RE-CLOSABLE LONG TERM STORAGE / PRESERVATION BAG (RCLTSP BAG); FOR THE PREVENTION OF CORROSION ON MILITARY AND / OR COMMERCIAL WEAPONRY

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ABSTRACT
This invention is a pre-made, re-closable, three-ply bag that has a clear serial number viewing window and is made from flexible packaging materials that collectively prevent corrosion from occurring on assets packaged within the bag while in transport or long-term storage. A VCI chemistry emitting film is used as the inner ply which surrounds the asset with corrosion preventive vapors. The center-ply; provides ample cushioning and puncture resistance. The outer ply provides a strong puncture resistant vapor barrier which keeps corrosion causing elements from entering the bag and prevents corrosion inhibiting chemistry from escaping the bag. The use of a re-closable fastener enables asset packaging by un-skilled laborers as well as future asset inspection without compromising package integrity. Packing speed is forty times faster with this invention than previous methods. The invention also allows serial number verification without opening the package. Significant cost savings are achieved through its use.

[Diagram of RCLTSP Bag configured for M16 Rifle]
Re-Closable Long Term Storage / Preservation Bag

3-Ply lay-up

RCLTSP Bag configured for M16 Rifle

Folded Top Edge

Heat-sealed edges

Clearview window heat-sealed to front wall of bag with rear wall center ply visible

Loop assy. sealed to face of bag

Hook assy. sealed to Lip area

Bag opening
Hook & Loop Material Sewn to Valeron Film Strip

Stitching

Figure 2A

Bag Opening Dimension

3/8” Heat-seal flange, both sides

Hook & Loop Closure

Hook

Loop

Figure 2B

Lip Area

Bag Opening
Single Panel Style

Window Hole
Fold Along Centerline

Lip Area

Figure 3A

Double Panel Style

Front Panel

Window Hole

Lip Area

Rear Panel

Pictorial View of Center Ply
LDPE Flat Sheet Plastic Netting

Four Strands Per Lineal Inch
Thickness = .07" (+/- .01")
Re-Closeable M16 Long Term Storage / Preservation Bag

Figure 4
RE-CLOSABLE LONG TERM STORAGE / PRESERVATION BAG (RCLTSP BAG); FOR THE PREVENTION OF CORROSION ON MILITARY AND / OR COMMERCIAL WEAPONRY

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This specification is now being filed (during the pendency) of the earlier filed Provisional Application having a filing date of Dec. 8, 2003 and which was assigned Application No. 60/527,642 with Confirmation Number 1225 and Filing Receipt #OC000000013563766. It is my intention to take benefit from said earlier filing.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not Applicable

REFERENCE TO SEQUENCE LISTING, A TABLE, OR A COMPUTER PROGRAM LISTING COMPACT DISC APPENDIX

[0003] Not Applicable

BACKGROUND OF THE INVENTION

[0004] The field of endeavor to which this invention pertains is the prevention of rust, corrosion or oxidation from occurring on the metal parts of a weapon while said weapon is in storage or during transport. The traditional method(s) of preventing corrosion on weapons involved costly labor intensive procedures, required the use of heat-sealing equipment, and required the purchase, inventory management and use of numerous different materials to accomplish the task (i.e. oils, desiccants, corrosion inhibiting papers etc). The most current method of preventing weapon corrosion utilized by the U.S. Armed Forces is as follows. A laborer measures and cuts two sheets of a flexible packaging material compliant with MIL-PRF-131-J from a large roll. Then he/she cuts multiple sheets of a VCI impregnated paper compliant with MIL-PRF-3420-G from another roll. The weapon is wrapped in one sheet of the paper and the remaining sheets of paper are crumpled and used as cushioning around the weapon. The paper wrapped weapon and cushioning are placed onto one of the MIL-PRF-131-J sheets and the second sheet of packaging material is placed over them. The laborer then manually heat-seals around all four sides of the two sheets of material which forms an airtight enclosure around the weapon. This process takes approximately twenty minutes per weapon and; results in inconsistent levels of protection from one weapon to the next due to the human factor (i.e. how much paper is utilized, how crumpled was it, how was it positioned, are all heat seals of acceptable quality, etc.). Additionally, this method of preservation disallows the inspection of the weapon without having to destroy the package by cutting it open and there is no way of verifying the serial number of an enclosed weapon without again compromising the package. The materials utilized and methods in which they are configured leave the finished pack susceptible to easily being punctured and/or torn which reduces the effectiveness of the package.

[0005] This invention was produced in response to an inquiry from the U.S. Marine Corps for a pre-made weapon cover that would prevent corrosion as well as or better than the existing method (as outlined above) and at the same time allow for simplified inspection of the weapon through use of a re-closable feature while also providing a method to visually verify the weapon’s serial number without removing it from the package. With a shortage of available trained personnel to carry out traditional preservation operations on large quantities of weapons the Corps was also interested in a design that would not require heat-sealing equipment and that would reduce the time required to preserve one weapon substantially. This invention was tested and found to be successful by USAMC LOGSA PSCC in Tobyhanna, Pa. The objective of the testing performed was to compare this invention to a traditionally preserved weapon package (as outlined above). The criteria used to determine success was that the test specimen (this invention) needed to perform equally to or better than the traditional configuration at preventing rust/corrosion of enclosed M16 rifles under varying environmental exposures.

BRIEF SUMMARY OF THE INVENTION

[0006] The object of this invention is to provide the military or commercial user with an effective corrosion preventive storage and/or shipping enclosure that offers the following features: re-closability, high degrees of puncture and tear resistance, easy and rapid packing of the weapon, consistent factory produced quality, clear observation of weapon’s serial number through window port and excellent anti-corrosion protection. This is all achieved by the invention. No heat-sealing equipment is required and therefore un-trained personnel can be used to carry out weapon preservation. Pack-out time is approximately 20-25 seconds per M16 rifle vs. 20 minutes previously. The inventions 3-ply construction provides a very robust package that is highly puncture and tear resistant resulting in greatly minimized re-work operations. The invention also greatly simplifies the task of routine weapon inspection due to the re-closable feature and the clear view port. Most importantly; use of the invention results in superior corrosion prevention over previous methods due to two factors. One; the use of Vapor Phase Corrosion Inhibitors which migrate to all metal surfaces inside the package (including on the inside of the weapon) and two; the use of a foil clad Barrier packaging material as the outside layer which traps the VpCI chemistry inside the bag where it remains effective for long periods of time.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

[0007] FIG. 1A depicts the 3-Ply lay-up utilized in the fabrication of the invention where the outer ply is a flexible packaging material that provides barrier properties; the center ply is a material that provides cushioning and additional puncture resistance and the inner ply which provides anti-corrosion protection through the use of VpCI chemistry.

[0008] FIG. 1B depicts the invention as it would be configured if intended for use in the preservation of an M16 rifle. The hook & loop assembly (Velcro) at the opening demonstrates the re-closable feature of the invention. The serial number viewing widow is shown; as are the “factory applied” heat sealed edges which form the pre-made re-closable package.

[0009] FIG. 2A depicts how the hook & loop assembly is sewn onto a strip of heat-sealable material leaving enough
space on each side of either the hook or loop to seal the resultant flange to the body of the bag.

[0010] FIG. 2B depicts how the hook and loop parts that have been previously sewn onto a heat-sealable strip are positioned at the opening of the bag. The loop strip is heat-sealed to the face of the bag while the hook strip is heat-sealed to the lip extension of the bag thereby allowing the lip to be folded over the face and closure to occur.

[0011] FIG. 3A depicts a Single Panel Style bag blank which demonstrates the shape that the three plies of material would be cut in if the finished bag were to have one folded edge and the remaining edges heat-sealed.

[0012] FIG. 3B depicts a Double Panel Style bag blanks which demonstrates the shapes that the three plies of material would be cut in if the finished bag were to have all its edges heat-sealed. (Note that depending upon the available widths of raw materials available, either the Single Panel or Double Panel style can be utilized).

[0013] FIG. 3C depicts a pictorial view of a typical Center Ply material (in this case being flat sheet plastic netting). This material was utilized as the Center Ply on the preservation bag designed for M16 rifles. Other materials such as PE foam or air-cap could be substituted for the plastic netting in bags designed to protect other assets.

[0014] FIG. 4 depicts the M16 Long Term Storage/Preservation Bag that was designed in response to the inquiry from the Marine Corps. It shows the Velcro closure in place at the bag opening and provides dimensions.

DETAILED DESCRIPTION OF THE INVENTION

[0015] This invention is a pre-made, re-closable, barrier providing, anti-corrosion protective bag which may, or may not, have a clear viewing port(s) or window(s) installed into the bag wall(s) (see FIG. 1B). The bag shall be of a 3-ply construction utilizing three separate materials that each individually provides certain performance aspects which collectively produce an optimally protective package for whatever metal bearing asset the bag is configured for (see FIG. 1A). Both the outer and inner plies of material must be heat-sealable to one another while the center ply may, or may not be.

[0016] The outer ply is to be a flexible packaging material that provides barrier properties that are equal to or greater than those specified in MIL-PRF-131 J. Typically a film/foil/poly laminated would be utilized, however; any heat-sealable flexible material that exhibits barrier capacity as noted above may be utilized as the outer ply. Examples of possible substitute materials for the tri-laminate would include but not be limited to metalized films and laminations, coated films, co-extruded films, ceramic impregnated films etc.

[0017] The center ply serves the purpose of cushioning the enclosed asset and enhancing the over-all puncture resistance of the bag. The material utilized is referred to as “flat sheet plastic netting” and is manufactured from Low Density Polyethylene (LDPE) that is produced in a configuration having crisscrossing strands that measure 0.07 inches in thickness (±/-0.01”) and that occur at four strands per inch (see FIG. 3C). Alternative flexible or semi-rigid materials could be substituted for the netting which include but are not limited to polyethylene or urethane foam, bubble pack, air-cap, HDPE netting, woven or non-woven materials etc. Choice of material to be utilized for the center ply is based upon the size and shape of the asset to be protected as well as the conditions of the project application (such as amount of handling after packaging, use or non-use of additional outer packaging such as cartons or cases, etc.).

[0018] The inner ply (weapon/asset contact ply) is produced by Cortec Corporation of St. Paul, Minn. It is referred to as Cortec VpCl®-126 Film. It is a 0.004" thick (4 mil) Vapor Phase Corrosion Inhibiting polyethylene film. This film (or any film that contains VpCl, or VCI chemistry as part of its make-up, either in coating form or impregnated within the film) must be utilized as the inner ply. A VCI is a volatile corrosive gas inhibitor. VpCl refers to those inhibitors that, migrate out of a carrier substrate (such as polyethylene film) and form a gaseous vapor from which the VCI molecules are attracted to and adsorb onto metal surfaces. This is known as Vapor Phase corrosion protection. The inner ply of the bag comprising this invention is made from either VpCl film or VCI film. VCI molecules make their way from the inner ply into the interior of the bag and surround the weapon or other asset that is enclosed. The molecules then attach to all metal surfaces forming a microscopic coating over the entire metal surface area which prevents oxygen, moisture and other contaminants present in the environment from making contact with the metal which thereby prevents the occurrence of rust or corrosion. The interrelationship of all three plies working collectively to provide the optimum level of protection is described thusly; the barrier properties of the outer ply keep the corrosion preventive molecules from the inner ply trapped inside the package while the center ply provides cushioning properties all of which result in an effective method of long term preservation. In severe environmental conditions the VCI protection provided by the inner ply can be supplemented through the introduction of additional VCI emitting devices/materials into the bag at the time that the weapon/asset is packaged. An emitter will provide even more VCI molecules to the package thereby extending preservation effectiveness.

[0019] In the three-ply lay-up, all three plies of material are die-cut to shapes that are conducive to packaging any given weapon or asset. (Note that the materials could also be template-cut, laser-cut, or manually cut as well). During the cutting process a series of small holes are punched around the perimeter of the inner ply (i.e. a 0.125” diameter hole, positioned 1” in from any given edge and spaced every three inches apart), to prevent air from being trapped between it and the outer ply and thereby creating a ballooning effect. If the window option is utilized all three plies of material also have a hole cut in them to accommodate the window. The holes are to be situated concentric to one another and in a location in the bag wall that is coincident with the location of the serial number on the packaged weapon/asset. To fasten the three plies together, first the center ply is heat-sealed to the inner ply around their respective perimeters. Then, the outer ply is aligned with the other two and heat-sealed around the perimeters. Sealing the three plies together in this fashion creates a panel which has the center ply “sandwiched” between the outer and inner plies.

[0020] The invention can be fabricated using two different methods. The first involves the utilization of just one three-
ply panel (see FIG. 3A). Once a panel has been constructed it is folded in half along its centerline such that inner ply faces inward and makes contact with itself. All of the un-folded edges are then heat-sealed except for one which is left as the bag opening. The second method involves the utilization of two separate three-ply panels (see FIG. 3B). Each of the two separate panels is to be of the same shape and dimensions as the other except that one panel shall have a lip extension on the edge which is to be left as the bag opening. The two panels are placed in alignment with the inner plies facing each-other. All edges are then heat-sealed together except for those which will form the bag opening.

[0021] The serial number viewing window may, or may not be installed, depending upon the application. If utilized; the window material is cut in an identical shape to the hole(s) in the bag wall(s). The dimensions of the cut-out window material are to be greater (i.e. 0.25"-0.625") than those of the hole(s). The window material, with its sealant layer facing the bag wall inner ply, is heat-sealed (in concentric registration) to the bag wall such that the hole(s) is/are completely covered and no gaps occur between the window material and the bag wall. The window shall be constructed from a clear flexible material that remains clear regardless of environmental conditions, has a polyethylene based sealant layer and is capable of minimizing the permeation of moisture vapor, oxygen and other contaminants through its surface into the bag interior. Typical materials to be utilized as additional layers of the window material include but are not limited to: nylon, polyester, EVOH, PVDC, aluminum oxide etc.

[0022] The bag opening shall be fitted with a closure system that allows for multiple opening and closing cycles. This "re-closable" feature shall be achieved primarily through the use of a hook & loop assembly. First both the hook and the loop are cut to the exact same length dimension as that of the bag opening. Additionally; one strip of a heavy duty, heat-sealable flexible material for both the hook and loop pieces is cut such that its length dimension is the same as that of the hook or loop piece and its width dimension exceeds that of the hook or loop piece by 0.75". The hook & loop pieces are then sewn onto the heat-sealable strips such that the ends of each are matched and the hook and loop pieces are centered on the heat-sealable strips (which leaves a 0.375" wide heat-seal flange area on each side of the hook and loop pieces) (see FIG. 2A). After sewing has taken place, the hook assembly is heat-sealed to the inner ply of the bag wall lip extension area at the opening. The face of the heat-sealable strip on which the hook is sewn must contact the inner ply of the bag wall and leave the hook material facing upwards. The loop/heat-sealable strip assembly is heat-sealed to the outer ply of the bag wall, immediately adjacent to and parallel with the edge of the bag opening and in alignment with the lip. Again; the face of the heat-sealable strip onto which the loop is sewn must make contact with the outer ply of the bag wall and leave the loop material facing upwards. Once the bag is finished being fabricated, the lip; with the hook assembly attached, is folded down onto the loop assembly which is heat-sealed to the bag face, in order to complete closure of the bag (see FIG. 2B). Note that depending upon applications and the environmental conditions that effect each varying application, alternative methods of closure may be utilized. Those alternatives include, but are not limited to: zippers, pressure sensitive adhesives, mechanical snaps, draw-string, magnets and etc.

[0023] The re-closable, long-term, storage/preservation bags can be fabricated in an unlimited number of shapes and sizes (see FIG. 4 for an example of a bag designed for the preservation of M16 rifles). Simple rectangles, compound contours, multi-angled or even circular configurations can be produced. The bags can be either two or three dimensional and utilize any one of the numerous closure methods as described above. Regardless of the choice(s) of materials to be utilized as the outer and center plies; the inner ply shall always be some form of VCI coated or impregnated heat-sealable film. The concept of the invention relies upon each of the three plies of the bag wall to perform as described above and collectively create an "inner atmosphere" within the bag that is rich in VCI molecular activity that is prevented from escape from the bag by the outer ply and thereby maintains a corrosion-preventive environment within the bag for extended periods of time.

[0024] This invention offers significant improvement over previous methods of asset preservation. Time to pack-out assets and amount of personnel training required are both reduced significantly. The previous method required an individual skilled in the use and handling of MIL-PRF-131J materials and heat-scaling equipment. Use of this invention requires the packaging laborer only to view a sixty second demonstration of how to load the asset into a pre-made bag, effect the closure and place the packaged asset into its storage location. The previous method of packaging took roughly twenty minutes per weapon, where use of this invention results in a pack-out time of less than sixty seconds per weapon. Another improvement that my invention offers over the previous packaging method is the ability to visually verify the serial number of the enclosed weapon without opening the package; thereby eliminating the time consuming and costly task of re-packaging after number verification. The re-closability feature of my invention also offers significant improvement over the previous method with regard to time and expense saved after periodic weapon inspection. Previously a package would need to be cut open to remove the weapon and then re-worked after inspection took place. This invention allows simplified removal and replacement into the same package through the re-closable opening.

DRAWINGS

[0025] There are four pages of drawings included herewith with views described above.

SEQUENCE LISTING

[0026] Not applicable.

What I claim as my invention is:

1. A re-closable bag that is fabricated from flexible packaging materials which provide long-term anti-corrosion protection to both ferrous and non-ferrous metal assets such as M16 rifles and/or other weapons,
allow convenient asset packing with no need of heat-sealing equipment due to the use of a hook & loop assembly, a zipper, mechanical snaps, pressure sensitive adhesive or a drawstring as the method of bag closure,

and provide a method of visual verification of the enclosed asset serial number without having to remove the asset from the bag, by viewing the number through the clear barrier window material heat-sealed into the side of the bag.

2. The re-closable bag of claim 1 provides superior puncture, tear and abrasion resistance over traditionally utilized MIL-PRF-131J flexible packaging materials due to the 3-ply construction of the bag wherein the outer ply is a flexible packaging material that provides barrier properties capable of minimizing the permeation of corrosion causing gaseous vapors and or contaminants in the environment through the material while at the same time preventing the escape of the corrosion inhibiting chemistry from within the interior of the bag,

while a center ply provides cushioning and additional puncture resistance and is made from polyethylene flat sheet netting, polyethylene or urethane foam, bubble pack, woven or non-woven flexible materials,

and an inner ply of linear low density polyethylene that is impregnated with Vapor Phase Corrosion Inhibitors such as VpCl®-126 Film from Cortec Corporation, or any equivalent film or material which prevents corrosion from occurring on any metal surface of any asset placed inside the bag while the bag is exposed to myriad environmental conditions.

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