A projectile absorbing and containment method and apparatus for individual and vehicle safety, protection, i.e. armor, and more particularly a reusable projectile target for absorbing and containing the projectile using a mass of self-adhesive polymeric beads. The target of the present invention includes a plurality of layers of different materials making up a composite material for absorbing and containing a projectile which is specifically of importance for safety purposes for high speed projectiles often fired from handguns or other projectile launching devices inside a building or room for example where control and containment of the projectile is important to protect the person using the projectile launching device and others in the vicinity.
PROJECTILE ABSORBING AND CONTAINMENT APPARATUS

FIELD OF THE INVENTION

[0001] The present invention relates to a novel projectile absorbing and containment method and apparatus for individual, structural and vehicle safety protection, i.e., armor, and more particularly to a reusable projectile target for absorbing and containing the projectile. The target of the present invention is specifically of importance for safety purposes for high speed projectiles often fired from handguns or other projectile launching devices inside a building or room for example where control and containment of the projectile is important to protect the person using the firearm, weapon or other projectile launching device and others in the vicinity.

BACKGROUND OF THE INVENTION

[0002] Ever since the advent of gunpowder, humans have been faced with how to handle bullets and other projectiles specifically in training situations where individuals may be practicing how to shoot or launch the projectiles. As recreational shooting has become more popular, many different accessories and components, including targets, have been made to increase the safety of or enhance the shooting experience. Such recreational shooting utilizes various weapons, from air guns (such as BB guns and AirSoft® guns), to firearms (such as handguns, rifles, and shotguns), all of which fire a bullet, or other type of projectile at a significant velocity, in most cases significant enough to injure or even kill individuals in the vicinity.

[0003] Cardboard or paper targets are employed generally when a shooter desires to determine where each round strikes the target relative to a target center. These conventional targets are used where each round is to be scored in competition and/or observed for training and practice purposes. These types of targets are particularly helpful in adjusting firearm sights to suit each individual shooter or user’s physical attributes and shooting technique. Basic cardboard and paper targets have a number of drawbacks. Generally the projectile passes through the target and impacts in a designated range area behind the target for example at an outdoor firing range. In such cases the projectile is generally lost and cannot be reused, and even if collected, is damaged by impact in the range area and cannot safely be reused.

[0004] Other types of targets include metal targets which can be pivotally attached to a common metal frame such as in U.S. Pat. No. 7,306,229 to Rolle, which are made out of two metal targets are pivotally attached to the frame and moved from a vertical ready position by the impact of a projectile to a resting position and simultaneously moves the other target to the ready position so that the targets are alternatively in a vertical ready position. Again with such conventional targets the projectile or round is damaged or lost in the range and cannot be used again.

[0005] Indoor shooting ranges have also become quite popular with commercial as well as private and individual facilities being built in small self-contained ranges and buildings. Obviously in these type of self-contained facilities, the rounds are fired within the building and if not properly contained can ricochet and injure individuals in the vicinity. Perhaps more dangerous is the matter of a projectile in such an enclosed contained space shattering and becoming shrapnel which can injure, maim and even kill an individual as well.

Currently indoor ranges tend to use various materials to absorb and contain the projectiles and shrapnel. Such materials may include wood, plastics, cement and other known materials which take up a relatively large amount of area, and if not properly maintained can fail to contain the projectiles and such materials can even become injurious shrapnel as well.

OBJECTS AND SUMMARY OF THE INVENTION

[0006] The first object of the present invention is to provide an easy to use and lightweight projectile absorbing and containment apparatus for use in an enclosed space to control a projectile after having been at least one of fired from a firearm and having passed through a conventional paper or cardboard target.

[0007] Another object of the present invention is to provide an economical projectile absorbing and containment apparatus which can safely contain a projectile from a firearm and also retain, collect and make the fired rounds available for reuse.

[0008] A still further object of the present invention is to provide an economical projectile absorbing and containment apparatus which can be used in a home, basement or a commercial shooting facility to control the projectile and protect individuals in the vicinity from ricochets and shrapnel during shooting events.

[0009] Yet still further object of the present invention to provide for a projectile absorbing and containment apparatus which can be used as personal, structural and vehicle armor to protect persons, structures and vehicles from various firearm projectiles and explosive devices.

[0010] The present invention relates to a projectile absorbing composite for example for use as a firearm target which includes a plurality of layers of different materials making up the composite for absorbing and containing the projectile. One of the layers of the composite specifically includes a mass of self-adhesive polymeric beads such as those manufactured under the Playfoam® mark. The composite can include other material layers for instance a steel or aluminum layer, a cardboard layer as well as a containment frame or shell which houses the different layers. It is to be appreciated that other material layers in addition to layer of self-adhesive polymeric beads may also be used in combination to facilitate absorbing, containment and collection of the projectiles fired at the projectile absorbing composite.

[0011] By “polymeric” in the present specification is meant in general a type of polymer material. A polymer is generally understood to be a large molecule composed of repeating structural units. These sub-units are typically connected by covalent chemical bonds. Although the term polymer is sometimes taken to refer to plastics, it actually encompasses a large class of compounds comprising both natural and synthetic materials with a wide variety of properties.

[0012] Polymeric materials play an essential and ubiquitous role in everyday life ranging from familiar synthetic plastics and elastomers to natural biopolymers such as nucleic acids and proteins that are essential for life. Natural polymeric materials such as shellac, amber, and natural rubber are fairly common. A variety of other natural polymers exist, such as cellulose, which is the main constituent of wood and paper. The list of synthetic polymers includes synthetic
rubber, Bakelite, neoprene, nylon, PVC, polystyrene, polyethylene, polypropylene, polyacrylonitrile, PVB, silicone, and many more.

[0013] Most commonly, the continuously linked backbone of a polymer used for the preparation of plastics consists mainly of carbon atoms. A simple example is polyethylene whose repeating unit is based on ethylene monomer. However, other structures do exist; for example, elements such as silicon form familiar materials such as silicones, examples being Silly Putty and waterproof plumbing sealant. Oxygen is also commonly present in polymer backbones, such as those of polyethylene glycol, polysaccharides and DNA. One example of a polymeric bead as it relates to the present invention could be an expandable polystyrene olefin based resin bead, although other types of polymeric beads and compounds could be utilized as well.

[0014] By “self-adhesive” is meant that each individual polymeric beads are provided with an attractive or bonding force, for example a static electrical charge by which the molecules in bead are attracted to one another leading to an electrical bond created between the polymeric beads. Alternatively, the polymeric beads are manufactured with, coated or impregnated with an adhesive material which when in contact with an adjacent bead or beads creates a bonding force which maintains the beads in relative contact with one another. In a neutral environment such atmospheric pressure, temperatures of between about 0-100 °F, the bonding or adhesive force between each of the polymeric beads maintains a predetermined mass of the beads in a single, malleable form.

[0015] This composite including the self-adhesive polymeric beads can also be used in any other context where high speed projectiles are involved. The term “high speed” is understood to mean projectiles generally fired by different firearms for example a BB gun and Airsoft gun having a range of about 100-800 feet/sec (fps), to small arms type firearms having projectile velocities in a range of between about 800 to 3000 fps. Besides use with small arms, this composite could be used as personal armor, as well as vehicle armor on the outside of vehicles to prevent even larger and faster projectiles and shrapnel from various firearms and explosive devices from harming or damaging an individual wearing such a composite armor or equipment protected thereby.

[0016] The present invention relates to a projectile absorbing composite for recreational shooting comprising a frame for supporting a composite material including multiple layers of different materials, a first layer movably situated within the frame comprising a plurality of self-adhesive polymeric beads bonded together by an attractive force, an impenetrable layer positioned adjacent the first layer of self-adhesive polymeric beads within the frame that is substantially impassable to the projectile, and a projectile force absorbing layer positioned adjacent the impenetrable layer for absorbing forces projected onto the impenetrable layer by the projectile.

[0017] The present invention also relates to the projectile absorbing composite described above wherein the frame further comprises a plurality of sidewalls substantially containing the first layer, impenetrable layer and force absorbing layer. The present invention further relates to the aforementioned projectile absorbing composite wherein a top edge of the plurality of sidewalls are substantially flush with a planar surface of the first layer. The projectile absorbing composite may also use either an adhesive material or an electrical attraction to provide the attractive force provided on the polymeric beads.

[0018] The present invention also relates to a method of making a composite apparatus for stopping and containing a projectile comprising the steps of providing a frame for supporting a composite material including multiple layers of different materials, situating a first layer movably within the frame, the first layer comprising a plurality of self-adhering polymeric beads bonded together by an attractive force, positioning an impenetrable layer adjacent the first layer of self-adhering polymeric beads within the frame that is substantially impassable to the projectile, and positioning a projectile force absorbing layer adjacent the impenetrable layer for absorbing forces projected onto the impenetrable layer by the projectile.

[0019] These and other features, advantages and improvements according to this invention will be better understood by reference to the following detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] Several embodiments of the present invention will now be described by way of example only, with reference to the accompanying drawings in which:

[0021] FIG. 1 is a perspective view of an individual firearm user shooting a projectile into a target and the projectile absorbing and containment apparatus alongside a conventional metal target;

[0022] FIG. 2 is a perspective view of a portion of the apparatus indicating the arrangement of a polymeric bead layer;

[0023] FIG. 3 is an exploded view of the apparatus showing the arrangement of various layers of the apparatus;

[0024] FIG. 4 is a cross-sectional view of the apparatus shown in FIG. 3;

[0025] FIG. 5 is a cross-sectional view of a second embodiment of the apparatus; and

[0026] FIG. 6 is a cross-sectional view of a third embodiment of the apparatus.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0027] The present invention discloses several embodiments of a projectile absorbing and containment apparatus and a method relating to the same as shown for example in FIG. 1. The projectile absorbing and containment apparatus 1, herein after referred to as the “apparatus”, is provided as described above to absorb, control and contain the projectile after being fired from a firearm 3 generally and after having passed through a conventional paper or cardboard target 5. As seen in FIG. 1 a paper target 5 is positioned on top of the apparatus 1. The paper target 5 is a visual guide by which a shooter 7 of the firearm 3 can consistently aim and fire the firearm 3. By visual observation the shooter 7 can observe where each round they fire passes through the paper target 5. In this way the individual’s skill at aiming the firearm 3 can be ascertained as well as for instance evaluating and correcting the accuracy of the weapon 3, often termed “zeroing” the weapon 3. As the use of such paper targets 5 are known in the art no further discussion is provided in this regard.

[0028] In the embodiment shown in FIG. 1 the shooter 7, or user, is provided with a firearm 3 or weapon 3 for shooting at a target 5 affixed to or supported on the apparatus 1. The target 5 as described above is generally interchangeable and can be changed or replace with any type of known target 5s such as
a bull’s-eye or picture of a human or animal form. Standing a desired safe distance away from the apparatus 1 the shooter 7 aims the weapon 3 at the target 5 and fires the weapon 3, shooting a projectile 9, or in the case of an automatic or semi-automatic weapon 3 a plurality of projectiles, at the target 5. In the case of a relatively skilled marksman, the shooter 7 hits the target 5 through which the projectile 9 passes and is absorbed and contained by the apparatus 1 in the manner described in further detail below.

A conventional target 11 as known in the prior art is shown in FIG. 1 adjacent the projectile 9 absorbing and containment apparatus 1. Such conventional metal target 11 is a specific example of the purpose of the present invention. A projectile 9 shot at such a conventional metal targets merely hits the target 11, making a noise or perhaps knocking the target 11 down. In doing so the projectile 9 is not controlled in any manner and in fact may shatter and/or deflect and ricochet off of such conventional targets 11 with unintended consequences. In a small, enclosed indoor shooting range this can be dangerous and even fatal. The apparatus 1 as described in detail below is intended to absorb and contain the projectile 9 and any pieces i.e. shrapnel, which may potentially eject from the projectile 9 upon shattering or impact.

In a first embodiment of the apparatus 1 as better shown in FIG. 2 a frame 13 is provided including at least a top sidewall 15, a bottom sidewall 17 and left and right sidewalls 19, 21. The sidewalls may further be attached to a rear wall 23 defining a cavity 25 having an opening leading into the cavity in which a plurality of layers forming the composite material 29 are placed to absorb and contain the projectile 9. The frame 13 may be fabricated from any known material, for example cardboard, paper wood, or metal. However for purposes of safety, and cost effectiveness, in one embodiment of the present invention a heavy cardboard frame 13 may be used to encase the below described projectile 9 absorbing composite material.

Substantially encased within the frame 13 are the composite materials including a first layer of self-adhesive polymeric beads 31 as shown in FIG. 2. This layer is comprised of a plurality, or mass, of self-adhesive polymeric beads 31 formed in such a manner as to define a substantially planar top surface 33 and a shape which substantially fills up the cavity in the frame 13 defined by the top, bottom and left and right sidewalls of the frame 13. The top surface of the mass of polymeric beads 31 is generally formed substantially flush with an upper edge 35 of the frame 13 as defined by the top, bottom and left and right sidewalls. In other words the upper edge of the frame 13 and the top surface 33 of the polymeric bead layer forms a substantially flush plane so that a target 5 which is perhaps larger than the frame 13 may be placed thereon without wrinkling or folding. In other words the paper or cardboard target 5 can be cleanly and planarly secured across the entire apparatus 1 if necessary, i.e. across the top surface of the first layer and the upper edges of the frame 13 without altering the generally planar nature of the target 5, so that a shooter 7 or other individual observing and shooting at the target 5 merely sees a conventional target 5 through the sites of their weapon 3 or binoculars.

The layer or mass of polymeric beads 31 situated in the frame 13 is provided with a desired thickness T which depends in particular upon several factors including the nature and speed of the projectile 9 to be absorbed and contained, the attractive, adhesive or bonding force between the individual polymeric beads 31 and also potentially a compressive force exerted by the frame 13 upon the mass of beads 31. In other words the bonding or adhesive force which attracts each individual bead to adjacent beads 31, as well as any compressive force exerted by the frame 13 on the mass of beads 31. By compressive force is meant, and it is to be appreciated that the polymeric beads 31 tend to be fairly compressive in that each bead tends to have a relatively elastic nature permitting each bead to be compressed from an expanded form into a compressed form and then rebound into the expanded form once the compressive force is removed. A desired density of beads 31 in this way may be inserted into the cavity of the frame 13 where the polymeric beads 31 may be in either the expanded form or in a compressed state retained by the top, bottom, left and right sidewalls of the frame 13. In this way the relative thickness T of the first layer of polymeric beads 31 may be varied within a desired range stopping, containing or absorbing different projectile 9s at different speeds. By way of example, for a substantially spherical projectile 9 such as a BB shot projectile 9 having a velocity of about 275 to 800 FPS a layer of polymeric beads 31 in the range of 1 inch to 3 inches and under little or no initial compressive force from the frame 13 has been found to be particularly efficient in absorbing and containing the projectile 9 fired into the apparatus 1.

Of particular importance in the present invention is the use of the polymeric beads 31 as an absorbing and containment layer. A critical aspect of such self adhesive polymeric beads 31 is that the projectile 9 as it enters the mass of polymeric beads 31 does not generally physically alter, change or destroy the individual polymeric beads 31 themselves but merely temporarily breaks or interrupts the bond, adhesive or attractive force between the individual beads 31 in the vicinity in which the projectile 9 impacts the mass of polymeric beads 31. A projectile 9 BB entering the above described mass of self-adhesive polymeric beads 31 at a rate of 400 or 800 FPS merely pushes aside the plurality of polymeric beads 31 creating a temporary passage which then closes over itself due to the attractive nature of the individual polymeric beads 31 after the passage of the projectile 9. The substantial closure of the temporary projectile 9 passage due to the bonding and adhesives force between the individual beads 31 as well as potentially the compressive force of the frame 13 and density of the beads 31, permits an almost infinitely reusable apparatus 1.

A second layer of the composite material may be an impenetrable layer 41 for example a metal sheet such as a steel or aluminum sheet placed directly behind and in substantial contact with a rear planar surface of the mass of polymeric beads 31. The impenetrable layer 41 is designed to finally stop the projectile 9 after passing through, assuming that it does so, the layer of polymeric beads 31. This impenetrable layer 41 may serve either to stop the projectile 9, or the projectile 9 may rebound off the impenetrable layer 41 and back into the mass of polymeric beads 31 where the projectile 9 is contained. Even if a projectile 9 impacts the impenetrable layer 41 in such a manner as to break, shatter or ricochet and cause shrapnel to be formed, this all occurs at the intersection of the polymeric bead layer and the impenetrable layer 41 and any shrapnel or ricochet is again contained within the layer of polymeric beads 31.

A projectile force absorbing layer 51 may be provided as an additional layer of the composite material behind the impenetrable layer 41. The absorbing layer 51 provides some elastic, cushioning or biasing between the impenetrable
The self-adhesive polymeric beads 31 can provide additional benefits for example it is to be appreciated that on the top surface of the layer of polymeric beads 31 the adhesive which bonds the individual beads 31 is exposed, thus providing an adhesive or bonding layer exposed to adhere to the paper or cardboard target 5 which is placed on the apparatus 1. In other words, the target 5 may be adhered to the top surface of the mass of polymeric beads 31 merely by the attractive force on the adhesive or bonding agent or force of the polymeric beads 31 and without any connecting elements. On the other hand the malleable nature of the polymeric beads 31 provides for the use of a series of simple push pins, pieces of cardboard or buttons which may be forced through the corners of the target 5 and extend into the mass of polymeric beads 31 to facilitate securing of the target 5 to the apparatus 1.

It is also to be appreciated that different or additional layers, or other materials may be used for the impenetrable layer 41 and the cushioning layer in the frame 13 in order to ensure that a projectile 9 is absorbed and/or contained by the apparatus 1. Another important aspect of the present invention is that the polymeric beads 31 generally contain and collect all the projectiles 9 used and fired during a training session. The projectiles 9 were found during testing to be located near the intersection of the rear surface of the mass polymeric beads 31 and the front surface of the impenetrable layer 41. It is in this location where the projectile 9s have been secured by the polymeric beads 31 adjacent the impenetrable layer 41 which facilitates the simple removal of the projectiles 9 from the apparatus 1. Manual separation of the layer of polymeric beads 31 from the impenetrable layer 41 permits the projectiles 9 to merely drop out or be collected in the frame 13 and then rolled out into a container in order to be used again. In many instances for example with spherical projectiles 9 such as round BBs or air soft projectiles 9, these projectiles 9 can then be reused and/or disposed of in an appropriate manner. The impenetrable layer 41 for example may be other types of material besides metal for example carbon fiber fiberglass or other type of rigid and semi-rigid material including Kevlar®.

The apparatus 1 has been tested with a target 5 to contain the blast back from steel BB’s and lead pellets that were fired at a distance of about 2-10 meters shooting .177, .45 mm Zinc plated Steel BB and .177 Lead Pellet and .22 Lead Pellet. The Following BB and Pellet guns were used for testing:

- [0040] Daisy Powerline 15XT—15 Shot Semi Auto Co2 480 FPS.
- [0041] Crossman C11 Tactical—18 Shot Co2 550 FPS.
- [0042] Daisy Buck 275 FPS
- [0043] Daisy Buck 275 FPS
- [0044] Daisy Powerline 880 — 800 FPS
- [0045] Remington RW8MM22 950 FPS
- [0046] The following apparatus 1 designs were tested:
- [0047] 28-Gauge Steel faced with 1/4 inch polymeric beads 31 struck by .177 BB and .177 Pellet traveling at a velocity of 275 FPS to 550 FPS tested excellent with a blast back 0-1/2 into polymeric layer. When struck by .177 BB and .177 Pellet traveling 800 FPS tested showed significant damage to 28 gauge steel.
- [0048] 28-Gauge Steel faced with 1/4 inch polymeric beads 31 struck by .177 BB and .177 Pellet traveling at a velocity of 275 FPS to 550 FPS tested excellent with a blast back 0-1/2 into self-adhesive polymeric beads 31.
- [0049] 22-Gauge Steel faced with 1/4 inch foam struck by .177 BB and .177 Pellet traveling at a velocity of 275 FPS to 800 FPS tested excellent with a blast back of 0-3/4 inch into self-adhesive polymeric beads 31. When struck by .22 Pellets traveling at a velocity of 800 FPS tested excellent with a blast back 0-1/2 inch into self-adhesive polymeric beads 31.
- [0050] 22-Gauge Steel faced with 1 inch self-adhesive polymeric beads 31 struck by .177 BB and .177 Pellet traveling at a velocity of 275 FPS to 800 FPS tested excellent with a blast back of 0-3/4 inch into self-adhesive polymeric beads 31. When struck by .22 Pellets traveling at a velocity of 800 FPS tested excellent with a blast back 0-1/2 inch into self-adhesive polymeric beads 31.
- [0051] 16 Gauge Steel faced with 1/4 inch self-adhesive polymeric beads 31 struck by .177 BB and .177 Pellets traveling at a velocity of 275 FPS to 800 FPS tested excellent with a blast back of 0-3/4 inch into self-adhesive polymeric beads 31. When struck by .22 Pellets traveling at a velocity of 800 FPS tested excellent with a blast back of 0-1/2 inch into self-adhesive polymeric beads 31.
- [0052] 16 Gauge Steel faced with 3/4 inch self-adhesive polymeric beads 31 struck by .177 BB and .177 Pellets traveling at a velocity of 275 FPS to 800 FPS tested excellent with a blast back of 0-1/4 inch into self-adhesive polymeric beads 31. When struck by .22 Pellets traveling at a velocity of 800 FPS tested excellent with a blast back of 0-1/2 inch into self-adhesive polymeric beads 31.
- [0053] Testing showed that apparatus 1 using 1/4 inch self-adhesive polymeric beads 31 needed to be emptied from BB’s more frequently than apparatus 1 using 1/4 inch self-adhesive polymeric beads 31. The BB’s stayed intact where the Pellets compressed or fragmented into multiple pieces. The smaller pieces of fragmented pellets tend to have a further blow back into the self-adhesive polymeric beads 31 compared to the larger fragmented pieces and compressed pellets. It was found that the apparatus 1 using 3/4 inch self-adhesive polymeric beads 31 should be emptied after firing 125-200 BB’s and apparatus 1 using 1/4 inch self-adhesive polymeric beads 31 should be emptied after firing 300-500 BB’s. Further testing showed that the apparatus 1 kept its integrity even when the apparatus 1 became overloaded with projectile 9s. In summary, a 16 Gauge steel backed apparatus 1 faced with 1” of self-adhesive polymeric beads 31 will easily contain blow back from BB’s and Pellets traveling at a velocity of 800 FPS. Then a heavier gauge steel backed target 5 faced with 10” of self-adhesive polymeric beads 31 will contain blow back from BB’s and Pellets traveling at a velocity of 8,000 FPS.
- [0054] The apparatus described above is also particularly applicable for conventional small arms weapons and ammu-
“Small arms” being a term of art used generally to denote infantry weapons an individual soldier may carry. The description is usually limited to revolvers, pistols, submachine guns, carbines, assault rifles, battle rifles, multiple barrel firearms, sniper rifles, squad automatic weapons, light machine guns (i.e. M60), and sometimes hand grenades. Shotguns, general-purpose machine guns, medium machine guns, and grenade launchers may also be generally considered as small arms.

In the context of small arms it is further to be appreciated that this type of composite particularly including the polymeric mass of polymeric beads 31 may function as relatively light weight armor for the structural nature of building construction as well as a vehicle and/or personal armor protection for an individual. The polymeric beads 31, for instance described above such as styrene or polystyrene olefin based blown beads 31, although other types of polymer or other material based beads may be used as well, are very light and may be formed in any shape and around substantially any article, device, element, curve or angle or otherwise enclosed within him some sort of frame 13 or other material for example even a cloth casing to form such armor.

By way of example in another embodiment of the present invention a military grade vehicle made with military grade steel armor could be covered with a predetermined thickness and density, for example 10 inches of self-adhesive polymeric beads 31, and then the self-adhesive polymeric beads 31 covered with light gauge penetrable steel 43 as shown in FIG. 5. The light gauge steel 43 would be penetrable by certain caliber small arms fire, grenades, and IED’s, the small arms fire which could penetrate the exterior layer of steel 43 and pass through the self-adhesive polymeric beads 31 and strike the penetrable military grade steel 43 on the military vehicle. The blowback and shrapnel material would thus be captured within the self-adhesive polymeric beads 31, reducing the amount of blow back and the material that would be ricocheted around the battlefield. This would help protect infantrymen and vulnerable components near the vehicle from blow back and shrapnel. Such a mass of self-adhesive polymeric beads 31 when used in combination with a substantially penetrable layer 41 and perhaps other cushioning or absorbing layer 51 and a frame 13 could form the basis for lightweight adaptable armor systems for vehicles and personnel.

Small arms were tested against the apparatus 1 as described in FIGS. 1-4 above, including:

**Rifles:**

<table>
<thead>
<tr>
<th>Model</th>
<th>Rounds Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ruger 10-22 LR</td>
<td>Blazer 22 LR 1200 fps Rounds used: Remington 22 LR</td>
</tr>
</tbody>
</table>

**Hand Guns:**

<table>
<thead>
<tr>
<th>Model</th>
<th>Rounds Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ruger 22 MK III LR</td>
<td>Federal 22 LR 40 gr</td>
</tr>
<tr>
<td>Taurus Millennium PT Pro 9 mm</td>
<td>Federal Champion 115 gr</td>
</tr>
<tr>
<td>Smith &amp; Wesson Air Lite 38 S/L</td>
<td>Remington UMC 130 gr</td>
</tr>
</tbody>
</table>

In this test 10-Gauge Steel faced with 1 1/2 inch thickness of polymeric beads was struck by 22 cal LR Lead and 9 MM Full Metal Jacket and 38 SPL Full Metal Jacket traveling at velocities of 1050 FPS to 1200 FPS. Apparatus tested excellent with a blast back into the polymeric beads after striking the 10-gauge steel, of between about 0-1/4 into polymeric layer. When struck by the above noted rounds, the rounds either compressed and stayed mostly intact with small bits of shrapnel breaking off, or the rounds compressed and broke apart into many pieces of shrapnel. The 22 cal LR consistently compressed and mostly stayed intact and continue to spin within the apparatus against the layer of steel and would travel around the cardboard frame of the apparatus against the steel and between the steel and the polymeric layer. The 9 MM rounds compressed and mostly stayed intact with a portion of the round breaking into shrapnel. The 38SPL rounds would compress and separate into many large pieces of shrapnel. After many rounds fired at the apparatus the utility and safety functions of the apparatus as described previously were confirmed and the apparatus showed excellent results. With small arms weapons and ammunition as compared to BB’s and Airsoft type ammunition, the integrity of the cardboard frame diminished and showed signs of additional damage and the steel showed additional signs of strain.

In another embodiment of the present invention disclosed in FIG. 6, a backing and support material may be applied to the composite for example an inexpensive wood, plastic or other type of relatively rigid, planar material may be used to provide some structural stability to the different layers of the apparatus. By way of example as shown in FIG. 6 a wood backer board 55 may be placed in the cardboard frame and wood screws 57 and finish washers 59, or other securing device, secures the backer board 55 within the cardboard frame by passing first through the frame and into the backer board 55. The force absorbing layer 51 may be placed on the pine board and penetrable layer 41 is then positioned on the absorbing layer 51 and all of these layers secured to the backer board using sheet metal screws or other securing device extending from the penetrable layer 41 through the absorbing layer 51 to be secured in the backer board 55. The sandwiching of all the layers by opposing securing devices entering the structurally rigid backer board in opposite directions is helpful in preventing relative parallel sliding movement of the layers during use as well as helpful in preventing relative planar separation of the layers. This provides a significant increase in structural integrity of the apparatus which is important to withstand the impact of various projectiles 9. The layer of polymeric beads 31 is then positioned over the metal.

The backer board 55 provides structure for facilitating support and suspension of the apparatus and target as well. In one embodiment eye hooks 61 are attached to the top of the apparatus passing through the frame and into the side edges of the backer board. A wire or rope suspension cord 63 is attached between the eye hooks 61 so that the apparatus 1 may be hung on a hook or other supporting structure. Of course the target can also be placed on a solid surface either free standing but preferably against a wall in some cases or secured in another manner relative to the solid surface.

The invention has been described in detail with particular reference to certain preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

We claim:

1. A projectile absorbing composite for recreational shooting comprising:
a frame for supporting a composite material including multiple layers of different materials; 
a first layer removably situated within the frame comprising a plurality of self-adhering polymeric beads bonded together by an attractive force; 
an impenetrable layer positioned adjacent the first layer of self-adhesive polymeric beads within the frame that is substantially impassable to the projectile; and 
a projectile force absorbing layer positioned adjacent the impenetrable layer for absorbing forces projected onto the impenetrable layer by the projectile.

2. The projectile absorbing composite as set forth in claim 1 wherein the frame further comprises a plurality of sidewalls substantially containing the first layer, impenetrable layer and force absorbing layer.

3. The projectile absorbing composite as set forth in claim 2 wherein a top edge of the plurality of sidewalls are substantially flush with a planar surface of the first layer.

4. The projectile absorbing composite as set forth in claim 1 wherein the attractive force is provided by an adhesive material provided on the polymeric beads.

5. The projectile absorbing composite as set forth in claim 1 wherein the attractive force is provided by an electrical attraction.

6. A method of making a composite apparatus for stopping and containing a projectile comprising the steps of: 
providing a frame for supporting a composite material including multiple layers of different materials; 
situating a first layer removably within the frame, the first layer comprising a plurality of self-adhering polymeric beads bonded together by an attractive force; 
positioning an impenetrable layer adjacent the first layer of self-adhering polymeric beads within the frame that is substantially impassable to the projectile; and 
positioning a projectile force absorbing layer adjacent the impenetrable layer for absorbing forces projected onto the impenetrable layer by the projectile.