

TOY LAUNCHER SCAR BARREL AND METHOD OF MAKING THE SAME

FIELD

[0001] The present disclosure is generally related to a toy projectile launcher, such as a toy pistol, gun, and the like, for launching toy projectiles, such as foam bullets, darts, balls, and in particular to devices that are placed at the end of a launcher muzzle to cause a projectile to spin when launched.

BACKGROUND

[0002] Traditional toy projectile launchers have utilized various forms of rifles, pistols, blasters, machine guns, and the like, for launching toy projectiles, such as foam balls and darts, to name a few. Such toy launchers have varied in size, power, and storage capacity, to name a few. More specifically, toy launchers of foam projectiles—bullets (or “darts”), balls, and the like—have become ubiquitous. One standard for foam bullets has been marketed under the brand name Nerf® with a rubber tip and a foam body that totals approximately 71.5 mm in length. There have been various types of rifles, machine guns, and the like that have been marketed for launching such foam projectiles.

[0003] A projectile will be more accurate when it spins/rotates in flight. As such, bullets move through a rifled barrel to achieve this spin. Similarly, a foam dart will also be more accurate after it has been made to spin.

[0004] In the main, there are three conventional prevalent ways to make a projectile spin, each involving attachment of a tube to the muzzle of a launcher.

[0005] Referring to FIG. 10A, one conventional technique involves molding of ridges on to the inside surface of the tube through which the dart passes, either through injection molding or extrusion, to produce the rifling. However, this only produces a limited spin, and causes too much friction that would adversely affect the velocity of the dart.

[0006] Referring to FIG. 10B, another conventional technique involves running monofilament fishing lines down the tube, to create the surface which makes the dart spin. This is an effective method, but it is very labor intensive, as each fish line needs to be manually tied, and quality control might be problematic over large production runs.

[0007] Referring to FIG. 10C, another conventional technique involves the use of metal/plastic rollers, with a metal pin running through a center hole, that are placed at an angle, usually from 10-15 degrees from the perpendicular. The resulting tube, sometimes referred to as a “scar barrel,” has three rows of rollers positioned at 120 degrees along the circumference of the tube. The number of rollers in each row can vary from, for example, two to five rollers. The higher the number of rollers, the more the spin. However, each roller also causes friction, and slows down the speed of the dart. As such, there is an optimum combination between the velocity of the dart, and the number of rollers required to create the necessary spin to achieve the desired degree of accuracy. Each roller has a narrow, raised, edge/wall, so that friction is kept to a minimum when the dart body passes over the roller. The angled position of the rollers induces the dart to spin. This is by far the most popular design, especially since a consumer could readily replace a damaged roller from open market sources or even find larger/smaller rollers to fit personal preferences.

[0008] To date, all scar barrels that use the roller method are 3-D printed. 3-D printing, however, is a slow and involved process, and, as such, the end product could be relatively expensive for accurate and quality pieces. Furthermore, 3-D barrel attachments might not be as durable as an injection molded variant, especially on impact when dropped.

[0009] Accordingly, there is a need for a scar barrel assembly process that provides a scar barrel that is not restricted to enthusiasts who could afford the present high retail from specialty venues.

SUMMARY

[0010] An object of the present invention is to provide a scar barrel for a launcher with a mass production design that provides quality, durability, precision, and affordability to the general public.

[0011] In exemplary embodiments, the present invention is directed to a scar barrel that is assembled using separate components which are formed in a mold, with the separate components including plates and/or sections with holes and/or slots for insertion of rollers and pins and other separate components that hold the pins in place.

[0012] According to an exemplary embodiment, a device for attachment to a muzzle of a projectile launcher comprises: a hollow main housing comprising: a proximal end portion; a distal end portion; a plurality of arms extending from the proximal end portion to the distal end portion; a plurality of plates configured to extend between the plurality of arms of the main housing, each of the plates comprising: one or more first openings that extend through a thickness of the plate; one or more second openings that extend across a width of the plate, each of the one or more second openings being in communication with a corresponding one of the one or more first openings; one or more rollers each disposed within a respective one of the one or more first openings, each roller comprising a center opening; and one or more pins each disposed within a respective one of the one or more second openings and inserted through the center opening of the roller within a corresponding one of the one or more first openings that is in communication with the respective one of the one or more second openings.

[0013] In exemplary embodiments, the hollow main housing and the plurality of plates are separate components.

[0014] In exemplary embodiments, the one or more rollers and the one or more pins are separate components that are inserted into the one or more first openings and the one or more second openings, respectively.

[0015] In exemplary embodiments, the device further comprises a cap disposed at the distal end portion of the main housing.

[0016] In exemplary embodiments, the plurality of arms and the plurality of plates together form an inner bore of the device.

[0017] In exemplary embodiments, the plurality of rollers are oriented at angles relative to a longitudinal axis of the device.

[0018] In exemplary embodiments, the proximal end portion of the main housing is configured for placement over a muzzle of a projectile launcher.

[0019] In exemplary embodiments, each roller comprises a raised edge around a circumference of the roller.

[0020] In exemplary embodiments, the one or more rollers extend into the inner bore.

[0021] According to an exemplary embodiment, a device for attachment to a muzzle of a projectile launcher comprises: a hollow main body comprising: a proximal end portion; a distal end portion; a plurality of sections extending from the proximal end portion to the distal end portion, each of the sections comprising: one or more through-holes that extend through a thickness of the section; one or more recessed grooves that extend across a width of the section, each of the one or more recessed grooves being in communication with a corresponding one of the one or more through-holes; one or more rollers each disposed within a respective one of the one or more through-holes, each roller comprising a center opening; and one or more pins each disposed within a respective one of the one or more recessed grooves and inserted through the center opening of the roller within a corresponding one of the one or more through-holes that is in communication with the respective one of the one or more recessed grooves; and a plurality of cover plates each disposed over a corresponding one of the plurality of sections, the cover plates holding the one or more pins in place while allowing the one or more rollers to freely spin.

[0022] In exemplary embodiments, the main body and the plurality of cover plates are separate components.

[0023] In exemplary embodiments, each of the plurality of cover plates comprises a peg that is configured for insertion into a corresponding opening in a corresponding one of the plurality of sections.

[0024] In exemplary embodiments, the one or more rollers and the one or more pins are separate components that are inserted into the one or more through-holes and the one or more recessed grooves, respectively.

[0025] In exemplary embodiments, the main body forms an inner bore of the device.

[0026] In exemplary embodiments, the plurality of rollers are oriented at angles relative to a longitudinal axis of the device.

[0027] In exemplary embodiments, the proximal end portion of the main body is configured for placement over a muzzle of a projectile launcher.

[0028] In exemplary embodiments, each roller comprises a raised edge around a circumference of the roller.

[0029] In exemplary embodiments, the one or more rollers extend into the inner bore.

[0030] According to an exemplary embodiment of the present invention, a device for attachment to a muzzle of a projectile launcher, comprises: a hollow main body comprising: a proximal end portion; a distal end portion; a plurality of sections extending from the proximal end portion to the distal end portion, each of the sections comprising: one or more through-holes that extend through a thickness of the section; one or more recessed grooves that extend across a width of the section, each of the one or more recessed grooves being in communication with a corresponding one of the one or more through-holes; one or more rollers each disposed within a respective one of the one or more through-holes, each roller comprising a center opening; and one or more pins each disposed within a respective one of the one or more recessed grooves and inserted through the center opening of the roller within a corresponding one of the one or more through-holes that is in communication with the respective one of the one or more recessed grooves; and a housing disposed over the main body and configured to hold the one or more pins in place while allowing the one or more rollers to freely spin.

[0031] In exemplary embodiments, the main body and the housing are separate components.

[0032] In exemplary embodiments, the housing comprises pairs of radial walls that extend towards a longitudinal axis of the housing.

[0033] In exemplary embodiments, each pair of radial walls is configured to hold down ends of the one or more pins within a corresponding one of the plurality of sections.

[0034] In exemplary embodiments, the one or more rollers and the one or more pins are separate components that are inserted into the one or more through-holes and the one or more recessed grooves, respectively.

[0035] In exemplary embodiments, the main body forms an inner bore of the device.

[0036] In exemplary embodiments, the plurality of rollers are oriented at angles relative to a longitudinal axis of the device.

[0037] In exemplary embodiments, the proximal end portion of the main body is configured for placement over a muzzle of a projectile launcher.

[0038] In exemplary embodiments, each roller comprises a raised edge around a circumference of the roller.

[0039] In exemplary embodiments, the one or more rollers extend into the inner bore.

BRIEF DESCRIPTION OF THE DRAWINGS

[0040] Exemplary embodiments of the present disclosure will be described with references to the accompanying figures, wherein:

[0041] FIG. 1 is an exploded perspective view of a scar barrel device according to an exemplary embodiment of the present invention;

[0042] FIGS. 2A-2E show various steps of assembly of the scar barrel device of FIG. 1 according to an exemplary embodiment of the present invention;

[0043] FIGS. 3A and 3B show the scar barrel device of FIG. 1 installed at the end of a muzzle of a launcher;

[0044] FIG. 4 is an exploded perspective view of a scar barrel device according to an exemplary embodiment of the present invention;

[0045] FIGS. 5A-5D show various steps of assembly of the scar barrel device of FIG. 4 according to an exemplary embodiment of the present invention;

[0046] FIGS. 6A and 6B show the scar barrel device of FIG. 4 installed at the end of a muzzle of a launcher;

[0047] FIG. 7 is an exploded perspective view of a scar barrel device according to an exemplary embodiment of the present invention;

[0048] FIGS. 8A-8F show various steps of assembly of the scar barrel device of FIG. 7 according to an exemplary embodiment of the present invention;

[0049] FIGS. 9A and 9B show the scar barrel device of FIG. 7 installed at the end of a muzzle of a launcher; and

[0050] FIGS. 10A – 10C show conventional devices for causing a projectile to spin.

DETAILED DESCRIPTION

[0051] Exemplary embodiments of the present invention are directed to a tube intended for placement at the end of a launch barrel of a toy projectile launcher to cause a projectile to spin as it leaves the launcher. The tube may be referred to as a “scar barrel”, which

in exemplary embodiments refers to an attachment to a launcher that causes a dart or other projectile to spin as it leaves the launcher.

[0052] FIG. 1 is an exploded view of a scar barrel device, generally designated by reference number 1, according to an exemplary embodiment of the present invention. The device 1 includes a hollow main housing 10 that is generally cylindrical shaped. The main housing 10 includes a proximal end portion 12 that is configured to fit over a muzzle of a toy launcher. In exemplary embodiments, the proximal end portion 12 may have an outer diameter that is less than an outer diameter of the remainder of the main housing 10. The main housing 10 further includes arms 14A, 14B, 14C that extend from the proximal end portion 12 of the main housing 10 towards a distal end portion 16 of the main housing 10. The arms 14A, 14B, 14C are preferably equally spaced at 120 degrees around the circumference of the device 1.

[0053] The device 1 further includes plates 18A, 18B, 18C that are generally rectangular shaped each with a width W, a length L and a thickness T. Each plate 18A, 18B, 18C includes a flat outer wall 19 and a curved inner wall 21. The curved inner walls 21 follow a concave curvature and form portions of the inner bore of the device 1. Each plate 18A, 18B, 18C includes a corresponding set of first openings 20 that extend through the thickness T of the plate 18A, 18B, 18C. Each plate 18A, 18B, 18C further includes a set of second openings 22 that extend across the width of the plate 18A, 18B, 18C. Each first opening 20 is in communication with a corresponding one of the second openings 22 within each plate 18A, 18B, 18C.

[0054] As explained in more detail below, each of the first openings 20 are configured to hold a generally cylindrical shaped roller 30. Each roller 30 has a center opening 31 and a raised, narrow edge 33 around an outer circumference of the roller 30. The rollers 30 are positioned in the first openings 20 such that their edges 33 protrude into the bore of the device 1. The edges 33 of the rollers 30 provide a minimum amount of contact with a projectile passing through the device 1, and therefore a minimum amount of friction with the projectile that would otherwise cause the projectile to lose velocity. In exemplary embodiments, the first openings 20 are set at corresponding angles so that the rollers 30 are likewise angled relative

to the direction of the projectile, thereby causing the projectile to spin as it proceeds through the device 1.

[0055] As also explained in more detail below, each of the second openings 22 is configured so that a corresponding pin 34 may pass through it and through the center opening 31 of a corresponding roller 30. Accordingly, the pins 34 are able to hold the rollers 30 in place within the plates 18A, 18B, 18C while allowing the rollers 30 to freely rotate as a projectile passes through the device 1 in contact with the rollers 30. In exemplary embodiments, the rollers and pins may be made of any suitable material, such as, for example, metal or plastic.

[0056] The device 1 further includes a cap 40 at the distal end portion. The cap 40 may be attached to the arms 14A, 14B, 14C using screws 50 that are inserted into corresponding openings 41 in the cap 40 to thereby hold the plates 18A, 18B, 18C in place on the main housing 10.

[0057] It should be appreciated that the device 1 is not limited to the number of arms, plates, rollers and associated pins as described and shown herein, and other exemplary embodiments may include more or less of such components.

[0058] FIGS. 2A-2E show various steps of assembly of the device 1 according to an exemplary embodiment of the present invention. As shown in FIG. 2A, in each plate 18A, 18B, 18C, rollers 30 are inserted into respective first openings 20 and each roller 30 is secured in place by pushing a respective pin 34 through the center opening 31 of the roller 30. In this regard, each pin 34 sits in a respective pair of grooves 17 that is in communication with a respective one of the second openings 22 and is held down by the inner walls 21 of the plates 18A, 18B, 18C. FIG. 2B and 2C show one of the plates 18A, 18B, 18C after the rollers 30 and pins 34 have been inserted.

[0059] FIGS. 2C-2E show subsequent steps of assembly in which each plate 18A, 18B, 18C is inserted between a corresponding pair of arms 14A, 14B, 14C. In this regard, each plate 18A, 18B, 18C includes corresponding outer edge grooves 23 (FIG. 2D). The outer edge grooves 23 assist in guiding the plates 18A, 18B, 18C between the arms 14A, 14B, 14C. When a plate 18A, 18B, 18C arrives at the base of corresponding arm 14A, 14B, 14C, a first protrusion 24 at a proximal end of the plate 18A, 18B, 18C is inserted into a corresponding opening 11 in a top wall of the main housing 10. In this regard, a corresponding opening

11 is positioned between corresponding base portions 15 of the arms 14A, 14B, 14C around the top wall of the main housing 10. The cap 40 is then placed at the distal end of the device 1 using the screws 50, which pass through the openings 41 of the cap and screwed into threaded openings 16 in distal end walls of the arms 14A, 14B, 14C (FIG. 2E). In exemplary embodiments, the positioning of the cap 40 may be aided by second protrusions 25 at distal ends of the plates 18A, 18B, 18C which fit into corresponding cavities 42 around the cap 40.

[0060] FIGS. 3A and 3B show placement of the device 1 at the end of a launcher muzzle 60. In exemplary embodiments, the muzzle 60 is inserted into the proximal end portion 12 of the device until it abuts against an inner stop 27 that protrudes from the bore of the device 1. The device 1 may be held on the muzzle 60 by friction fit. As shown, the rollers 30 cause a projectile 100 to take on a spinning motion as the projectile 100 passes through the device 1.

[0061] FIG. 4 is an exploded view of a scar barrel device, generally designated by reference number 100, according to an exemplary embodiment of the present invention. The device 100 differs from the device 1 in that it includes a main body that is formed as a single unitary piece (i.e., there are no separate plates) using, for example, injection molding with one or more slides, and separate covering plates are used to hold down the pins for each row of rollers.

[0062] More specifically, the device 100 includes a hollow main body 110 that is generally cylindrical shaped. In exemplary embodiments, the main body 110 has a unitary construction, and may be formed by, for example, injection molding. The main body 110 includes a proximal end portion 112 that is configured to fit over a muzzle of a toy launcher. In exemplary embodiments, the proximal end portion 112 may have an outer diameter that is less than an outer diameter of the remainder of the main housing 110. The main body 110 further includes sections 118A, 118B, 118C (118B not shown but disposed between the sections 118A and 118C) that extend from the proximal end portion 112 of the main body 110 towards a distal end portion 116 of the main body 110. The sections 118A, 118B, 118C are preferably equally spaced at 120 degrees around the circumference of the device 100.

[0063] Each section 118A, 118B, 118C includes a corresponding set of through holes 120 that extend through the main body 100 and in communication with the hollow interior of

the main body 100. Each section 118A, 118B, 118C further includes a set of recessed grooves 122 that extend across the width of the section 118A, 118B, 118C. Each through hole 120 is in communication with a corresponding one of the recessed grooves 122 within each section 118A, 118B, 118C.

[0064] As explained in more detail below, each of the through holes 120 are configured to hold a generally cylindrical shaped roller 130. Each roller 130 has a center opening 131 and a raised, narrow edge 133 around an outer circumference of the roller 130. The rollers 130 are positioned in the through holes 120 such that their edges 133 protrude into the bore of the device 100. The edges 133 of the rollers 130 provide a minimum amount of contact with a projectile passing through the device 100, and therefore a minimum amount of friction with the projectile that would otherwise cause the projectile to lose velocity. In exemplary embodiments, the through holes 120 are set at corresponding angles so that rollers 130 held within the through holes 120 are likewise angled relative to the direction of the projectile, thereby causing the projectile to spin as it proceeds through the device 100.

[0065] As also explained in more detail below, each of the recessed grooves 122 is configured so that a corresponding pin 134 may be held within the groove 122 and through the center opening 131 of a corresponding roller 130. Accordingly, the pins 134 are able to hold the rollers 130 in place within the sections 118A, 118B, 118C while allowing the rollers 130 to freely rotate as a projectile passes through the device 100 in contact with the rollers 130. In exemplary embodiments, the rollers and pins may be made of any suitable material, such as, for example, metal or plastic.

[0066] The device 100 further includes cover plates 150A, 150B, 150C, each corresponding to one of the sections 118A, 118B, 118C. The cover plates have 150A, 150B, 150C have respective openings 152 that allow the rollers 130 to protrude through the cover plates 150A, 150B, 150C. The cover plates 150A, 150B, 150C also have respective pegs 154 that protrude from bottoms walls of the cover plates 150A, 150B, 150C, and which are configured to engage with respective openings 125 in the sections 118A, 118B, 118C to hold the cover plates 150A, 150B, 150C in place over the sections 118A, 118B, 118C.

[0067] FIGS. 5A-5D show various steps of assembly of the device 100 according to an exemplary embodiment of the present invention. As shown in FIG. 5A, a pin 134 is inserted through the center opening 131 of each roller 130, and then each pin-roller assembly is inserted into the sections 118A, 118B, 118C with each roller 130 extending into a respective one of the through holes 120 and each pin 134 inserted into a respective one of the recessed grooves 122.

[0068] The cover plates 150A, 150B, 150C are then placed over the respective sections 118A, 118B, 118C, with the pegs 154 inserted into respective openings 125 in the sections 118A, 118B, 118C. With the cover plates 150A, 150B, 150C in place, the rollers 130 protrude through the cover plate openings 152 and the ends of the pins 134 are held in place to allow the rollers 130 to freely spin.

[0069] FIG. 5C shows the device 100 after being fully assembled, and FIG. 5D is a view through the distal end of the device 100 showing the rollers 130 and pins 134.

[0070] FIGS. 6A and 6B show placement of the device 100 at the end of a launcher muzzle 160. In exemplary embodiments, the muzzle 160 is inserted into the proximal end portion 112 of the device 100 until it abuts against an inner stop 127 that protrudes from the bore of the device 100. The device 100 may be held on the muzzle 160 by friction fit. As shown, the rollers 130 cause a projectile 1000 to take on a spinning motion as the projectile 1000 passes through the device 100.

[0071] It should be appreciated that the device 100 is not limited to the number of sections, cover plates, rollers and associated pins as described and shown herein, and other exemplary embodiments may include more or less of such components.

[0072] FIG. 7 is an exploded view of a scar barrel device, generally designated by reference number 200, according to an exemplary embodiment of the present invention. The device 200 is the same as the device 100 in that it includes a main body formed of a single unitary piece. However, instead of using separate cover plates to hold down the pins, the main housing is inserted into an external shell having three sets of walls that hold down the pins.

[0073] More specifically, the device 200 includes a hollow main body 210 that is generally cylindrical shaped. In exemplary embodiments, the device 200 has a unitary construction, and may be formed by, for example, injection molding. The main body 200 includes a

proximal end portion 212 that is configured to fit over a muzzle of a toy launcher. In exemplary embodiments, the proximal end portion 212 may have an outer diameter that is less than an outer diameter of the remainder of the main housing 210. The main body 200 further includes sections 218A, 218B, 218C (218B not shown but disposed between the sections 218A and 218C) that extend from the proximal end portion 212 of the main body 210 towards a distal end portion 216 of the main body 210. The sections 218A, 218B, 218C are preferably equally spaced at 120 degrees around the circumference of the device 200.

[0074] Each section 218A, 218B, 218C includes a corresponding set of through holes 220 that extend through the main body 200 and in communication with the hollow interior of the main body 200 (FIG. 8A). Each section 218A, 218B, 218C further includes a set of recessed grooves 222 that extend across the width of the section 218A, 218B, 218C (FIG. 8A). Each through hole 220 is in communication with a corresponding one of the recessed grooves 222 in each of the sections 218A, 218B, 218C.

[0075] As explained in more detail below, each of the through holes 220 is configured to hold a generally cylindrical shaped roller 230. Each roller 230 has a center opening 231 and a raised, narrow edge 233 around an outer circumference of the roller 230. The rollers 230 are positioned in the through holes 220 such that their edges 233 protrude into the bore of the device 200. The edges 233 of the rollers 230 provide a minimum amount of contact with a projectile passing through the device 200, and therefore a minimum amount of friction with the projectile that would otherwise cause the projectile to lose velocity. In exemplary embodiments, the through holes 220 are set at corresponding angles so that rollers 230 held within the through holes 220 are likewise angled relative to the direction of the projectile, thereby causing the projectile to spin as it proceeds through the device 200.

[0076] As also explained in more detail below, each of the recessed grooves 222 is configured so that a corresponding pin 234 may be held within the groove 222 and through the center opening 231 of a corresponding roller 230. Accordingly, the pins 234 are able to hold the rollers 230 in place within the sections 218A, 218B, 218C while allowing the rollers 230 to freely rotate as a projectile passes through the device 200 in contact with the rollers 230. In exemplary embodiments, the rollers and pins may be made of any suitable material, such as, for example, metal or plastic.

[0077] The device 200 further includes a housing 250 into which the main body 210 is inserted. The housing 250 is generally cylindrical shaped with a hollow interior. The housing 250 has a proximal end portion 251 having an outer diameter that is less than an outer diameter of the remainder of the housing 250. The proximal end portion 251 of the housing 250 has an inner diameter that is slightly larger than the outer diameter of the proximal end portion 212 of the main body 210 so as to accommodate the proximal end portion 212 of the main body 210. The housing 250 includes an internal wall 252 from which pairs of radial walls 254A, 254B extend towards a longitudinal axis of the housing 250. In exemplary embodiments, the number of pairs of radial walls 254A, 254B correspond to the number of sections 218A, 218B, 218C. As explained in more detail below, when the main body 210 is inserted into the housing 250, the radial walls 254A, 254B press down on the pins 234 and hold them in place.

[0078] The device 200 further includes a cap 240 having a central opening 242 and a collar 244 that is configured to be inserted into the hollow interior of the main body 210. In exemplary embodiment, the collar 244 of the cap 240 may include an elongated protrusion 246 that is configured to be inserted into a corresponding elongated groove 255 at a distal end of the housing 250 (FIG. 8D). In exemplary embodiments, the collar 244 may be threaded and the distal end portion of the hollow interior of the housing 250 may have corresponding threads so that the cap 240 may be screwed into the hollow interior.

[0079] FIGS. 8A-8F show various steps of assembly of the device 200 according to an exemplary embodiment of the present invention. As shown in FIG. 8A, a pin 234 is inserted through the center opening 231 of each roller 230, and then, as shown in FIG. 8B, each pin-roller assembly is inserted into the sections 218A, 218B, 218C with each roller 230 extending into a respective one of the through holes 220 and each pin 234 inserted into a respective one of the recessed grooves 222. FIG. 8C is a view through the distal end of the device 200 showing the rollers 230, the pins 234 and the radial walls 254A, 254B.

[0080] As shown in FIG. 8D, the main body 210 is then inserted into the housing 250 until the proximal end portion 212 of the main body 210 is fully inserted into the proximal end portion 251 of the housing 250. As shown in FIG. 8F, the housing 250 has a stop wall 256 protruding around the inner circumference of the housing 250 at the proximal end of the

housing 250. The inner diameter of the proximal end portion 212 of the main body 210 is equal to the inner diameter of the stop wall 256 so that the proximal end portion 212 of the main body 210 and the stop wall 256 form a smooth surface with no obstructions that would otherwise interfere with passage of a projectile. When fully inserted, the proximal end of the main body 210 rests against the stop wall 256 of the housing 250. Also, when the main body 210 is fully inserted into the housing 250, each pair of radial walls 254A, 254B presses down on the ends of the pins 234 within a corresponding row of pins 234 on the main body 210, thereby holding the pins 234 in place while allowing the rollers 230 to freely spin.

[0081] FIGS. 8E show the device 200 after being fully assembled with cap 240 inserted at the distal end.

[0082] FIGS. 9A and 9B show placement of the device 200 at the end of a launcher muzzle 260. In exemplary embodiments, the muzzle 260 is inserted into the proximal end portion 212 of the device 200 until it abuts against an inner stop 227 that protrudes from the bore of the device 200. The device 200 may be held on the muzzle 260 by friction fit. As shown, the rollers 230 cause a projectile 1000 to take on a spinning motion as the projectile 1000 passes through the device 200.

[0083] It should be appreciated that the device 200 is not limited to the number of sections, rollers and associated pins as described and shown herein, and other exemplary embodiments may include more or less of such components.

* * * * *

[0084] While particular embodiments of the present disclosure have been shown and described in detail, it would be obvious to those skilled in the art that various modifications and improvements thereon may be made without departing from the spirit and scope of the disclosure. It is therefore intended to cover all such modifications and improvements that are within the scope of this disclosure.

CLAIMS

What is claimed is:

1. A device for attachment to a muzzle of a projectile launcher, comprising:
 - a hollow main housing comprising:
 - a proximal end portion;
 - a distal end portion;
 - a plurality of arms extending from the proximal end portion to the distal end portion;
 - a plurality of plates configured to extend between the plurality of arms of the main housing, each of the plates comprising:
 - one or more first openings that extend through a thickness of the plate;
 - one or more second openings that extend across a width of the plate, each of the one or more second openings being in communication with a corresponding one of the one or more first openings;
 - one or more rollers each disposed within a respective one of the one or more first openings, each roller comprising a center opening; and
 - one or more pins each disposed within a respective one of the one or more second openings and inserted through the center opening of the roller within a corresponding one of the one or more first openings that is in communication with the respective one of the one or more second openings.

2. The device of claim 1, wherein the hollow main housing and the plurality of plates are separate components.
3. The device of claim 1, wherein the one or more rollers and the one or more pins are separate components that are inserted into the one or more first openings and the one or more second openings, respectively.
4. The device of claim 1, further comprising a cap disposed at the distal end portion of the main housing.
5. The device of claim 1, wherein the plurality of arms and the plurality of plates together form an inner bore of the device.
6. The device of claim 1, wherein the plurality of rollers are oriented at angles relative to a longitudinal axis of the device.
7. The device of claim 1, wherein the proximal end portion of the main housing is configured for placement over a muzzle of a projectile launcher.
8. The device of claim 1, wherein each roller comprises a raised edge around a circumference of the roller.
9. The device of claim 5, wherein the one or more rollers extend into the inner bore.

10. A device for attachment to a muzzle of a projectile launcher, comprising:
- a hollow main body comprising:
 - a proximal end portion;
 - a distal end portion;
 - a plurality of sections extending from the proximal end portion to the distal end portion, each of the sections comprising:
 - one or more through-holes that extend through a thickness of the section;
 - one or more recessed grooves that extend across a width of the section, each of the one or more recessed grooves being in communication with a corresponding one of the one or more through-holes;
 - one or more rollers each disposed within a respective one of the one or more through-holes, each roller comprising a center opening; and
 - one or more pins each disposed within a respective one of the one or more recessed grooves and inserted through the center opening of the roller within a corresponding one of the one or more through-holes that is in communication with the respective one of the one or more recessed grooves;
 - a plurality of cover plates each disposed over a corresponding one of the plurality of sections, the cover plates holding the one or more pins in place while allowing the one or more rollers to freely spin.
11. The device of claim 10, wherein the main body and the plurality of cover plates are separate components.

12. The device of claim 11, wherein each of the plurality of cover plates comprises a peg that is configured for insertion into a corresponding opening in a corresponding one of the plurality of sections.
13. The device of claim 10, wherein the one or more rollers and the one or more pins are separate components that are inserted into the one or more through-holes and the one or more recessed grooves, respectively.
14. The device of claim 10, wherein the main body forms an inner bore of the device.
15. The device of claim 10, wherein the plurality of rollers are oriented at angles relative to a longitudinal axis of the device.
16. The device of claim 10, wherein the proximal end portion of the main body is configured for placement over a muzzle of a projectile launcher.
17. The device of claim 10, wherein each roller comprises a raised edge around a circumference of the roller.
18. The device of claim 14, wherein the one or more rollers extend into the inner bore.

19. A device for attachment to a muzzle of a projectile launcher, comprising:
- a hollow main body comprising:
 - a proximal end portion;
 - a distal end portion;
 - a plurality of sections extending from the proximal end portion to the distal end portion, each of the sections comprising:
 - one or more through-holes that extend through a thickness of the section;
 - one or more recessed grooves that extend across a width of the section, each of the one or more recessed grooves being in communication with a corresponding one of the one or more through-holes;
 - one or more rollers each disposed within a respective one of the one or more through-holes, each roller comprising a center opening; and
 - one or more pins each disposed within a respective one of the one or more recessed grooves and inserted through the center opening of the roller within a corresponding one of the one or more through-holes that is in communication with the respective one of the one or more recessed grooves;
 - a housing disposed over the main body and configured to hold the one or more pins in place while allowing the one or more rollers to freely spin.
20. The device of claim 19, wherein the main body and the housing are separate components.

21. The device of claim 19, wherein the housing comprises pairs of radial walls that extend towards a longitudinal axis of the housing.
22. The device of claim 21, wherein each pair of radial walls is configured to hold down ends of the one or more pins within a corresponding one of the plurality of sections.
23. The device of claim 19, wherein the one or more rollers and the one or more pins are separate components that are inserted into the one or more through-holes and the one or more recessed grooves, respectively.
24. The device of claim 19, wherein the main body forms an inner bore of the device.
25. The device of claim 19, wherein the plurality of rollers are oriented at angles relative to a longitudinal axis of the device.
26. The device of claim 19, wherein the proximal end portion of the main body is configured for placement over a muzzle of a projectile launcher.
27. The device of claim 19, wherein each roller comprises a raised edge around a circumference of the roller.
28. The device of claim 24, wherein the one or more rollers extend into the inner bore.