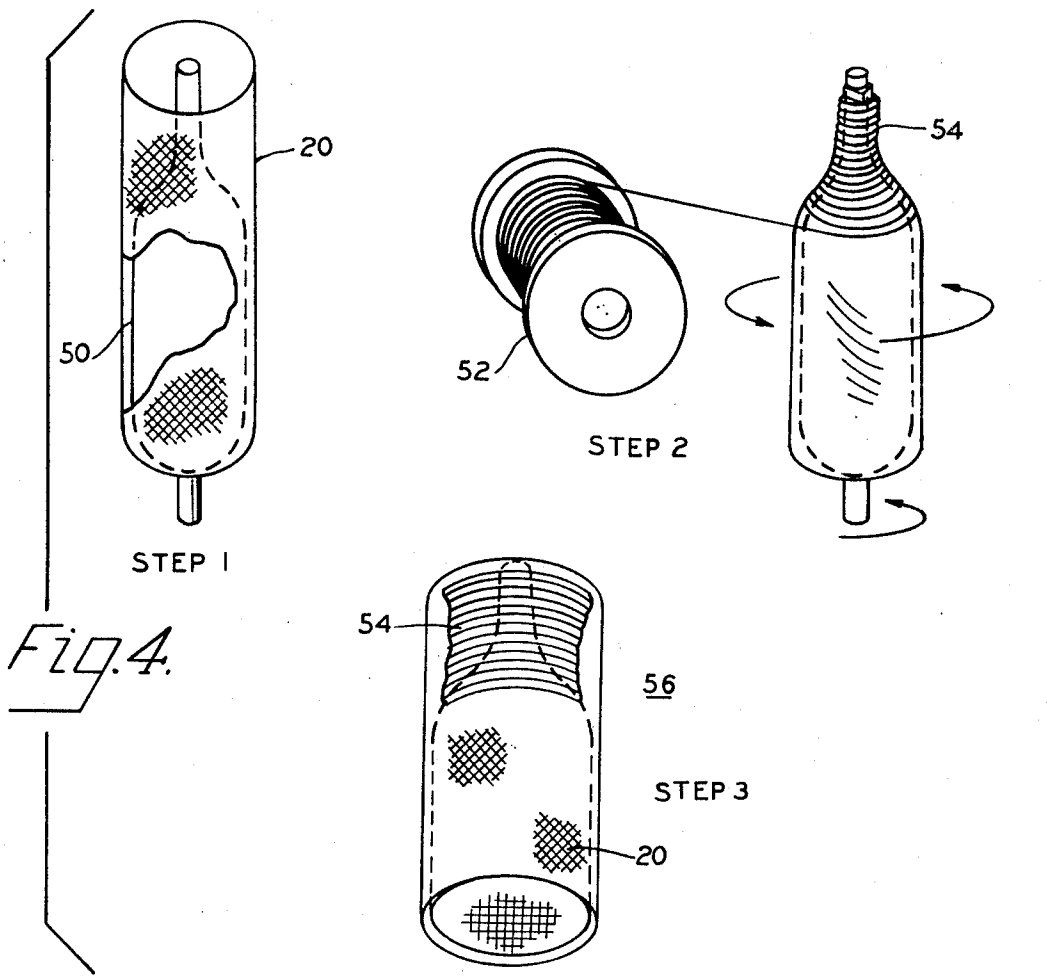
BY
Meyer, Tilberry & Body
ATTORNEYS.



INVENTOR.
LESTER E. BURGESS

BY

Meyer, Tilberry & Body
ATTORNEYS.



INVENTOR.
LESTER E. BURGESS

BY
Meyer, Tilberry & Boyd
ATTORNEYS.

METAL COATED PLASTIC CARTRIDGE CASE AND METHOD OF MANUFACTURE

This invention pertains to the art of cartridge cases for munitions and particularly to plastic cartridge cases.

The invention more particularly pertains to plastic cartridge cases which are metallized, that is, which are coated with a thin layer of metal, and to a method of manufacturing such metallized cartridge cases.

Cartridge cases were originally made from various brass compositions which satisfied the requirement of the munitions industry for many years. Brass has excellent characteristics such as strength, formability, good elastic recovery after distortion, heat stability, heat transfer control, corrosion resistance, and lubricity. However, considerations of cost, weight, and other factors such as availability of the raw material, have led to the manufacture of cartridge cases from materials other than brass, notably from plastics. Among the advantages available by producing cartridge cases from plastic are the fact that plastics are made from raw materials which are in plentiful supply, plastics are corrosion resistant and lend themselves to improvements in production efficiency and reduction in cost. Furthermore, a plastic cartridge case is much lighter than a corresponding case made from brass. The weight reduction is particularly important for munitions which are designed to be used or carried aboard aircraft.

The principal disadvantage of manufacturing cartridge cases from plastic has been the low strength of plastic as compared to brass or other metals traditionally used in cartridge cases. The severest test of the strength of a cartridge case occurs during firing of the cartridge. The pressure of the exploding gas imposes severe stresses upon the cartridge case and it is necessary that the case be able to withstand the stresses without rupturing and without being distorted to the extent that extraction of the case from the weapon is impeded.

Another important factor in extraction, particularly in high rate of fire automatic weapons, is elastic recovery of the cartridge case after firing. That is, the case may be distorted for a brief instant of time, measured in small fractions of a second, at the moment of explosion of the charge. It is important that the case recover from distortion to its original dimension very rapidly so that the case may be readily extracted from the chamber as soon as the cartridge is fired.

Another problem arising in the use of plastic cartridge cases has been the heat degradation of plastic when the cartridge enters the hot chamber or remains in the hot chamber after firing. This problem is particularly acute in automatic weapons where the rate of fire is high and there is not opportunity for the chamber to cool off between rounds.

Yet another problem encountered by the use of plastic cartridge cases has been the susceptibility of the case to abrasion. The cartridge case must be able to withstand handling without the formation of burrs during the loading process, in being assembled into belts for automatic-fire weapons by metal linkages, and in being manipulated by the chambering and extraction mechanism of the weapon. Abrasion or deformation of the case would tend to cause it to jam in the weapon, causing a malfunction of the weapon.

Another problem area associated with plastic cartridge cases is burn-through of the fired powder. That is, the case must not be susceptible to the exploded

powder burning a small hole through the case upon firing. Such burn-through is, of course, highly undesirable in causing a leakage of powder and an eruption or distortion in the surface of the case.

Yet another problem encountered in the use of plastic cartridge cases is the lack of lubricity of most plastics as compared to brass, whereby extraction of the round from the hot chamber is hampered.

Finally, the base of the cartridge case must be particularly rigid and have sufficient strength to protect the primer hole during the loading and firing sequence of the cartridge; the lack of strength of plastics as compared to metals is a particular problem of this regard.

In order to be suitable for use, especially in military weapons where high rate of fire and absolute dependability are prime considerations, a plastic cartridge case must overcome the foregoing problems and in addition must be resistant to attack by moisture, sunlight, temperature extremes and other environmental factors over prolonged periods of time while in storage, transportation and use.

The present invention contemplates a new and improved plastic cartridge case which has the advantage of light weight and low cost and yet has increased strength to resist firing stresses, is protected against heat degradation even in the hot chamber of the weapon, has good abrasion resistance and lubricity and excellent resistance to environmental attack.

In accordance with one aspect of the invention there is provided a plastic cartridge case with a heavy metal skin at high stress points and a thin metal film elsewhere on the cartridge.

In accordance with another aspect of the invention, a non-reinforced plastic cartridge case is provided with a heavy metal skin at critical stress points to provide the requisite strength.

In accordance with another aspect of the invention, there is provided a fiber reinforced plastic cartridge case which is metal-plated to enhance its strength and its heat and environmental resistance.

In accordance with still another aspect of the invention, there is provided a one piece reinforced plastic cartridge case which has a first metal skin of about 1 to 2 mils thickness over its outer surface, a second metal skin of about 5 to 7 mils thickness over its outer base area, and a metal film of about .05 to 0.1 mils thickness over its inside surface.

In accordance with yet another aspect of the invention, there is provided a method of manufacturing a metallized plastic cartridge case by forming a fiber-wound cup on the end of a fabric sleeve, inserting the cup-sleeve combination into a mold, expanding said sleeve into said mold by means of an expandable mandrel, molding the cartridge case around said expandable mandrel, and metal-plating the molded cartridge case.

In yet another aspect of the invention, there is provided another method of manufacturing a metallized plastic cartridge comprising resin-impregnating a sleeve-cup combination to form a blank which is then molded around an expandable mandrel. In yet another aspect, the blank is formed by injection molding from a two stage thermosetting resin without imposing a permanent set, and the cartridge is then formed by compressing the extractor area and blow-molding the rest of the case from the blank.

The principal object of the present invention is to provide a light weight, low cost, high strength, high heat and abrasion resistant plastic cartridge case.

It is yet another object of the invention to provide a one piece plastic cartridge case plated with a thin layer of metal to enhance the strength, lubricity, and heat and environmental resistance of the case.

It is yet another object of the invention to provide a fiber-reinforced metallized plastic cartridge case.

It is yet another object of the invention to provide an efficient method of manufacturing such cartridge cases.

The invention may take physical form in certain parts and arrangements of parts, preferred embodiments of which will be described in detail in the specification and illustrated in the accompanying drawings which form a part hereof and wherein

FIG. 1 is a schematic, partial section view of a cartridge case seated in a gun.

FIG. 2 is a schematic view of a typical section of a cartridge case showing stresses as force arrows.

FIGS. 3 and 3a are schematic drawings representing the sequence of steps of a preferred manufacturing method in accordance with the invention and the reinforced cartridge case obtained thereby.

FIG. 4 is a schematic drawing representing the sequence of steps in another preferred manufacturing method.

FIG. 5 is a cross section view of a finished cartridge made in accordance with one aspect of the invention.

FIG. 5A is an enlarged cross section of the cartridge wall.

Referring to FIG. 1, a schematic diagram is shown in partial section, of the base of the cartridge case seated within the firing chamber of a weapon. The chamber may be considered to be formed by the rear most portions of the gun barrel 1 and the gun backstop 2. The cartridge case is shown generally at 3, with the walls of the cartridge case designated 5 and the base portion 7. The cartridge primer charge is shown at 8. A firing pin 10 is shown positioned within the gun backstop and adapted to be forced forward by suitable means (not shown) so as to detonate primer charge 8. Upon firing, firing pin 10 strikes primer charge 8 which detonates and in turn detonates the main powder charge (not shown) contained within cartridge case 3. Upon detonation, severe stresses are imposed upon the cartridge case. Internal pressure stresses (which reach typical values of about 50,000 to 70,000 PSI or higher during firing) are imposed upon the case. The stresses imposed upon the cartridge case may be described as axial stresses, radial stresses and circumferential, or hoop stresses. These stresses are shown diagrammatically in FIG. 2 wherein 11 represents generally a section of the cartridge case wall. The arrows 12 and 12' represent the radial stresses imposed upon the case, the arrows 13 and 13' represent the axial stresses posed upon the case by firing, and the arrows 14 and 14' represent the circumferential or hoop stresses.

Where there are abrupt changes in shape or thickness of the case such as at the extractor groove shown as 9 in FIG. 1, the stresses are intensified. Typical stress distribution lines at the base and lower wall portion of the cartridge case during firing with values in pound per square inch are shown in FIG. 1. Stresses of between 50,000 to 70,000 PSI are shown to be incurred by the cartridge case which stresses are far in excess of the

maximum strength of plastics. In order to withstand the stresses of firing, a cartridge case made of plastic will require reinforcement.

One method of reinforcing plastics to provide additional strength is to provide an aluminum, iron or other metal powder filling. Another well known method of enhancing the strength of plastics is by the addition of fibers or fabrics within the plastic composition to provide reinforcing strength. For example, the plastic article may be formed around or have embedded within it fibers of various materials to enhance its strength. Glass filaments, rovings, chopped fibers, filament windings, etc., are well known in such reinforcing applications.

The surface relationships between the metal powder or fiber reinforcing means and the plastic may be enhanced by the addition of coupling agents, such as silanes, to improve surface adhesion between the reinforcing material and the plastic resin.

Finally, mixtures of various plastic resins may be employed to obtain desired characteristics including enhanced strength.

Table I below, shows the enhanced strength obtainable by the addition of fillers and glass fabric to plastic resins. Table I also shows the tensile strength range of brass and aluminum alloys and it is seen that even with powder filling and glass fabric reinforcement the tensile strength of plastics is generally insufficient to meet the requirements of resisting the stresses to which a cartridge case is subjected.

TABLE I

COMPARISON OF TENSILE STRENGTH FOR SELECTED PLASTICS AND METALS

Material	Tensile Strength (1,000 Psi)
Unfilled Plastics:	
Nylon (type 6 molded)	7 to 12
Polycarbonate	8 to 9
Polysulfone	10 to 11
Filled and Fiber Reinforced Plastics:	
Epoxy (glass filled)	10 to 30
Nylon 6/10 (20 to 40% glass filled)	13 to 35
Polyester (premix chopped glass filled)	4 to 10
Polycarbonate	12 to 20
Polyester (glass fabric reinforced webb)	30 to 50
Metals:	
Brass Alloy	35 to 120
Steel Alloy	100 to 290
Aluminum Alloy	13 to 83

It has been discovered that a plastic cartridge case of sufficient strength and with other desirable characteristics can be obtained by plating a plastic case with a thin film of metal, which provides not only the requisite strength but other additional beneficial characteristics. Metal plating of the plastic increases the tensile strength of the plastic by an appreciable amount, while the flexural modulus is increased by even greater ratio. The flexural modulus (or Young's modulus) of a material generally reflects the resistance to deformation of the material under stress. For a given applied stress in pounds per square inch, a material with a high flexural modulus will deform less than a material with a lower flexural modulus. Material with a higher flexural modulus has the better characteristics for instant elastic recovery from the stresses imposed by firing.

Generally, any plastic which has the requisite properties of moldability, strength and capability of being metal plated may be used in the invention. A combination or "alloy" of two or more resins is preferred for use in the invention whereby desired characteristics

may be obtained. An "alloy" of thermosetting and thermoplastic resins has been found to be particularly useful in the process of manufacturing cartridge cases as is described more fully hereinbelow. By way of example and not by way of limitation, the cartridge case of the invention may be made from polysulfone, polyethylene, polypropylene, acrylonitrile-butadiene-styrene (ABS), polycarbonate, polyester, epoxy, phenolic-aldehyde, melamine-formaldehyde, acrylate, polyvinyl, styrene and polyamid (nylon) resins or combinations thereof. In addition, as described more fully hereinbelow, fillers and fiber or cloth reinforcement may be used to enhance the strength, stability, hardness and elasticity of the metal-plated plastic case.

The metal plating of the case is essential to providing a cartridge case with sufficient strength and other satisfactory properties as described above. However, it has been found that a satisfactory cartridge case can be made in accordance with the invention wherein the total metal content (plating and fillers) is not more than about 3 percent by weight. Typical plating metals which may be used in the invention are nickel and chrome. Other metals may be used.

Table II shows typical properties of plated and unplated polysulfone. The increases in structural strength amounts to roughly 25 percent whereas the increase in flexural modulus is approximately four-fold.

TABLE II
TYPICAL PROPERTIES OF PLATED (a) AND UNPLATED POLYSULFONE

Property	Plated Polysulfone	Unplated Polysulfone
Flexural Strength, psi	20,900	15,400
Flexural Modulus, psi	1,719,000	390,000
Heat Deflection At 264 psi, °F	363	345
At 66 psi, °F	(b)	358
a. Plating:	1.2 mils semi-bright nickel bright nickel 10 micro-in. chrome	0.3 mils
b. No failure, even at melting point of resin		

It has been found that by using suitable thicknesses of metal plating, either alone or in combination with other reinforcing means, plastic cartridge cases can be manufactured which can withstand firing stresses and have other desirable characteristics such as rapid elastic recovery so that such cases are suitable for use in weapons and particularly in automatic, high rate-of-fire weapons. Without wishing to be bound by the correctness of the theory, it is believed that the improvement in strength can be attributed at least in part to an internal effect caused by the metal film which prevents the formation of breach points on the surface of the plastic. The metal film is believed to accomplish this by bridging each point on the surface of the plastic to each other point. An additional contribution to the overall strength is, of course, made by the strength and elasticity of the metal film itself. The elastic recovery rate of plastic is improved by the metal plating which enhances the flexural modulus of the plated composite material. It has been found that a metal film thickness of up to 5 mils, preferably 0.05 to 2 mils, suffices, in conjunction with reinforced plastic cartridge cases, to provide the requisite strength, whereas metal skin thicknesses up to 20 mils, preferably about 5 to 7 mils thickness, are required at high stress areas, e.g., the base and ex-

tractor groove area of the cartridge, when a non-reinforced plastic is used.

The addition of plasticizers and fiber reinforcement materials enhances the flexural modulus and therefore the elastic recovery rate of the plastic. It has been found that by suitably selecting one or more of these elements, i.e., metal plating, suitable plasticizers, and reinforcing materials, a plastic cartridge case can be made to provide the desired strength and flexural characteristics.

Plastic fiber reinforcement can be effected in numerous ways. As aforesaid, chopped, random length fibers may be employed, or continuous fiber filaments or woven fabric lay-ups may be employed, or a combination of these. In one preferred embodiment of the invention, wound filaments, that is continuous filaments which are wound in a specific manner within the finished cartridge case, are employed to provide enhanced strength.

While the use of any type of reinforcing filament is within the scope of this invention, it is particularly preferred to employ glass fiber filaments as the reinforcing medium. Various types of glass fibers are known. The glass fibers are available in a variety of forms such as copped, strands, yarns, woven fabrics and roving. Rovings are rope-like bundles of continuous untwisted strands and provide great strength reinforcement.

Continuous, reinforcing filaments may be wound in place instead of, or in addition to, dispersed fibers so that the density and direction of the filaments can be closely controlled. One advantage of such filament winding is that by properly controlling the angle between the wound filaments and the direction in which stresses are imposed, enhanced directional strength may be obtained. By properly selecting a winding angle, the strength of the cartridge in relation to hoop, radial and axial stresses may be tailored to the particular design requirements. Accordingly, in one aspect of the present invention a filament-wound reinforcement is employed to enhance the strength of the plastic cartridge case. In another aspect of the invention filament-wound reinforcement is used to supplement other reinforcing means, as set forth in detail in connection with the description of FIG. 5.

Referring now to FIG. 3, there is schematically depicted a sequence for manufacturing a reinforced one-piece metalized plastic cartridge case. In step 1 a sleeve shaped reinforcing fabric 20 is impregnated with a thermoplastic resin or a thermosetting resin or a combination of the two. For example, polysulfone plastic resins may be used. The sleeve, which may be made of nylon, glass fiber or other material, may advantageously then be extruded with the thermoplastic or thermosetting resin, as illustrated in step 1, wherein the extruder is shown generally at 21. In step 2, the sleeve is cut into tubes 22 the length of which is somewhat in excess of the length of the finished cartridge. In step 3, the cut tube 22 is inserted into an open mold designated generally as 24, and an expandable mandrel 26, comprising essentially a diaphragm 28 of rubber or other elastic material in a plunger 30, is inserted (in step 4) within the tube 22. The mold sections 24A and 24B are then closed. Plunger 30 serves to collect the impregnated fabric sleeve and jam it to the upper portion of the closed mold which, as is seen in the drawing of step 4, forms the base of the cartridge case. In step 5, the mandrel is inflated by compressed air admitted via line 32

and pressure gauge 33 and controlled by valve 34. The expanded diaphragm 28 forms the interior of the cartridge case. In step 6, the mold is cooled, if necessary (generally, cooling is required only for thermoplastics), diaphragm 28 is deflated and the mandrel is removed. The mold is opened and the cartridge ejected.

The resultant product is shown in step 7 to comprise a one-piece plastic cartridge case 36 reinforced by the reinforcing sleeve (not shown) which extends throughout the wall section 40 of the finished case in a uniform single layer and which is bunched-up at the base section 42 into multiple layers to provide added strength. The finished cartridge case then proceeds to the metal plating process (not shown) wherein metal is plated on both the inside and outside surfaces of the finished case.

Referring now to FIG. 4, which shows a modified process of preparing the cartridge case, in step 1 a fabric sleeve 20 is placed upon a winding mandrel 50.

As hereinabove stated, particularly high stresses are encountered at the base of the cartridge where abrupt changes in cross-sectional area occur. Accordingly, filament winding reinforcement of the base area is employed in conjunction with the fabric sleeve reinforcement. Specifically, a filament is wound from spool 52 about one end of the mandrel to form a filament wound cup 54 in combination with the sleeve 20, as is shown in step 2.

While the winding may be employed underneath the sleeve or both under and over the sleeve, it is preferred that the sleeve be employed over the filament-wound cup to provide greater strength at the ejector groove of the cartridge. A filament or tape may be used as the winding. A resin filament may be wound simultaneously with a glass fiber or other reinforcing filament to obtain more intimate resin impregnation of the winding. The finished combined sleeve and filament-wound cup end may be impregnated with a plastic resin, for example polysulfone, by an injection molding technique or by a solvent resin solution impregnation technique to form impregnated sleeve-cup 56. That is, the fiber sleeve and filament-wound cup combination may be soaked in a resin dissolved in solvent or a resin may be molded around the sleeve-cup combination to form the resin impregnated sleeve-cup molding blank 56 shown in step 3. The remaining steps of the process are similar to that described with respect to FIG. 3. The molding blank is placed within a mold and an inflatable mandrel inserted therein to mold the cartridge case into its final shape. The molded cartridge case then is metal plated as described with reference to FIG. 3. When preliminary molding or extruding with thermosetting resins is utilized to impregnate the sleeve-cup combination to form the molding blank, care is taken to preclude a permanent set of the resin so that it may be remolded in mold 24 to the finished shape. Considering step 7 of FIG. 3 to represent the molded plastic case obtained by the process of FIG. 4, walls 40 are reinforced by the single layer of the sleeve while base section 42 is additionally reinforced by the wound cup. After molding, polishing and grinding may be accomplished to obtain final specification tolerances and the cartridge then sent to metal plating.

In general, it is seen that the cartridge case may be reinforced by fibers, cloth or wound filaments, or a combination thereof, so that such reinforcement may be tailored to accommodate areas of different stress

throughout the case. A high stress area, such as the extractor or base area, will suitably be highly reinforced.

Filament winding may be employed throughout the cartridge case, disposed at selected winding angles, as is known to those skilled in the filament winding art, to accommodate the different stresses throughout the case by enhancing the strength of the case in particular directions.

The sleeve reinforcement or sleeve-cup reinforcement may be pre-formed and impregnated with a resin by molding or solvent resin impregnation techniques. More than a single layer of sleeve reinforcement may be used, although generally a single layer is sufficient and preferred in the wall area of the cartridge while it is preferred to bunch-up the sleeve into multiple layers in the base area of the cartridge.

The plastic case may be fiber-reinforced, by which is meant that randomly dispersed chopped fiber, fiber rovings, windings cloth, matt, fabric or tape or any combination thereof may be embedded within the plastic case.

In addition or in lieu of fiber reinforcement, fillers such as iron, aluminum or other metal powder or the like may be added to the plastic.

Coupling agents, such as silanes or the like, which are well known to the art may be used in conjunction with the fillers and/or fiber reinforcement.

A plastic cartridge case without fiber, filament or fibersleeve reinforcement may be molded and then metal plated. While FIG. 3 shows a single molding step in relation to mold 24, the cartridge base or extractor area may be compression-molded while the remainder of the case is blow-molded.

Finally, mixtures of resins and plasticizers may be formulated to tailor-make desired strength and flexural modulus characteristics.

Metal plating of the plastic cartridge case can be carried out by any known means. Typically, the part to be plated is cleaned and its surface is conditioned or etched in an acid bath to promote bonding between the plastic and the subsequent plate. Conditioning is followed by immersion in a sensitizing solution. An activating step, in which the plastic surface is seeded with a catalyst, follows.

The catalyzed plastic surface is then immersed in a copper or nickel plating bath, and the plating metal is reduced out of the solution so that it deposits upon the plastic surface. Typically, thicknesses on the order of 10 to 40 millionths of an inch are obtained. This electroless plating step provides the plastic with a metal surface so that it can be electroplated by standard electroplating procedures as with any other article.

The strength added by metal plating the one piece plastic cartridge may be such, where relatively thick platings are used, as to eliminate the necessity for fiber or other reinforcing of the plastic. Referring now to FIG. 5, there is shown a metalized one piece plastic cartridge case formed without fiber reinforcement of the plastic. A first metal skin 60 is plated over the plastic body 62 to a thickness of 1 to 2 mils. An inside metal film 64 is plated on the interior of the cartridge to a thickness of from about 0.05 to about 0.1 mils. A second metal skin 66 is plated on the outside of the base portion 68 of the cartridge to a thickness of from 5 to 7 mils. The thick, second metal skin aids in providing the added strength required at the base section of the cartridge. A plastic coating 69 may be overlaid on the

first metal skin so that a smooth transition surface between second metal skin and the walls of the cartridge is provided. This is more clearly shown in FIG. 5A.

The various thickness of plating may be obtained by plating methods well known to those skilled in the art.

While the thick metal coating is desirable in order to obtain sufficient strength for non-reinforced cartridges, it will be appreciated that even in the case of fiber-reinforced cartridges, variations in coating thickness from one point on the cartridge to another may be desired in order to enhance the strength of certain area of the case.

A non-fiber reinforced plastic cartridge case with metal skin and film at least of the thickness specified with respect to the embodiment of FIG. 5, has sufficient strength and flexural modulus to serve satisfactorily as a 20 mm cartridge case.

It is thus seen that by using one or more of the techniques of fiber reinforcement, powder additive, blending of plastic resins and addition of coupling agents, in combination with the essential step of metal-plating, the strength of a plastic cartridge case may be enhanced to a level which will permit the case to withstand firing stresses. The metal plating also provides other desirable properties.

Among these other desirable properties are the added heat resistance provided to the case by its metal plated surface. The plated interior surface of the cartridge is well protected from powder burn-through upon firing of the cartridge. The outer metal plated surface enhances the strength and hardness of the case whereby the cartridge is able to withstand the mechanical handling of loading, chambering and extraction carried out by the firing mechanism of the weapon.

It will further be apparent that many modifications of

the above-described specific embodiments will occur to those skilled in the art upon the reading and understanding of the within description and that it is intended to include all such modifications within the described invention insofar as they fall within the scope of the appended claims or the equivalent thereof.

What is claimed is:

1. A one piece cartridge case made of plastic, the surfaces of which are metal plated to the extent that the weight of metal in said case is not more than about 3 percent of the total weight of plastic and metal in said case, the outside of said case is metal plated to a metal thickness of between about 1 to about 2 mils, the inside of said case is metal plated to a metal thickness of between about 0.05 to about 0.01 mils, and the outside of the base area of said case is metal plated to a metal thickness of about 5 to about 7 mils.

2. A one piece cartridge case made of plastic, the surfaces of which are metal plated to the extent that the weight of metal in said case is not more than about 3 percent of the total weight of plastic and metal in said case, said plastic is fiber-reinforced by a cloth sleeve disposed in a single layer, substantially tubular configuration embedded within the substantially cylindrical walls of said case, and by a wound filament cup embedded in the base area of said case.

3. The cartridge case of claim 2 wherein said plastic contains a particulate filler selected from the class consisting of aluminum, iron and mixtures thereof, and a coupling agent.

4. The cartridge case of claim 2 wherein said wound filament cup is disposed inside of said sleeve.

5. The cartridge case of claim 2 wherein said metal plating is nowhere thicker than about 5 mils.

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