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(54) **PRESET, NON-SERVICEABLE TIP ASSEMBLY SYSTEM FOR FENCING**

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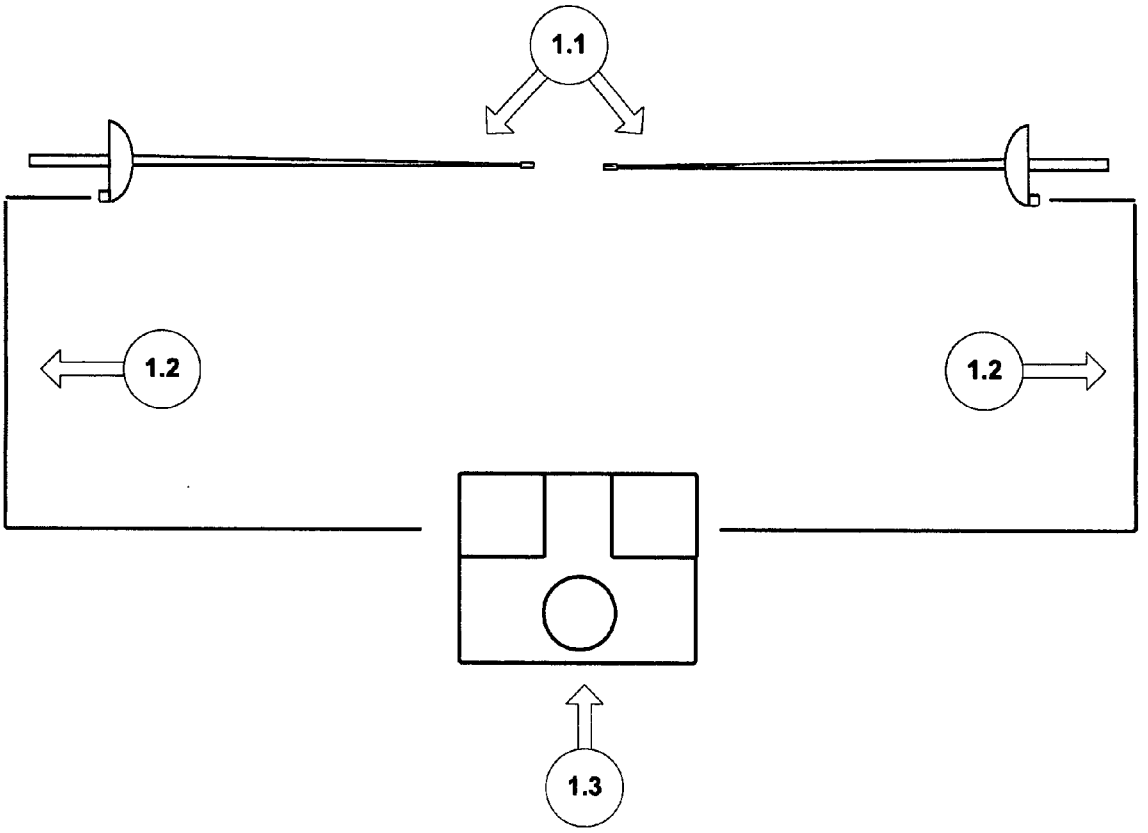
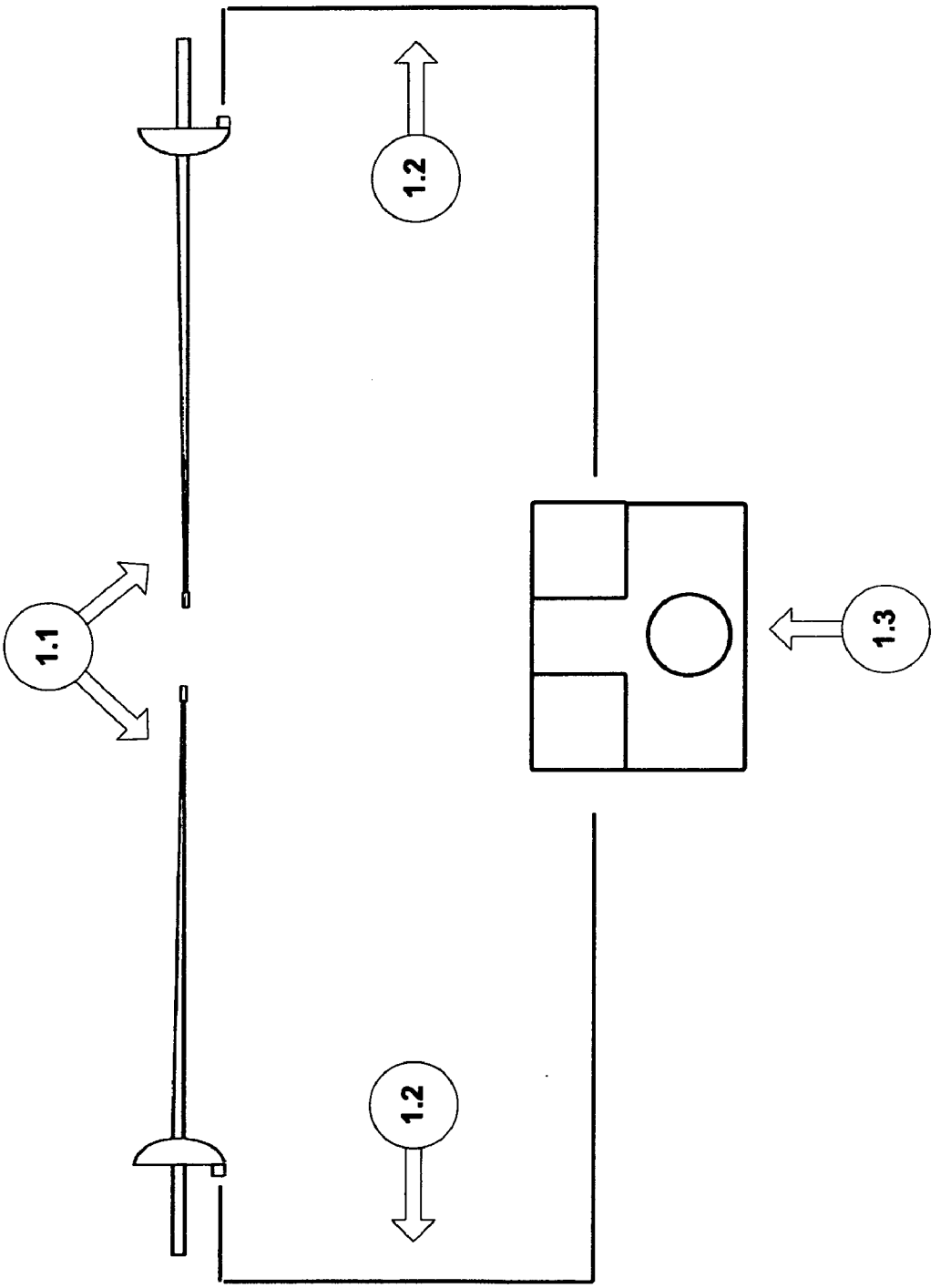
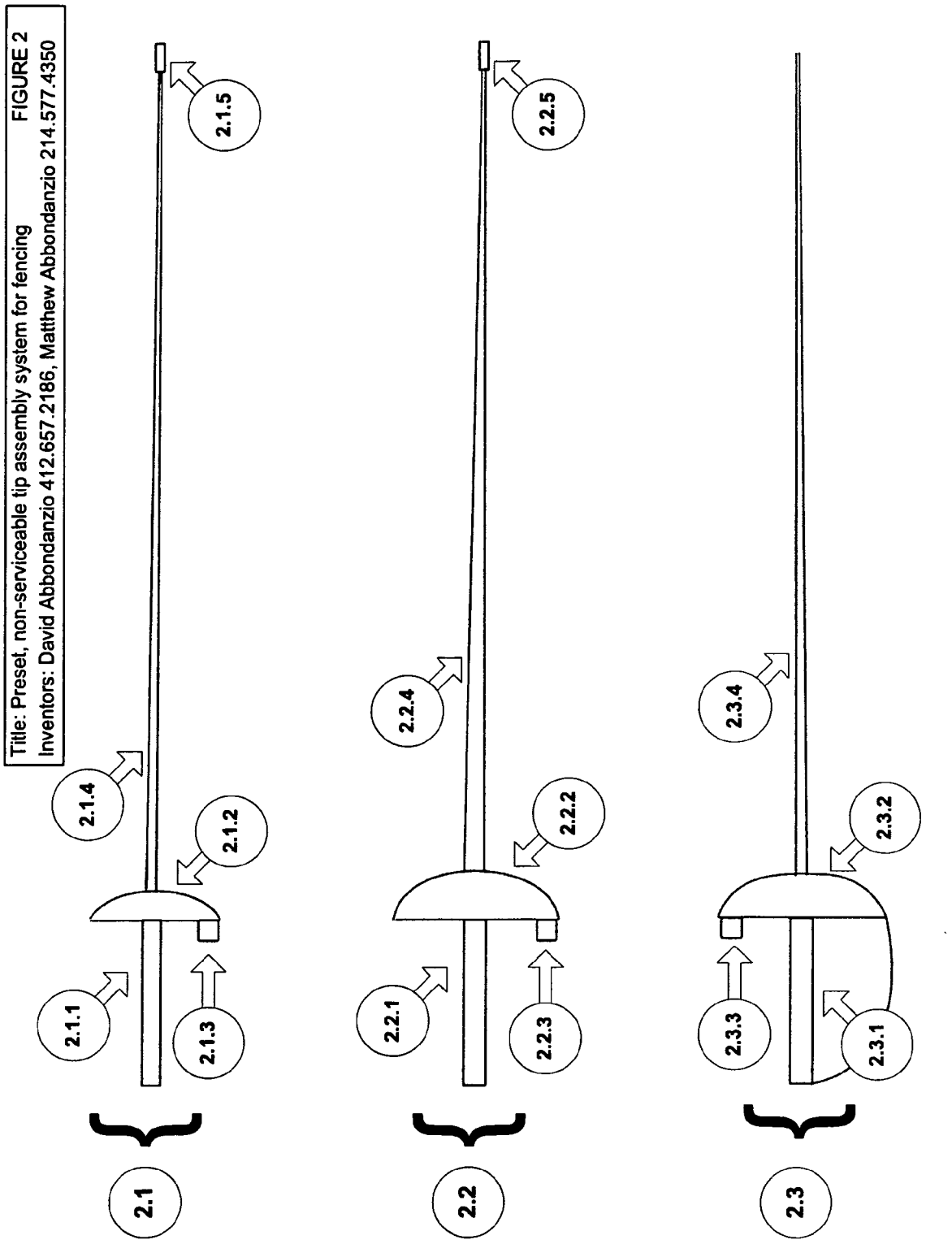
(57) **ABSTRACT**

The invention is a non-serviceable tip assembly system used in the weapon assembly of weapons or swords utilized in the sport of fencing which is preset to comply with all rules and regulations governing competitive specifications as set forth by the Federation Internationale d'Escrime (FIE) and United States Fencing Association (USFA) and is compatible with common fencing weapon assemblies. This system comprises components such as an adapter collar, a non-serviceable barrel and a self-locking point which may be incorporated into common tip assemblies.





Title: Preset, non-serviceable tip assembly system for fencing FIGURE 1
Inventors: David Abbondanzio 412.657.2186, Matthew Abbondanzio 214.577.4350


Title: Preset, non-serviceable tip assembly system for fencing FIGURE 2
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2.1.1
2.1.2
2.1.3
2.1.4
2.1.5
2.1
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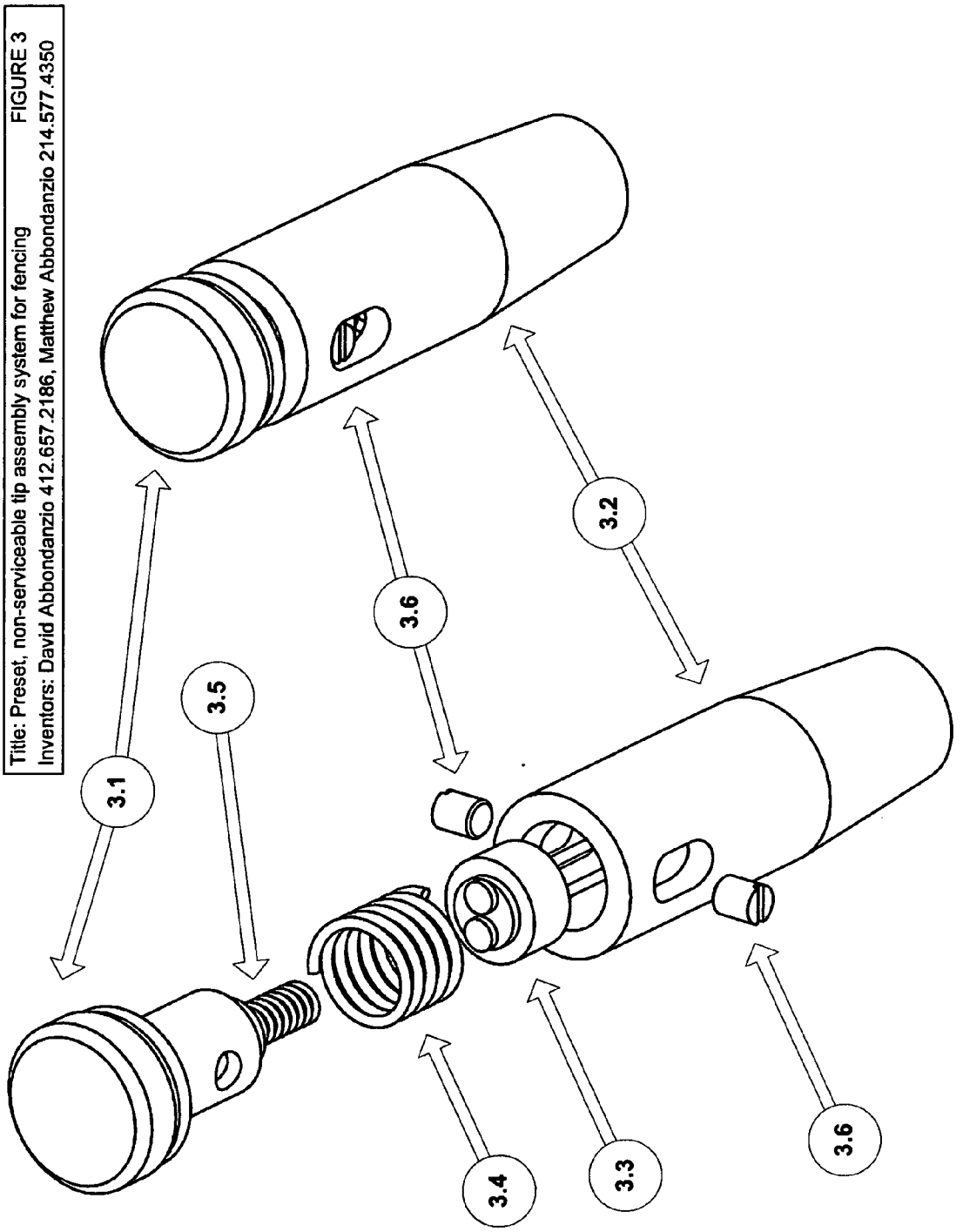
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FIGURE 3
3.1
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3.4
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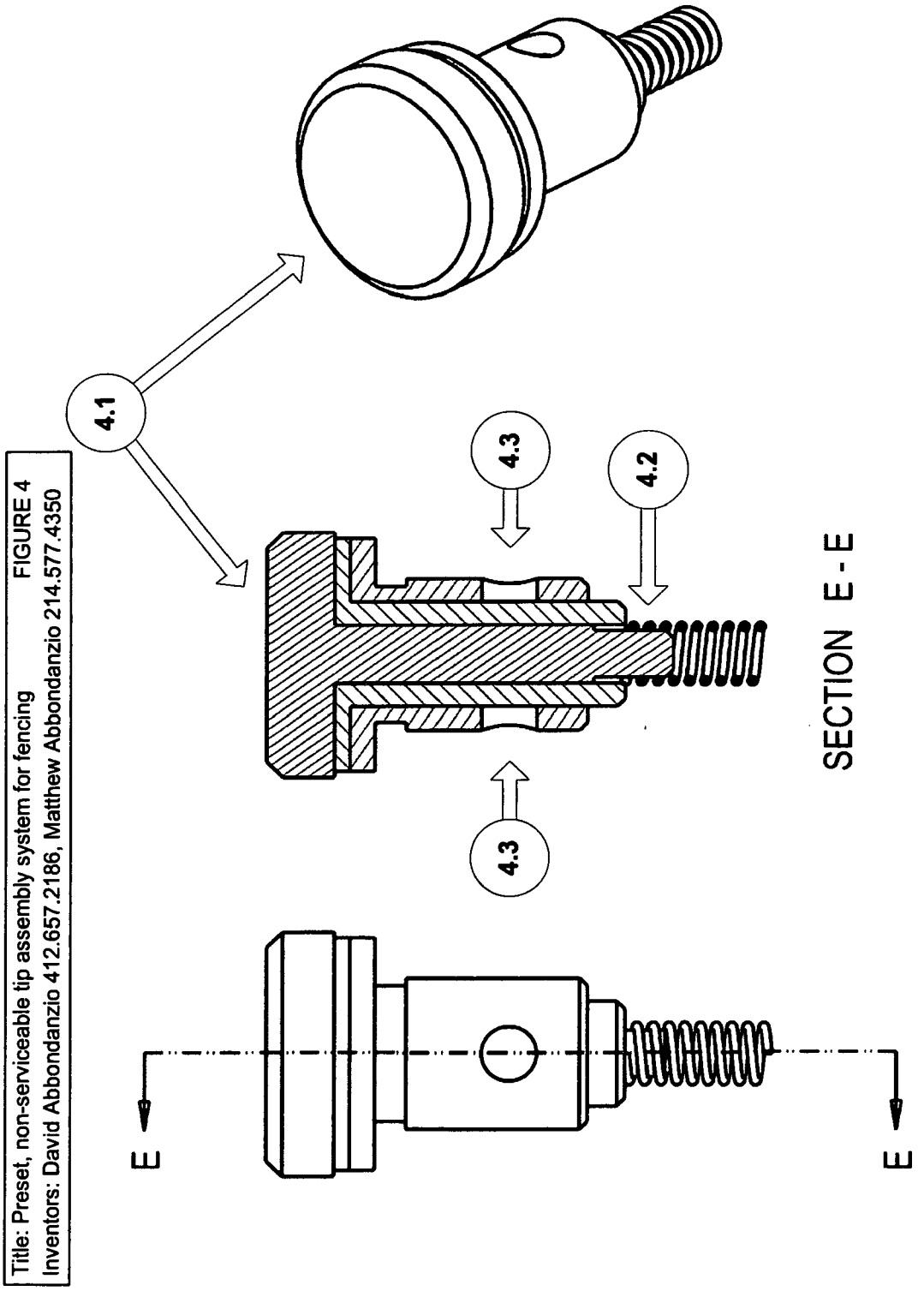
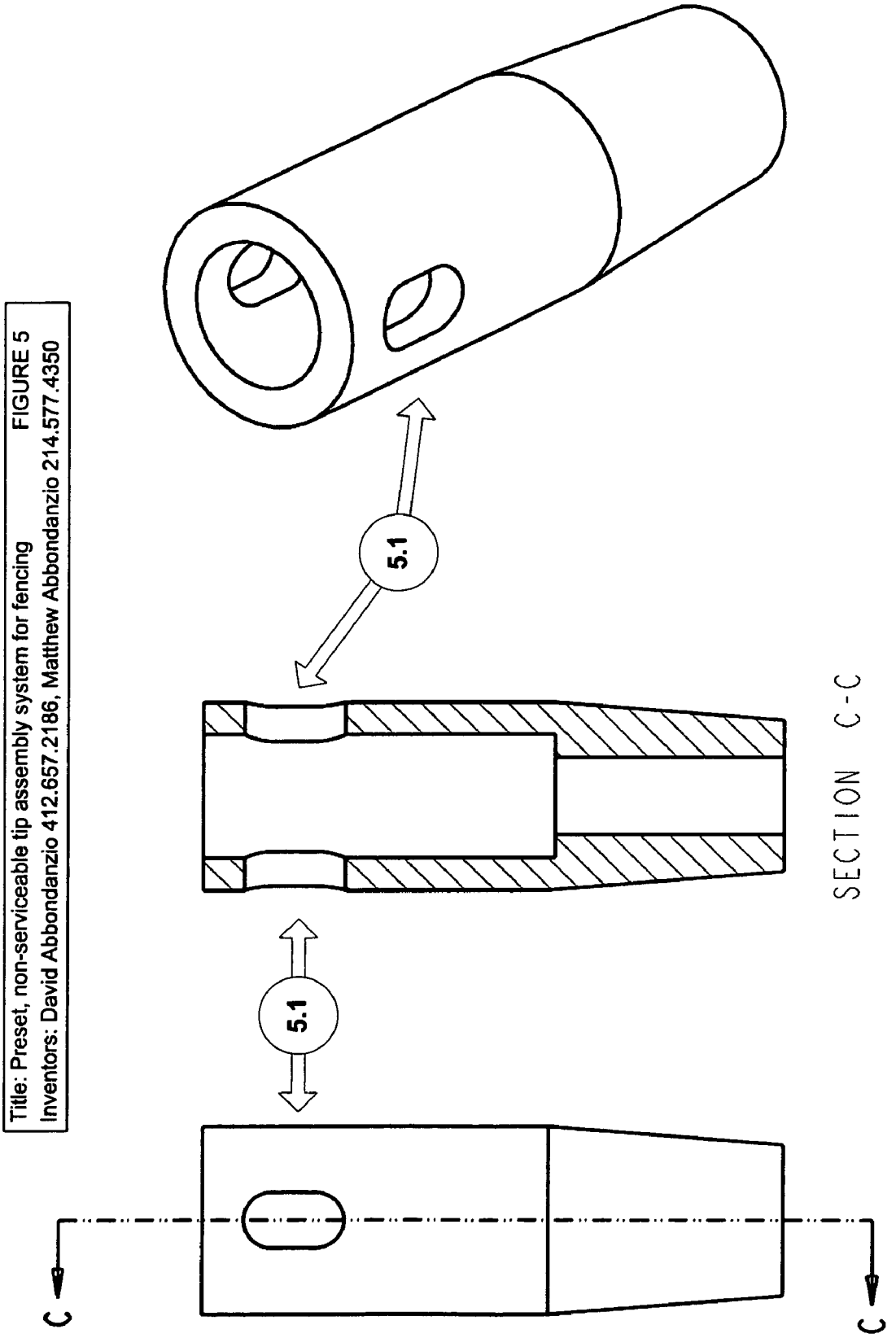
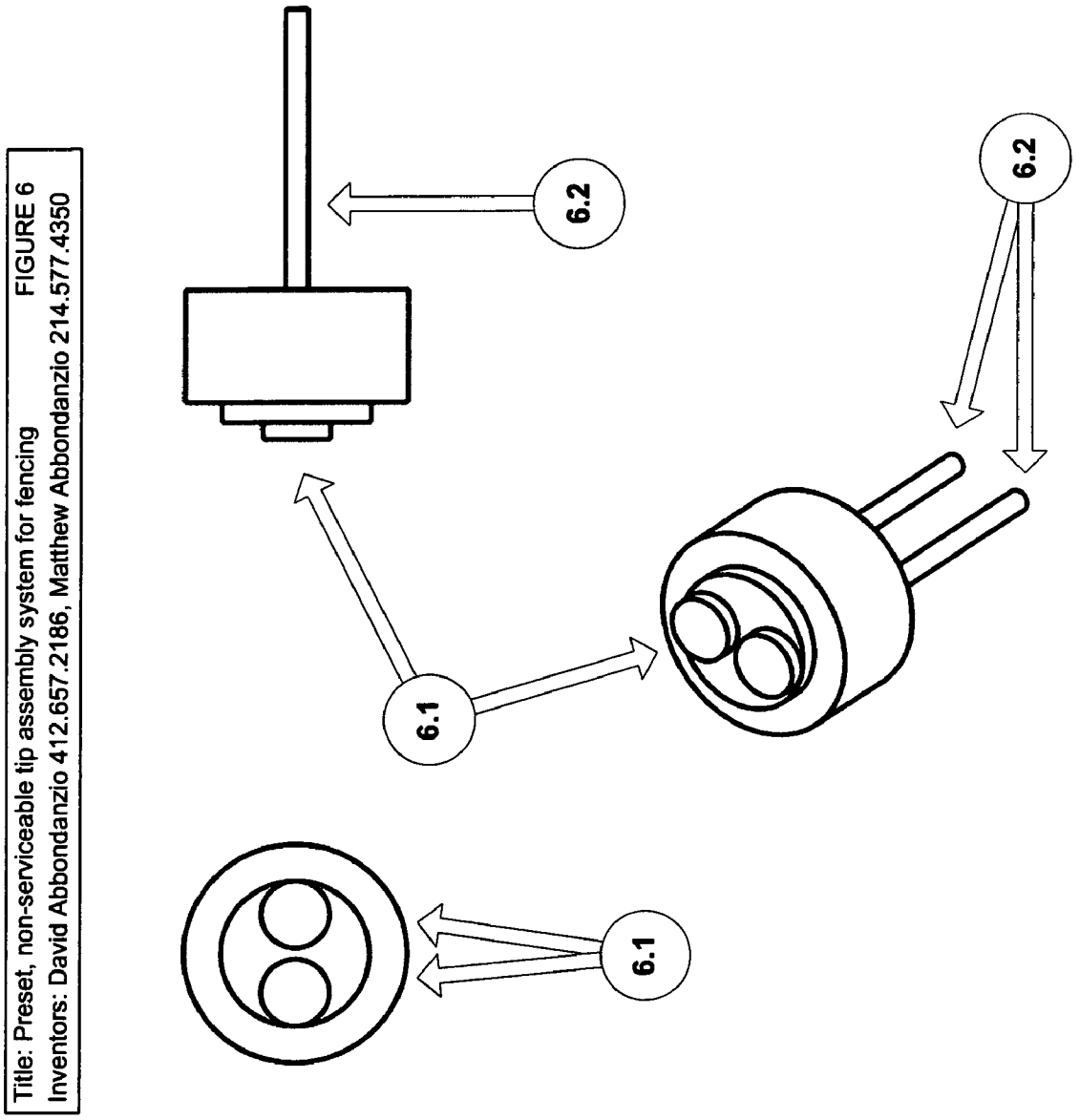
3.6

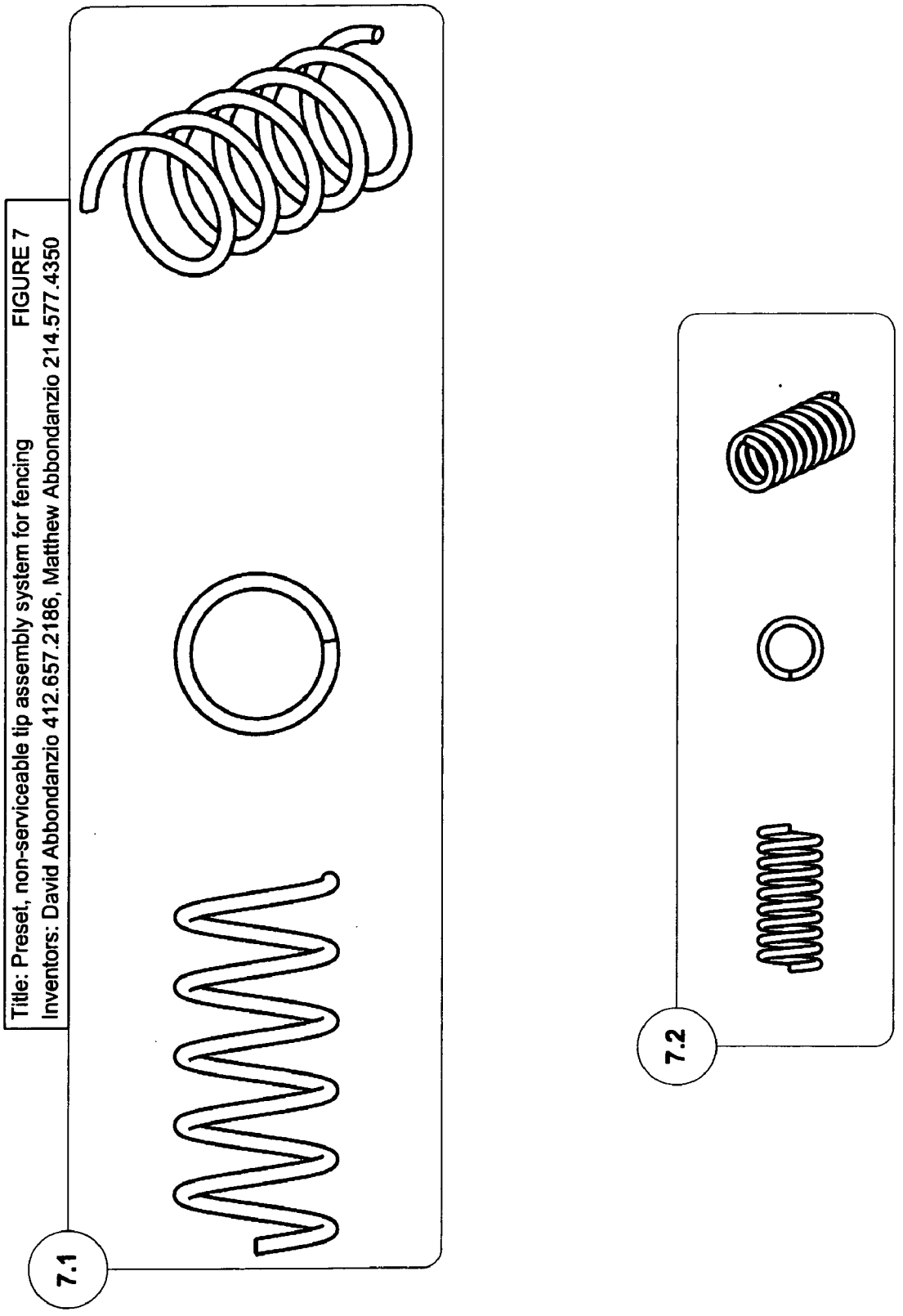


Title: Preset, non-serviceable tip assembly system for fencing FIGURE 4
Inventors: David Abbondanzio 412.657.2186, Matthew Abbondanzio 214.577.4350


Title: Preset, non-serviceable tip assembly system for fencing FIGURE 5
Inventors: David Abbondanzio 412.657.2186, Matthew Abbondanzio 214.577.4350
5.1
5.1
SECTION C-C
C
C



Title: Preset, non-serviceable tip assembly system for fencing FIGURE 6
Inventors: David Abbondanzio 412.657.2186, Matthew Abbondanzio 214.577.4350


Title: Preset, non-serviceable tip assembly system for fencing FIGURE 7
Inventors: David Abbondanzio 412.657.2186, Matthew Abbondanzio 214.577.4350
7.1
7.2

Title: Preset, non-serviceable tip assembly system for fencing FIGURE 8
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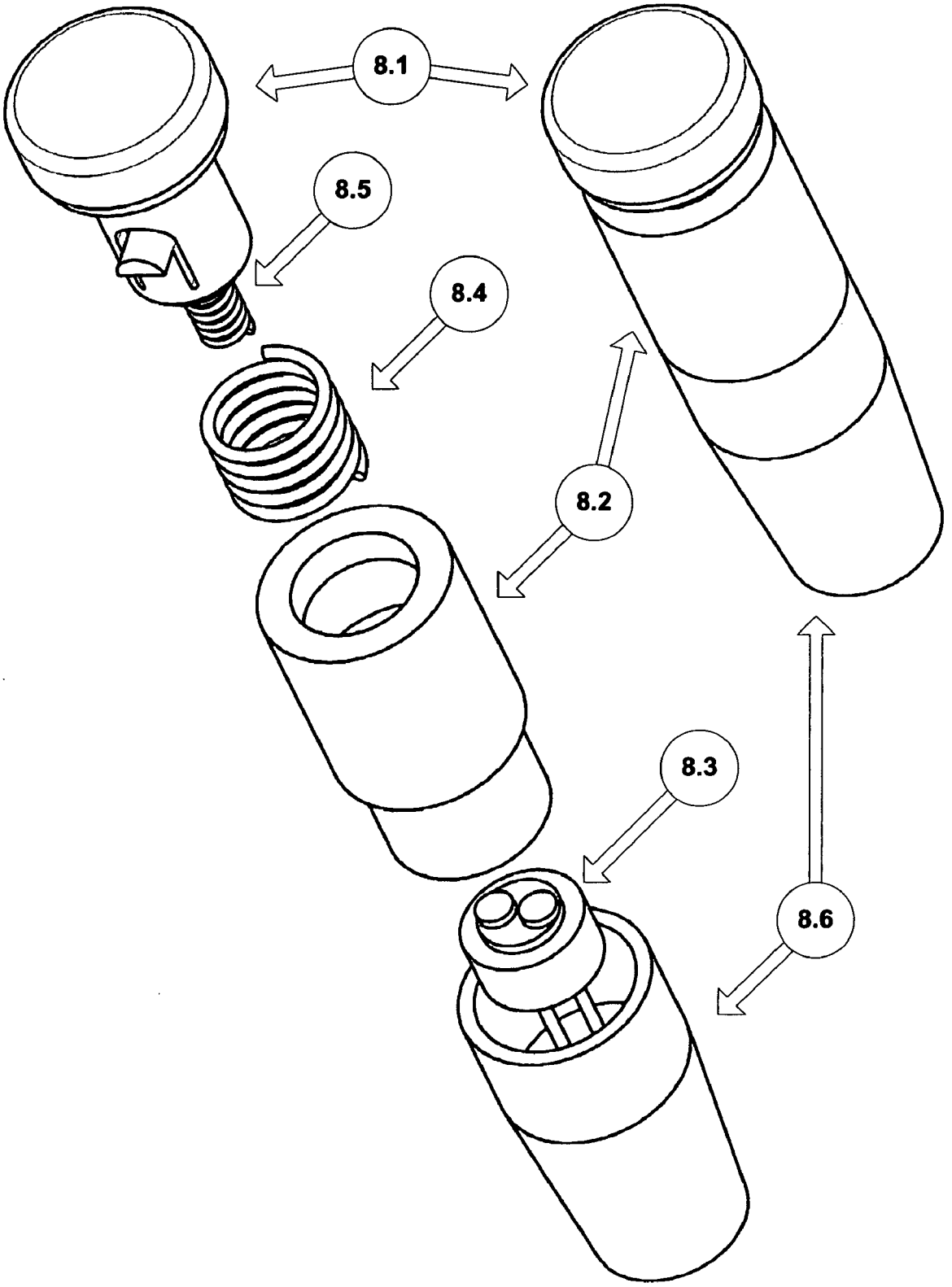

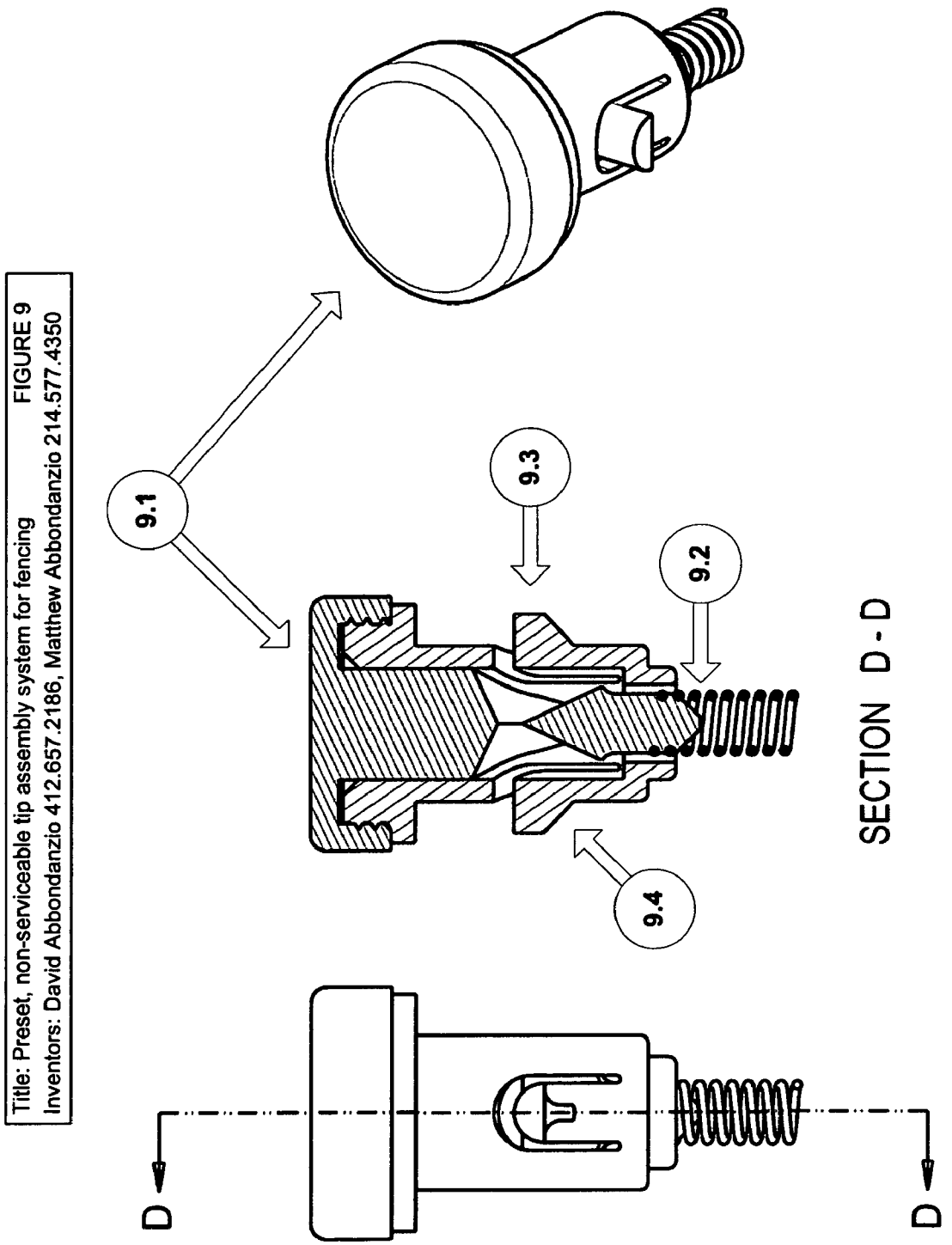

Title: Preset, non-serviceable tip assembly system for fencing FIGURE 9
Inventors: David Abbondanzio 412.657.2186, Matthew Abbondanzio 214.577.4350

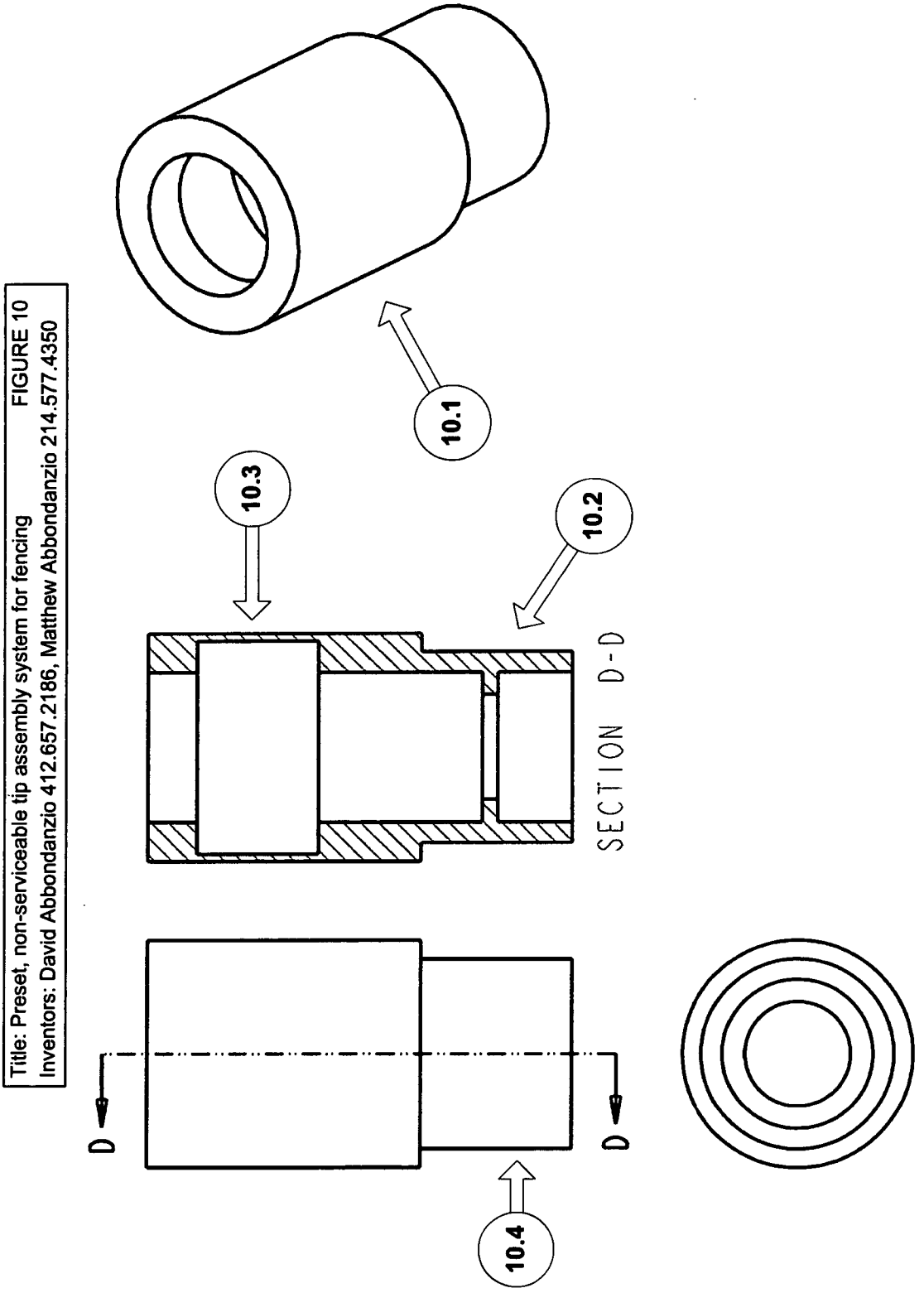
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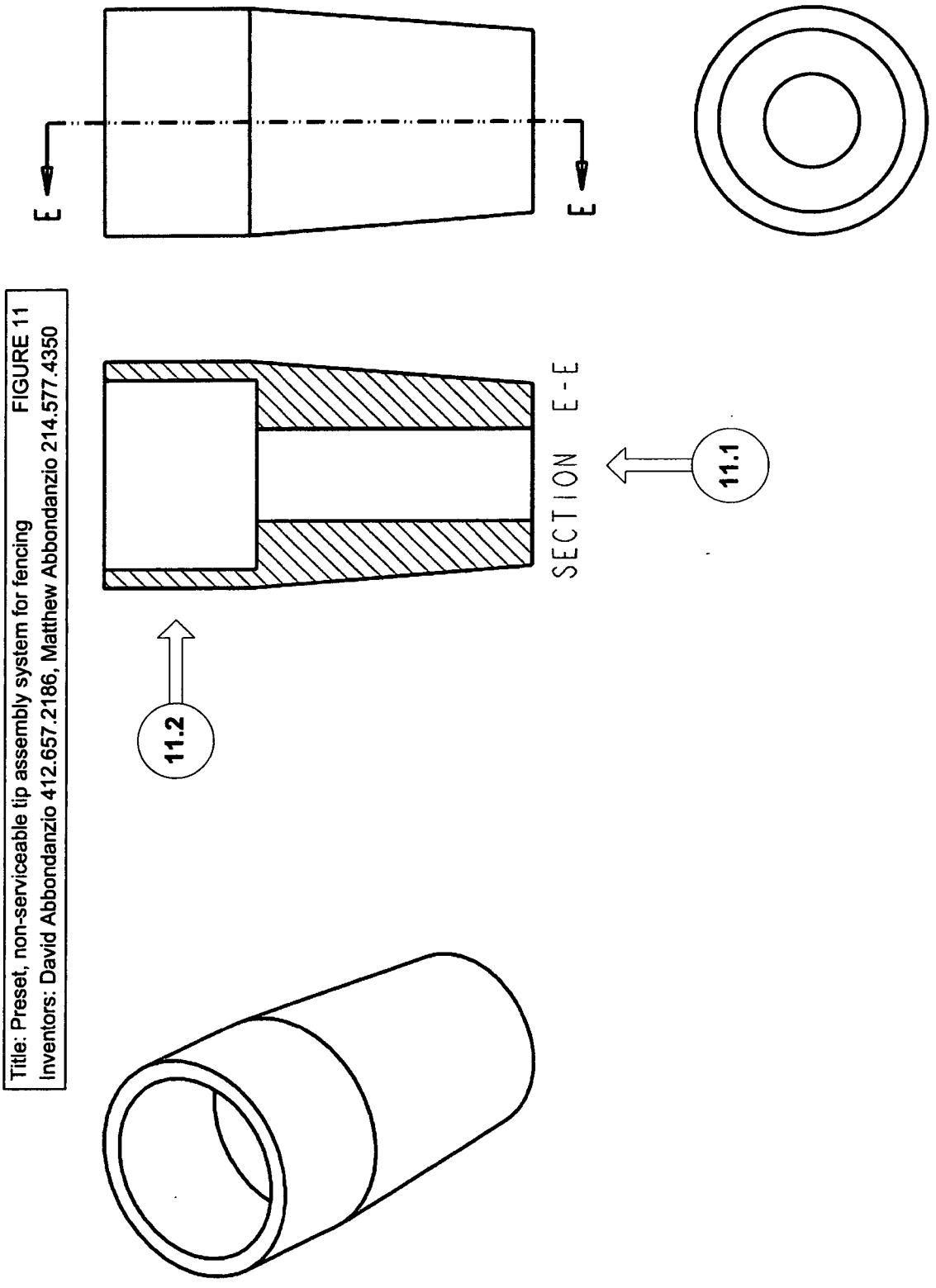
FIGURE 10
10.1
10.2
10.3
10.4
SECTION D-D
D
D



Title: Preset, non-serviceable tip assembly system for fencing FIGURE 11
Inventors: David Abbondanzio 412.657.2186, Matthew Abbondanzio 214.577.4350

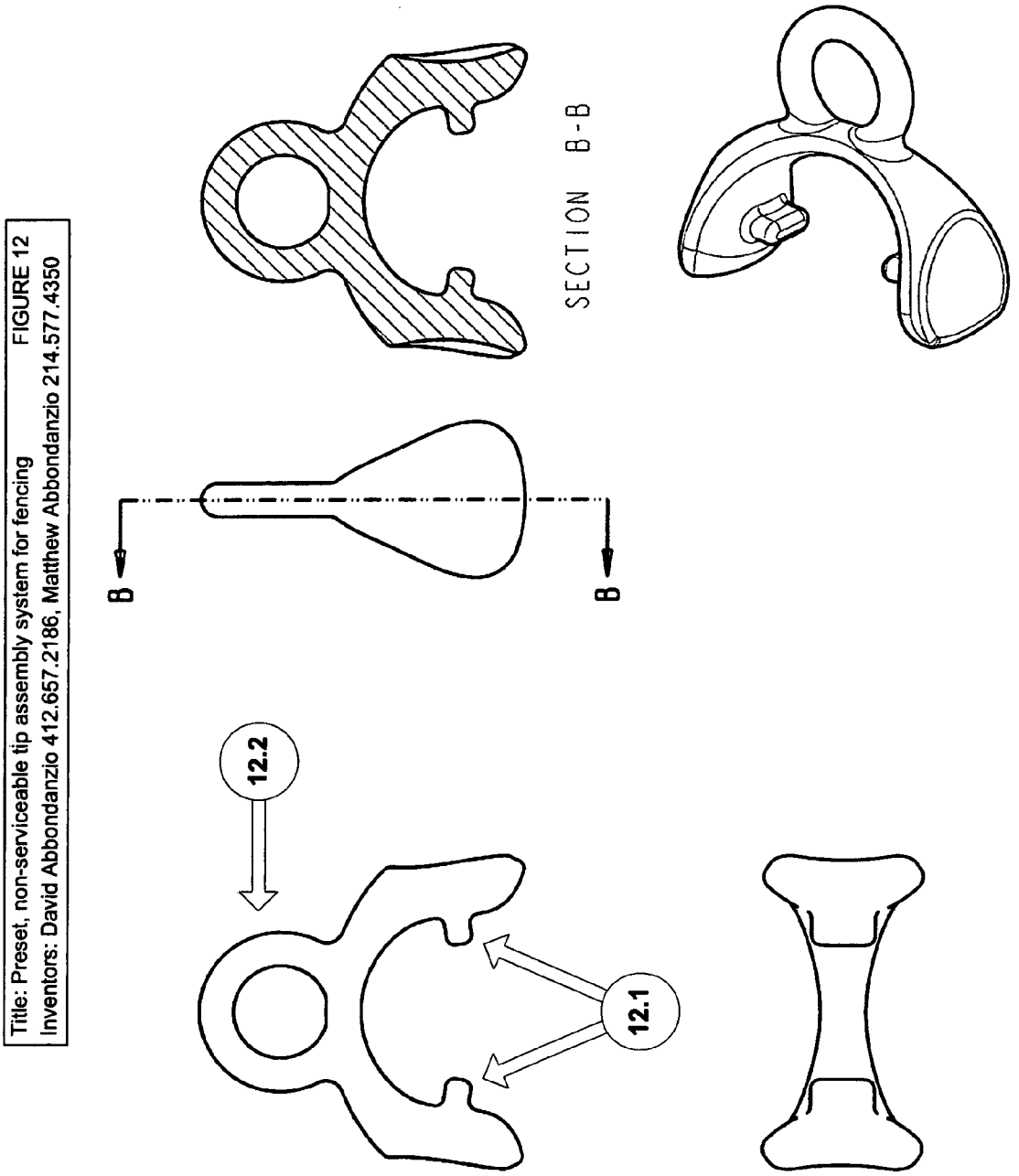

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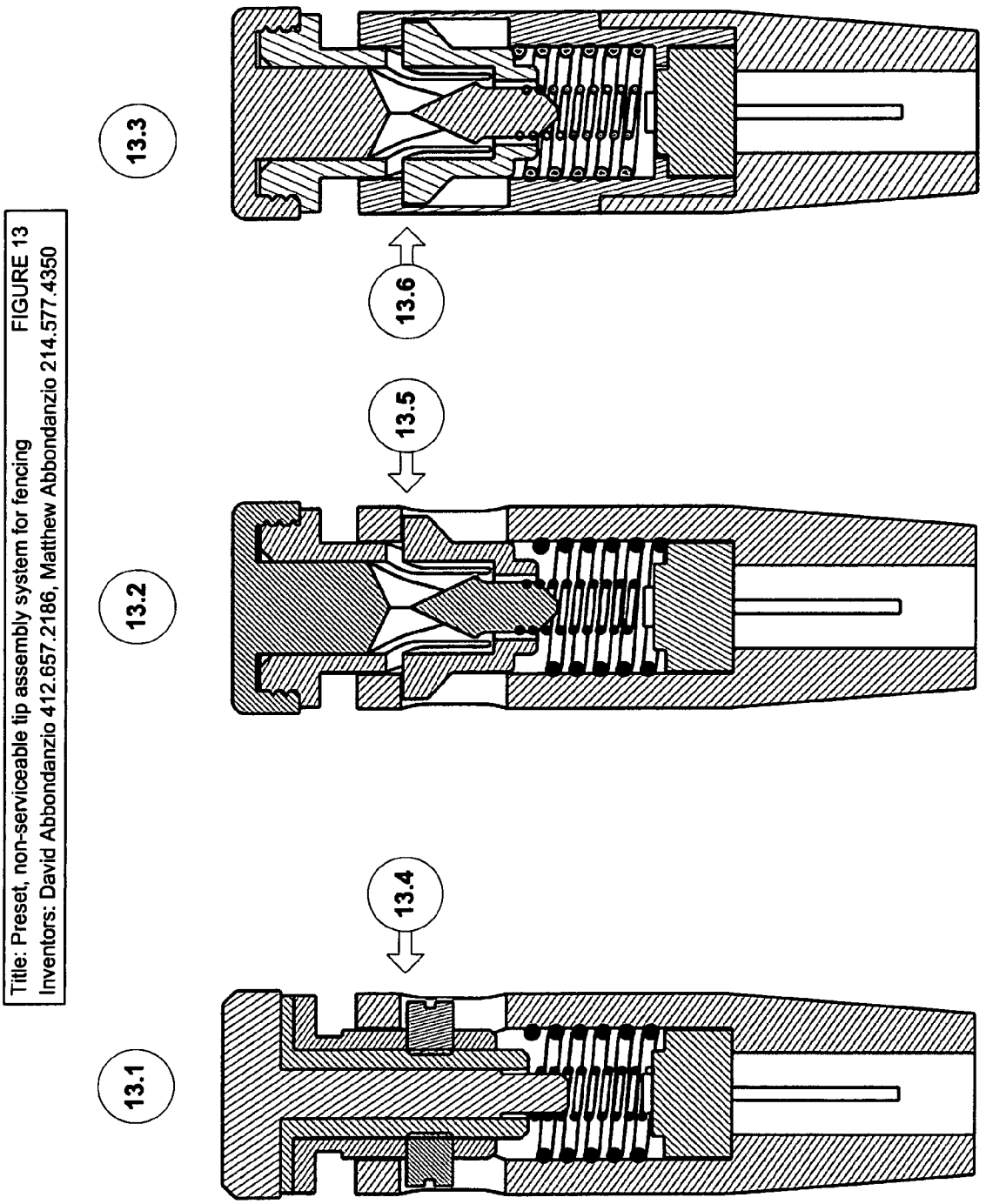
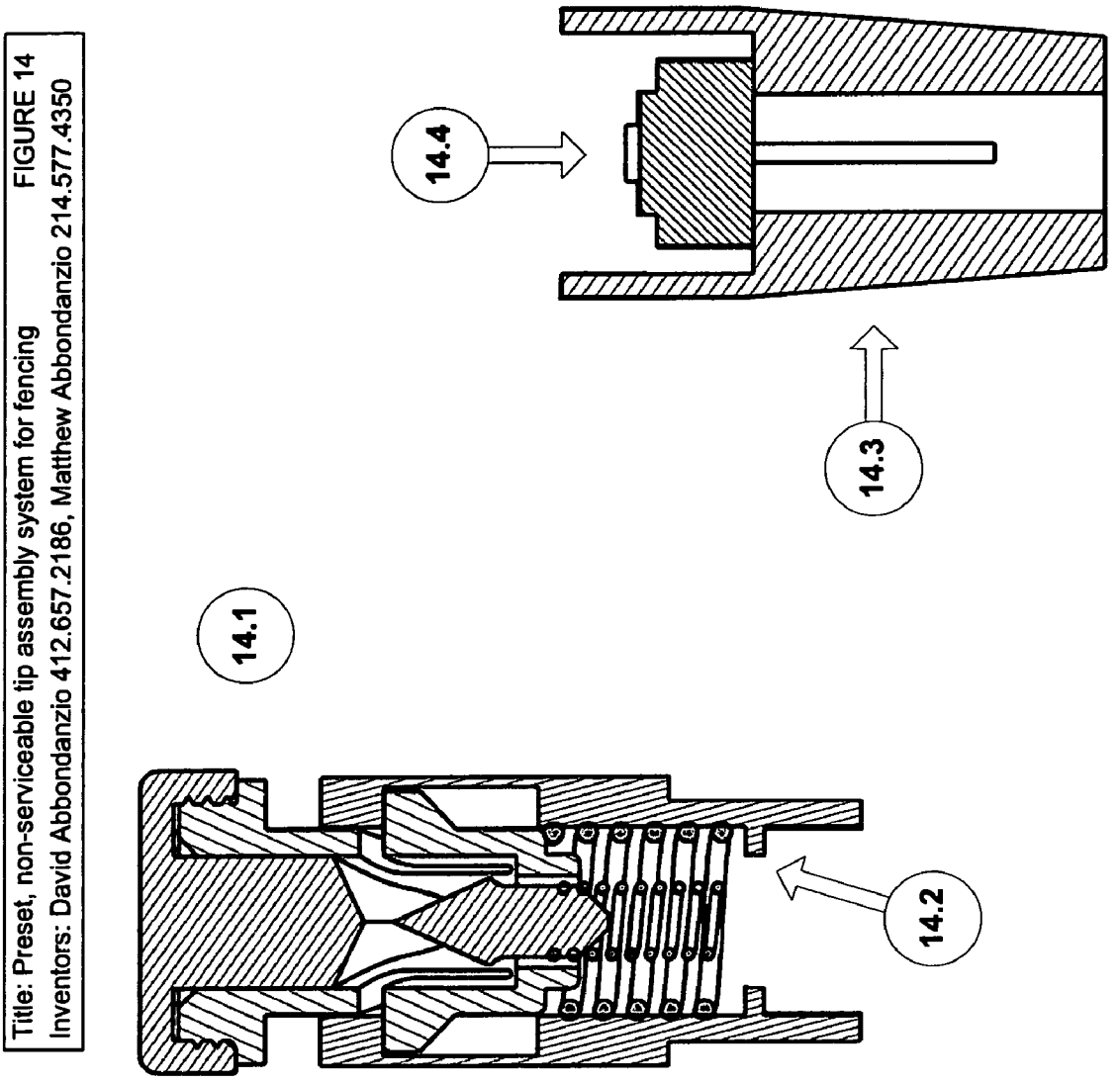
FIGURE 12
SECTION B-B
B
B
12.2
12.1



Title: Preset, non-serviceable tip assembly system for fencing FIGURE 13
Inventors: David Abbondanzio 412.657.2186, Matthew Abbondanzio 214.577.4350



Title: Preset, non-serviceable tip assembly system for fencing FIGURE 14
Inventors: David Abbondanzio 412.657.2186, Matthew Abbondanzio 214.577.4350

PRESET, NON-SERVICEABLE TIP ASSEMBLY SYSTEM FOR FENCING

[0001] This application claims benefit of our provisional application, No. 60/553,988 filed on Mar. 18, 2004.

BACKGROUND OF INVENTION

The Sport of Fencing

[0002] Fencing is a sport where two opponents face off and compete against one another using hand-held weapons or swords. Within the sport of fencing there are three distinct games defined by the type of sword or weapon used in the game. The three weapons, Foil (**FIG. 2.1**), Epee (**FIG. 2.2**) and Sabre (**FIG. 2.3**), differ physically and by how they are meant to be used in the sport and these differences along with rule sets specific to each weapon define the game.

Governing Bodies

[0003] The international sport of fencing is regulated by an organization called the Federation Internationale D'Escrime (FIE); a governing body based in Europe which sets forth rules by which the sport of fencing, all fencers and competitions must abide. In the United States there is a similar, but subordinate governing body which sets forth regulations for fencing in this country called the Unites States Fencing Association (USFA). The USFA, although independent of the FIE takes direction from the rules and regulations set forth by the FIE to aid in consistency in compliance in a global sense. Rules set forth by these organizations specify such aspects of the sport of fencing that include but are not limited to the physical size and shape of the equipment used in the sport, the material the equipment is comprised of, how points are awarded during a bout and much more.

Scoring a Valid Touché

[0004] During a bout (or single game between two fencers) points are scored by making contact between one competitor's weapon and his/her opponent's body. A valid contact by which a point is awarded to a fencer depends on several aspects of the game including but not limited to 1) how the contact is made 2) where the contact is made on the opponent's body. This valid area of potential contact (called "Valid Target Area") depends on which weapon is being used (or which game is being played). In the game of Sabre, a valid point (or touché) is scored when any part of the blade portion (**FIG. 2.3.4**) of the weapon comes in contact with the opponent's valid target area for this game. In the Foil and Epee games, the contact must occur in the appropriate valid target area for these games but must only be made by the small end (or point) (**FIG. 2.1.5**, **FIG. 2.2.5**) portion of the weapon in a "poking" manner.

The Scoring System

[0005] Today's currently produced fencing weapons incorporate electromechanical scoring mechanisms to aid in determining valid points or touchés and the overall winner of a bout. In the foil and epee, a push-button with extending wires is incorporated at the far end of the weapon (**FIG. 2.1.5**, **FIG. 2.2.5**). The wires, attached internally to the workings of the push-button, extend from the base of the button and run down the length of the blade to the bell guard (**FIG. 2.1.2**, **FIG. 2.2.2**) area of the weapon. These wires end at a socket receptacle (**FIG. 2.1.3**, **FIG. 2.2.3**) inside the bell guard which is connected through a series of interconnects (**FIG. 1.2**) to a scoring machine (**FIG. 1.3**) during a competition. The first of such interconnects called a "body cord" is a device comprised of connecting plugs and wires and is worn under the protective clothing of a fencer from the hand of the weapon arm, through the sleeve, down the inside of the jacket and then out behind the fencer. The end of the body cord which is exposed at the end of the sleeve of the weapon arm is connected to the socket in the bell guard area of the weapon while the other end of the body cord is attached to a cable that is then connected to a scoring machine. This scoring machine is responsible for helping to determine such things as valid and non-valid hits and the timing of the touchés (who hits who first). The indications the scoring machine provides in the form of lights and buzzers assist the Director (or referee) of the bout in determining the victor.

The Tip Assembly

[0006] With the point weapons, Foil and Epee, the push-button which is incorporated at the end of the weapon must be depressed against an opponent within the valid target area to score a valid touch. The push button at the end of the weapons is also referred to as a "tip assembly" (**FIG. 3**). These assemblies are comprised of a number of items including a barrel (**FIG. 3.2**) (a metallic or hard containment cylinder which houses all the following components); a contact cup (**FIG. 3.3**) (contact cup with metal contacts attached to wires extending down the length of the blade of the weapon and electrically connected to the body cord for score hit detection), a point (**FIG. 3.1**) (or button which travels axially within the barrel and which is the point of contact when scoring a touché), a compression spring (**FIG. 3.4**) (a traditional spring which provides resistance to scoring a touché), and two screws (**FIG. 3.6**) which retain the point and therefore other components within the barrel.

[0007] When the point of the tip assembly is fully depressed within the assembly the metal contacts of the contact cup (**FIG. 6.1**) are electrically "shorted" together by the base of the point (or by a smaller "contact"spring). These contacts are connected to the wires (**FIG. 6.2**) that carry the "sense" signal (of the point which is now depressed) to and from the electrical scoring system. Since the base of the point (which the contact spring is attached to) is electrically connected to the scoring surface of the point, the scoring system is able to sense when a hit lands on a valid or non-valid target area. Hits that land on non-valid target areas will not be registered as a valid touché by the scoring machine.

The Screws

[0008] To retain the point (and subsequently all other tip assembly components) inside the barrel, opposing screws are inserted through slots, holes or apertures in the sides of the barrel (**FIG. 3.6**) and threaded into the point. The screws, when properly fitted (**FIG. 13.4**), extend out into the slots, holes or apertures of the barrel and allow the point to travel axially but do not allow the point to be removed from the tip assembly. These screws must be present in the tip assembly at the beginning of a bout to avoid subsequent penalties. However, over time these screws wear, work loose and fall out.

[0009] The screws also enable the assembly to be serviced. Servicing the assembly may include but is not limited

to making adjustments to the compression spring or contact spring/mechanism. These adjustments allow fencers to alter their tip assembly to be more or less sensitive, resulting in weapons operating at differing specifications.

Compression Spring

[0010] The compression spring (**FIG. 7.1**) supplies resistance to depressing the point and establishes a preset amount of force necessary to score a valid touché. At the beginning of a bout, this tip assembly must support a specified amount of weight (750 g for Epee and 500 g for Foil) without triggering the scoring machine to sense a touché. However, over time this spring fatigues and falls out of compliance with the regulatory specification. Any fencer who presents a weapon that does not pass this test is subject to penalties.

Contact Spring (mechanism)

[0011] The contact mechanism (a conventional spring in the Epee) (**FIG. 7.2**) is used to set the amount of travel allowed before a valid touché can be scored. By threading this spring on or off of a post built into the point, the space between the end of the contact spring and the contacts in the contact cup can be enlarged or shortened. A larger space means the point must travel further within the barrel before striking the contacts and triggering a touché. This space between the contact mechanism and contact cup is measured at the beginning of each bout. If the weapon presented for testing does not pass the minimum spacing (shim test) requirement penalty points will be awarded.

Contact Cup

[0012] In common tip assemblies, the contact cup is seated within the barrel with the bottom of the barrel affixed beneath it (not shown). The wires from the contact cup extend down trough the bottom of the barrel and are typically glued into place in a trough of the blade. This configuration makes it impossible to remove the barrel from the blade without destroying or severing the wires which are glues below. When removing the barrel, a new contact cup and wire assembly must be purchased.

Penalties

[0013] At the beginning of each bout a fencer is required to present him/herself to the director. The director inspects various pieces of equipment for safety and regulatory compliance. Of the pieces of equipment, the director will devote a portion of time to the weapon the fencer will be using. This weapon must pass several visual and operational tests before the weapon is allowed on the piste (or fencing area).

[0014] One test is to visually inspect if the tip assembly contains the correct number of screws or fasteners in the barrel which will retain the point. If screws or fasteners are determined to be missing a penalty will be awarded.

[0015] The next two tests inspect the operation of the tip assembly. The first of these tests the compression spring for compliance while the second will test the contact spring (or mechanism) setting for the correct, minimal amount of spacing.

[0016] If a weapon fails any of the above tests a penalty will be awarded to the fencer's opponent. In the worst case where a weapon does not pass the initial tests and all subsequent weapons presented fail these tests, a fencer could potentially lose the bout on these technical fouls before competing.

SUMMARY OF THE INVENTION

[0017] The invention is a non-serviceable tip assembly system used in the weapon assembly of weapons or swords utilized in the sport of fencing which is preset to comply with all rules and regulations governing competitive specifications as set forth by the Federation Internationale d'Escrime (FIE) and United States Fencing Association (USFA) and is compatible with common fencing weapon assemblies. This system comprises components such as an adapter collar, a non-serviceable barrel and a self-locking point which may be incorporated into common tip assemblies.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] **FIG. 1**. is a system-level diagram of a typical fencing system where:

[0019] **1.1**. shows a weapon assembly

[0020] **1.2**. shows the body cord and other interconnects (as one line)

[0021] **1.3**. is the scoring machine

[0022] **FIG. 2**. is a multi-view drawing of the three weapon assemblies where:

[0023] **2.1**. is the Foil weapon assembly and

[0024] **2.1.1**. is the grip

[0025] **2.1.2**. is the bell guard

[0026] **2.1.3**. is the socket which is connected to the body cord

[0027] **2.1.4**. is the blade

[0028] **2.1.5**. is the tip assembly

[0029] **2.2**. is the Epee weapon assembly and

[0030] **2.2.1**. is the grip

[0031] **2.2.2**. is bell guard

[0032] **2.2.3**. is the socket which is connected to the body cord

[0033] **2.2.4**. is the blade

[0034] **2.2.5**. is the tip assembly

[0035] **2.3**. is the Sabre weapon assembly and

[0036] **2.3.1**. is the grip

[0037] **2.3.2**. is the bell guard

[0038] **2.3.3**. is the socket which is connected to the body cord

[0039] **2.3.4**. is the blade

[0040] **FIG. 3**. is a common tip assembly showing;

[0041] **3.1**. the point

[0042] **3.2**. the barrel

[0043] **3.3**. the contact cup with wires

[0044] **3.4**. the compression spring

[0045] **3.5**. the contact spring

[0046] **3.6**. the screws

[0047] **FIG. 4**. is a common point where:

[0048] **4.1**. is the scoring surface

[0049] **4.2**. is the contact mechanism mount

[0050] **4.3**. are the tapped holed for the screws

[0051] **FIG. 5**. is a common barrel where:

[0052] **5.1**. are the service apertures

[0053] **FIG. 6**. is the contact cup and wires assembly where:

[0054] **6.1**. are the contacts

[0055] **6.2**. are the wires

[0056] **FIG. 7**. is a multi-view drawing of the two springs in the system where:

[0057] **7.1**. is the compression spring

[0058] **7.2**. is the contact spring

[0059] **FIG. 8**. is a non-serviceable tip assembly where:

[0060] **8.1**. is a self-locking point

[0061] **8.2**. is a non-serviceable barrel

[0062] **8.3**. is the contact cup with wires

[0063] **8.4**. is the compression spring

[0064] **8.5**. is the contact spring

[0065] **8.6**. is an adaptor collar

[0066] **FIG. 9**. is a self-locking point where:

[0067] **9.1**. is the scoring surface

[0068] **9.2**. is the contact mechanism mount

[0069] **9.3**. is the locking mechanism

[0070] **9.4**. is an abutment surface

[0071] **FIG. 10**. is a non-serviceable barrel where:

[0072] **10.1**. is a sealed cylinder with no servicing apertures

[0073] **10.2**. is a spring retainer feature to retain the compression spring within the sub-assembly

[0074] **10.3**. is a locking mechanism for mating with the self-locking mechanism of the self-locking point

[0075] **10.4**. is where a locking mechanism for the adaptor collar would be which is NOT SHOWN

[0076] **FIG. 11**. is an adaptor collar where:

[0077] **11.1**. is the threads for mating with the threads of the blade

[0078] **11.2**. is where a locking mechanism for the barrel would be which is NOT SHOWN

[0079] **FIG. 12**. is a removal tool where:

[0080] **12.1**. are the unlocking features

[0081] **12.2**. is the attachment feature

[0082] **FIG. 13**. is a comparison of cross-sections of three different tip assembly configurations where:

[0083] **13.1**. is a cross-section of a common tip assembly configuration

[0084] **13.2**. is a cross-section of a self-locking point in a common barrel of a common tip assembly configuration

[0085] **13.3**. is a cross-section of a non-serviceable tip assembly configuration

[0086] **13.4**. shows the screws against the apertures in a common type assembly configuration

[0087] **13.5**. shows the self-locking features against apertures in a common type assembly configuration

[0088] **13.6**. shows the self-locking features against locking mechanism feature in non-serviceable barrel configuration

[0089] **FIG. 14**. is a cross-section view of anon-serviceable tip assembly and collar separated where:

[0090] **14.1**. is a non-serviceable tip assembly not assembled with the collar, but retaining the compression spring and all other internal components

[0091] **14.2**. is the spring retainer feature

[0092] **14.3**. is an adaptor collar

[0093] **14.4**. is the contact cup in the adaptor collar

DETAILED DESCRIPTION OF THE INVENTION

[0094] This non-serviceable tip assembly system comprises:

[0095] an adaptor collar for mounting the barrel to the blade of the weapon;

[0096] a non-serviceable fencing barrel which prohibits the servicing of the components contained within the assembly;

[0097] a fencing point with an integrated, self-locking mechanism; and

[0098] a tool used to remove the self-locking point from fencing barrels which are serviceable

[0099] The system is assembled as per **FIG. 8**.

[0100] The adaptor collar may be a hollow cylinder with integrated threads (**FIG. 11.1**) that mate with the threads found at the tip end of common blades. This adaptor collar threads onto the end of common blades where common barrels would thread onto the blade in a common tip assembly. This collar may incorporate an integrated feature (not shown) to affix and locate the contact cup within the area bounded by the collar at the end of the blade. The contacts in the contact cup are exposed from the top of the collar (**FIG. 14.4**) to the barrel which is affixed to the collar. A self-locking mechanism (not shown) affixes the barrel to the collar. It is appreciated that this self-locking mechanism may be integrated into the barrel, integrated into the collar, or integrated in part into both.

[0101] The non-serviceable barrel may be a hollow cylinder with radial surfaces sealed (**FIG. 10.1**) to prohibit

tampering or servicing of components within. The inner surface of the barrel incorporates a singular or plurality of features (**FIG. 10.3**) to act as a receptacle or receptacles for the self-locking mechanism integrated into the point. It is appreciated that these features could be similar to the apertures (**FIG. 5.1**) found in common barrels but sealed from the outside (not shown). It is also appreciated that this receptacle feature could be one continuous inner-circumferential recess (**FIG. 10.3**). Additionally, a feature (**FIG. 14.2**) is incorporated in the interior surfaces of the barrel which retains the compression spring within the barrel when the point is inserted. This feature will allow for the contacts of the contact cup to be exposed to the internal workings of the assembly while containing the compression spring.

[**0102**] The self-locking point is a fencing point which incorporates a self-locking mechanism. It is appreciated that this point must have a scoring surface (**FIG. 9.1**) which is electrically connected to the contact mechanism mount (**FIG. 9.2**). For example, one embodiment is that this connection comprises a single, electrically conductive part (**FIG. 9**) from scoring surface to contact mechanism mount. A second embodiment may comprise multiple components (not shown). It is also appreciated that the outer surface of the point and locking mechanism must be electrically isolated from the inner electrically conductive components. For example, one embodiment comprises a single, inner, electrically conductive component and an outer electrically insulating component. The outer component housing the self-locking mechanism would isolate the inner components from the barrel.

[**0103**] It is appreciated that the self-locking mechanism may consist of a single feature, multiple features or a system of components. For example one embodiment of this mechanism, would be comprised of a plurality of sufficiently large protrusions (**FIG. 9.3**) integrated into the outer component of the point and which are incorporated onto a flexible portion of the outer, non-conductive component (the sleeve) described above. During assembly these flexible components are deflected inward as the point is inserted into the barrel. The attached protrusions incorporate a surface (**FIG. 9.4**) which is non-parallel, nor perpendicular to that of the axis of symmetry of the device. This angled surface will wedge against the inner circumferential surface of the barrel and guide it inward towards the central axis of the device. By this manner of insertion described, the locking protrusions will be depressed into the device extending no further apart at their maximum radial distance than the inside diameter of the barrel in use.

[**0104**] Once the point is fully inserted into the barrel and the protrusions aligned with the slots in the barrel the protrusions extend back to their normal position to obstruct the point from being removed from the barrel. The locking protrusions must then be depressed externally by a device of another design to remove the point.

[**0105**] The self-locking point which is incorporated in this system may also be used in common tip assemblies. These tip assemblies are typically serviceable by means of apertures in the circumferential surfaces of the common barrel typically used to insert screws to retain the point. A tool described herein is used to remove the self-locking point from a common, serviceable barrel. This tool incorporates a plurality of features (**FIG. 12.1**) that fit into the apertures found in common barrels and will unlock the self-locking point. It is appreciated that there is needed a method of unlocking the self-locking point which is complimentary to the self-locking mechanism. For example, in one embodiment of the unlocking method, the features incorporated in the tool may be inserted into the apertures to depress the protrusions of the self-locking mechanism of the point inward and out of interference with the barrel to release the point from the barrel. It is also appreciated that this tool must flex, swivel or in any other manner be manipulated to enact the method of unlocking complimentary of the self-locking mechanism. For example, in one embodiment the tool may be constructed of one piece of flexible plastic that can be deformed between the thumb and forefinger, pressing the unlocking features into the apertures of the barrel. In another embodiment, the tool may be constructed of multiple components assembled together with a rivet, pin, hinge or other pivot point. This tool also comprises an attachment feature (**FIG. 12.2**) which may be used in attaching this device to a loop, hoop, lanyard or string. It is appreciated that this feature may be of either open or close construction and may be attached to any number of items.

We claim:

1. A preset, non-serviceable tip assembly system comprising:

a self-locking fencing point;

a non-serviceable fencing barrel;

an adaptor collar; and

a removal tool device.

2. The system from claim 1 wherein the said system is not user-serviceable to adjust internal settings.

3. The system from claim 1 wherein all internal adjustments are set to comply with the metrics set forth by the FIE and USFA.

4. A fencing point which includes a self-locking mechanism.

5. The point from claim 4 wherein the said self-locking mechanism is incorporated into the point.

6. The point from claim 4 wherein the said self-locking mechanism includes a singular or plurality of retractable, extendable or movable features or protrusions which facilitate the locking action.

7. The point from claim 4 wherein the said self-locking mechanism incorporates a surface which is neither parallel nor perpendicular to the major axis of symmetry of the tip assembly to aid in unlocking said locking features during assembly.

8. The point from claim 4 wherein the said point incorporates a singular or plurality of components to electrically connect the scoring surface of the point to a contact mechanism.

9. The point in claim 4 is compatible with common fencing barrels.

10. A non-serviceable barrel comprising:

a sealed cylinder;

a singular or plurality of integrated locking features or receptacles to retain a self-locking point;

a locking mechanism to affix the barrel to an adaptor collar; and

a singular or plurality of spring retaining features to retain a compression spring within the barrel.

11. A barrel from claim 10 wherein said cylinder is sealed to prohibit servicing the interior components contained within the tip assembly.

12. A barrel from claim 10 wherein said locking features are incorporated into the barrel.

13. A barrel from claim 10 wherein said locking mechanism is incorporated into the barrel.

14. A barrel from claim 10 wherein said spring retaining features are incorporated into the barrel.

15. An adaptor collar comprising:

a singular or plurality of retaining features to retain the contact cup in a fixed location;

a thread feature to affix the collar to the blade; and

a locking mechanism to affix a barrel to the adaptor collar.

16. A collar from claim 15 wherein said retaining features are integrated into the collar.

17. A collar from claim 15 wherein said thread feature is compatible with common blades.

18. A collar from claim 15 wherein said locking mechanism is incorporated into the adaptor collar.

19. A removal tool comprising:

a singular or plurality of unlocking features that aid in unlocking the self-locking mechanism of a self-locking point; and

a singular or plurality of attachment features that aid in affixing this tool to fasteners, lanyards or ropes.

20. The tool from claim 19 wherein the said unlocking features facilitate the unlocking action to unlock a self-locking point.

21. The tool from claim 19 wherein said attachment features may be open or closed.

22. The tool from claim 19 wherein said attachment features are used to affix to fasteners, locking or non-locking hooks, loops, lanyards, strings or ropes.

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