United States of America

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The Director

of the United States Patent and Trademark Office has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this United States

Patent

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Coke Morgan Stewart

Acting Director of the United States Patent and Trademark Office

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If the application for this patent was filed on or after June 8, 1995, the term of this patent begins on the date on which this patent issues and ends twenty years from the filing date of the application or, if the application contains a specific reference to an earlier filed application or applications under 35 U.S.C. 120, 121, 365(c), or 386(c), twenty years from the filing date of the earliest such application ("the twenty-year term"), subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b), and any extension as provided by 35 U.S.C. 154(b) or 156 or any disclaimer under 35 U.S.C. 253.

If this application was filed prior to June 8, 1995, the term of this patent begins on the date on which this patent issues and ends on the later of seventeen years from the date of the grant of this patent or the twenty-year term set forth above for patents resulting from applications filed on or after June 8, 1995, subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b) and any extension as provided by 35 U.S.C. 156 or any disclaimer under 35 U.S.C. 253.

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Midtlyng

(10) **Patent No.: US 12,304,256 B1**
(45) **Date of Patent: May 20, 2025**

(54) **AIR CHUCK WITH LEAK-PREVENTION AND SINGLE ROTARY ATTACHMENT FUNCTION**

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(72) Inventor: **Richard Midtlyng**, Robbinsdale, MN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **18/984,862**

(22) Filed: **Dec. 17, 2024**

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B60C 29/00 (2006.01)
F16K 15/20 (2006.01)
F16L 29/02 (2006.01)

(52) **U.S. Cl.**
CPC ***B60C 29/066*** (2013.01); ***B60C 29/002*** (2013.01); *F16K 15/20* (2013.01); *F16L 29/02* (2013.01); *Y10T 137/3724* (2015.04)

(58) **Field of Classification Search**
CPC F04B 33/005; F16K 15/20; F16L 29/02; Y10T 137/3724
USPC 141/38; 152/415; 251/149.4; 285/309
See application file for complete search history.

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Primary Examiner — Robert K Arundale
(74) *Attorney, Agent, or Firm* — Charles A. Lemaire; Lemaire Patent Law Firm, P.L.L.C.

(57) **ABSTRACT**

An air chuck for use with tire stems (or other air vessels) that use Schrader valves. In some embodiments, the air chuck has an outer threaded part that is rotated to urge a core with an O-ring to form a seal with the inner surface of the tire stem, preventing air leaks. The air chuck attaches via a single multi-turn rotary motion, which first creates the seal and then depresses the Schrader valve to allow air flow. This design offers improved air-pressure accuracy, simplicity, efficiency, ease of use, and reliability. Some embodiments further include a manually operable air valve and an air-pressure gauge operatively coupled to the air chuck.

20 Claims, 5 Drawing Sheets

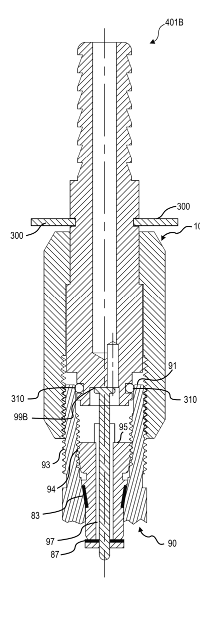

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FIG. 1A

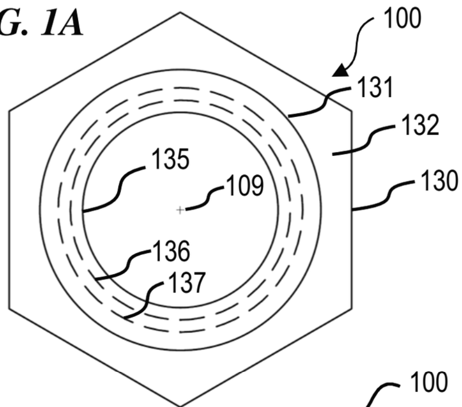


FIG. 1B

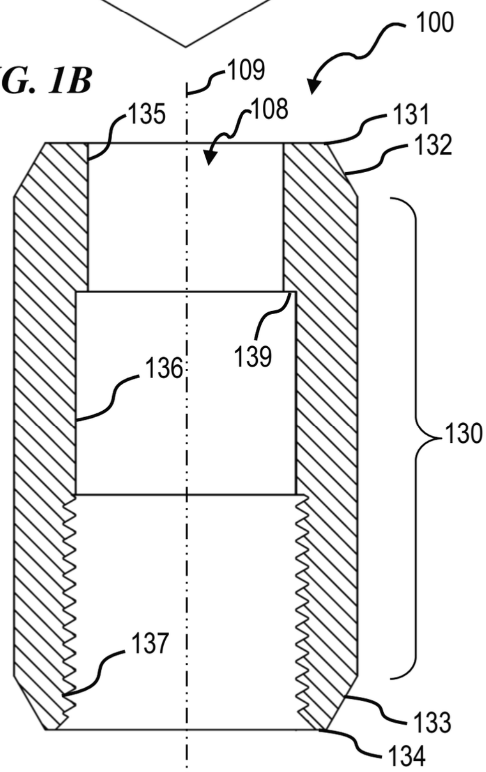


FIG. 1C

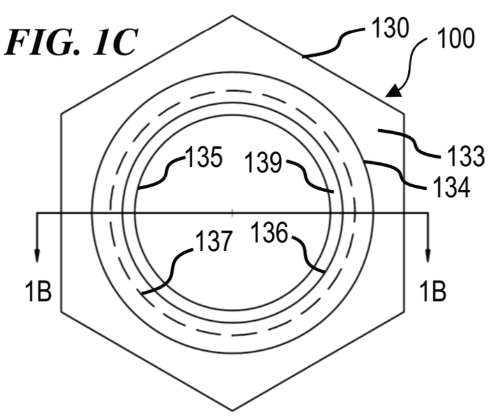


FIG. 2A

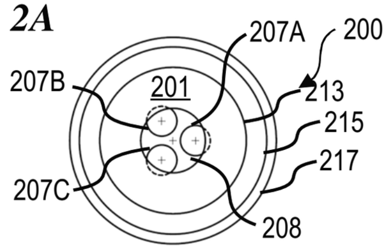


FIG. 2B

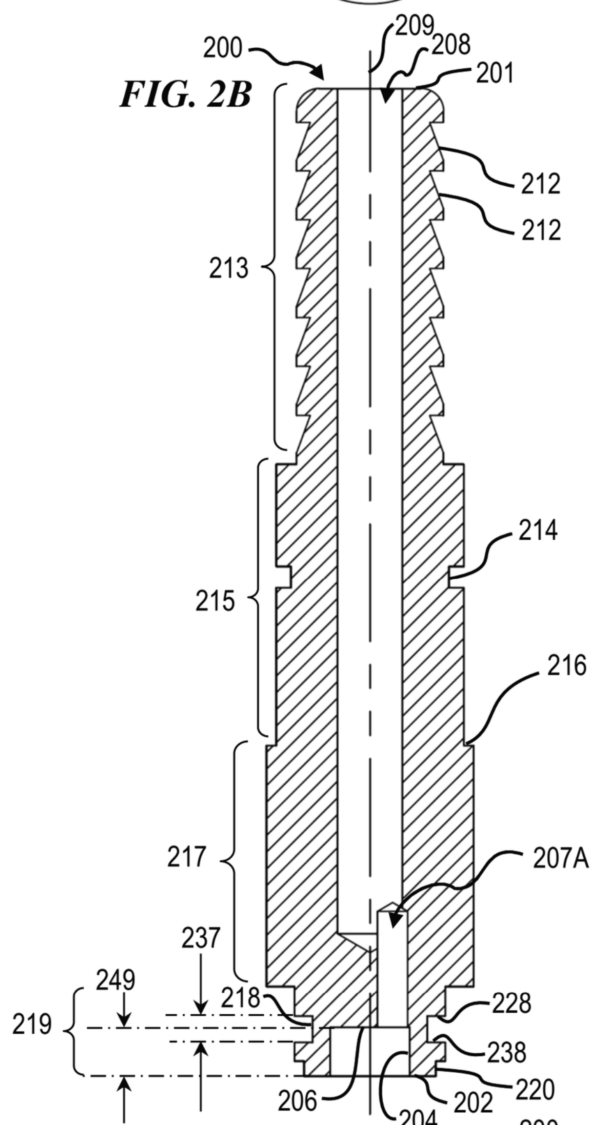


FIG. 2C

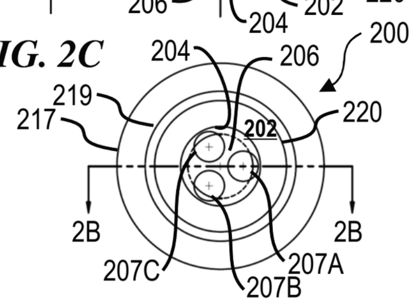


FIG. 3A

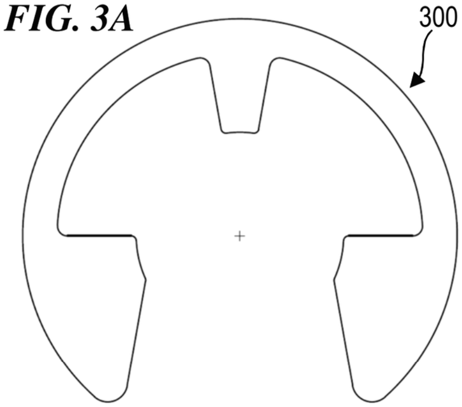


FIG. 3B

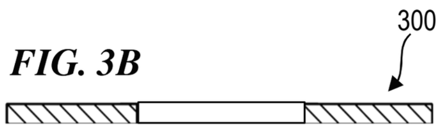


FIG. 3C

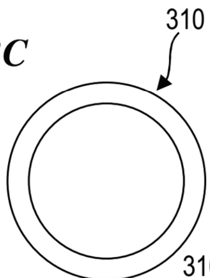


FIG. 3D

FIG. 4A

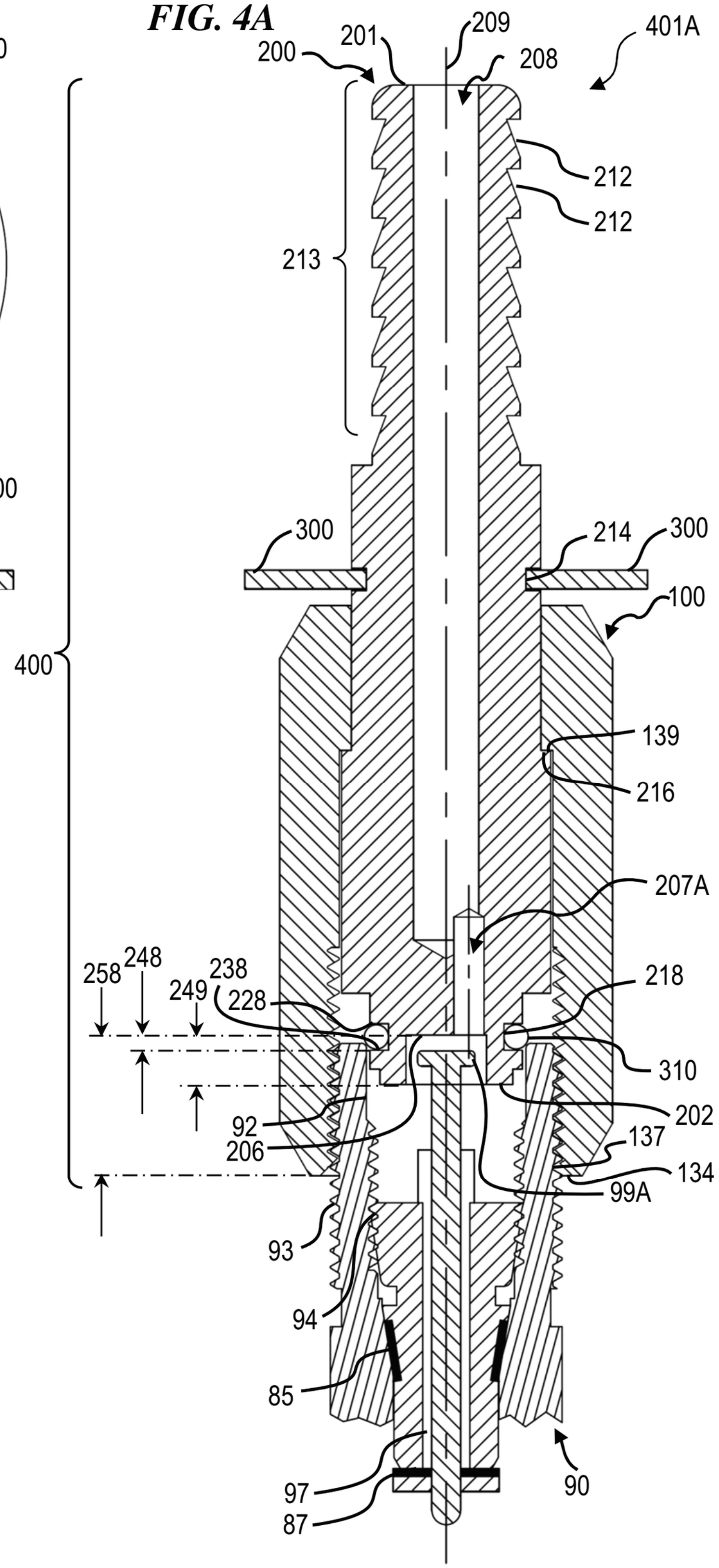


FIG. 3E

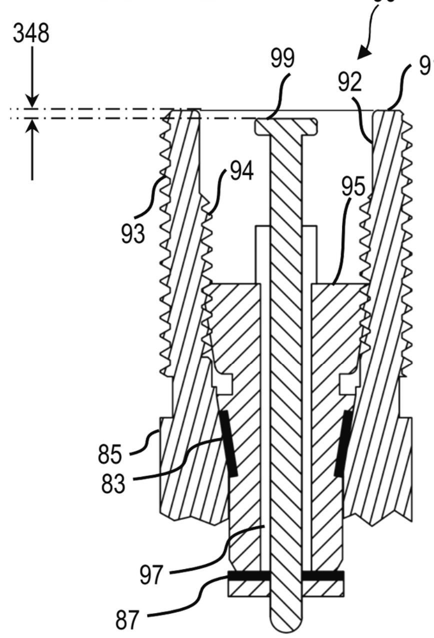


FIG. 3F

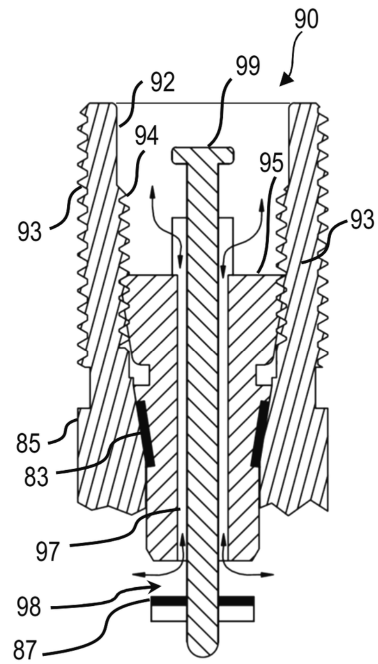


FIG. 4D

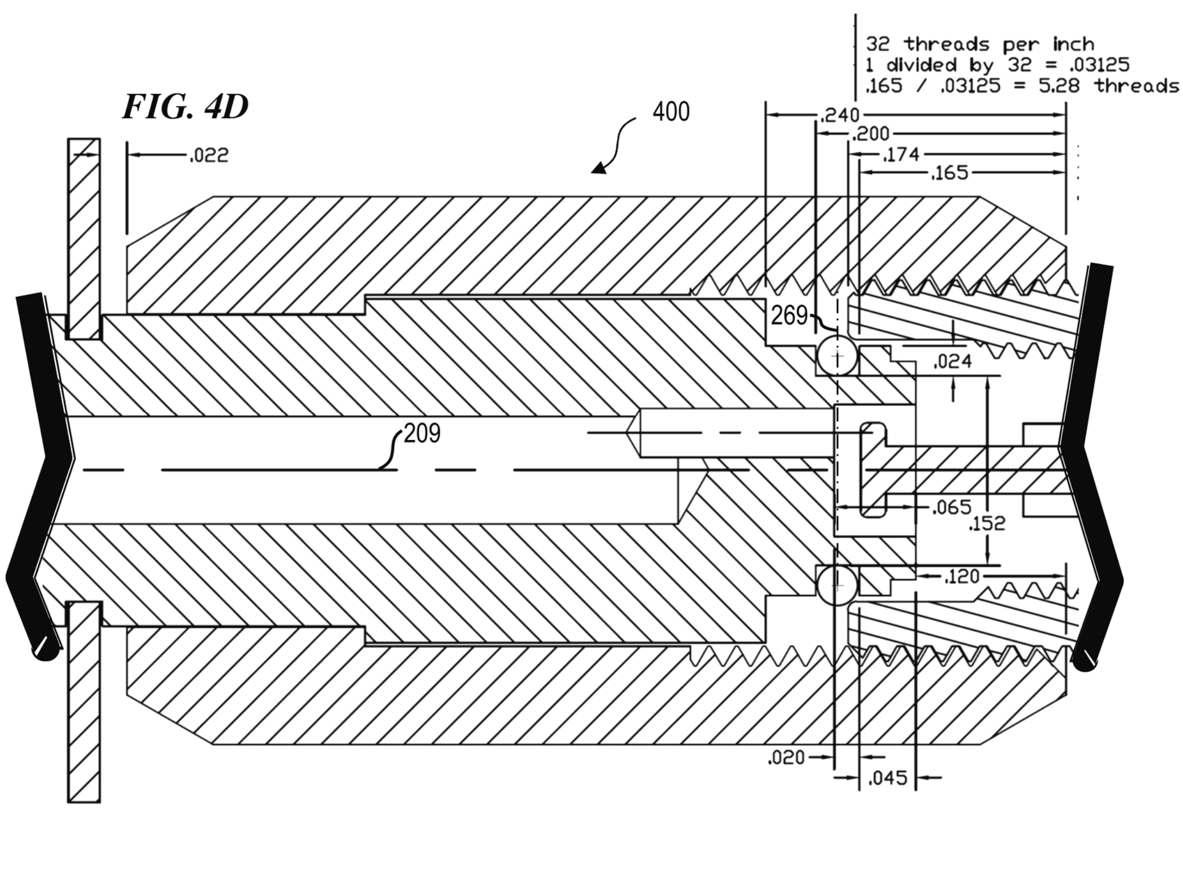


FIG. 4B

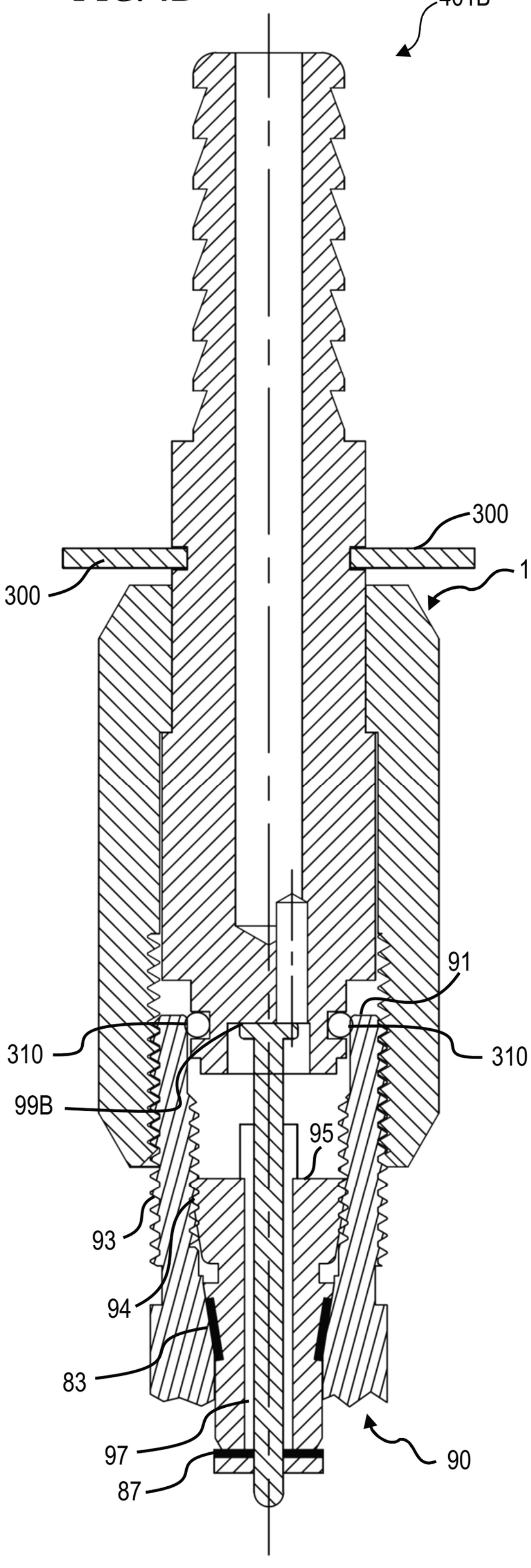

401B
300
300
100
310
310
91
99B
95
93
94
83
97
87
90

FIG. 4C

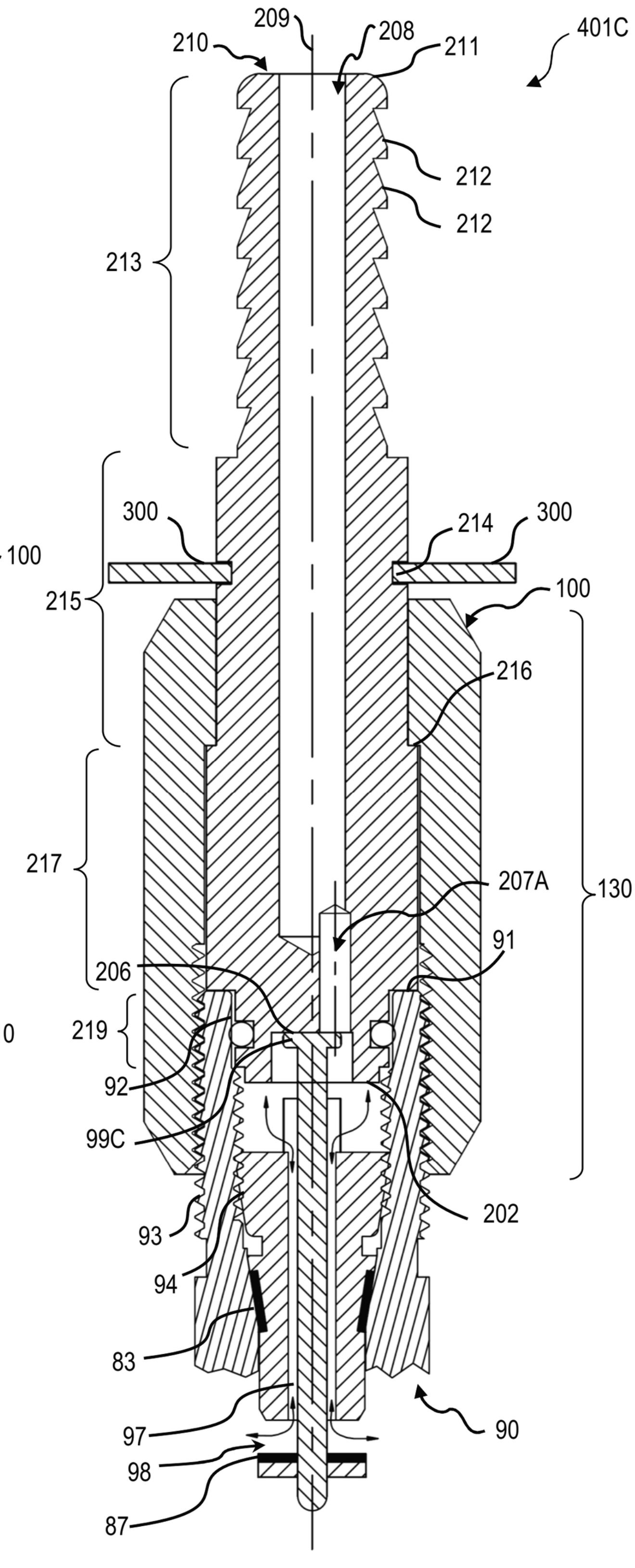

209
210
208
211
401C
212
212
213
300
214
300
215
100
216
217
207A
130
206
91
219
92
99C
202
93
94
83
97
98
87
90

FIG. 5A

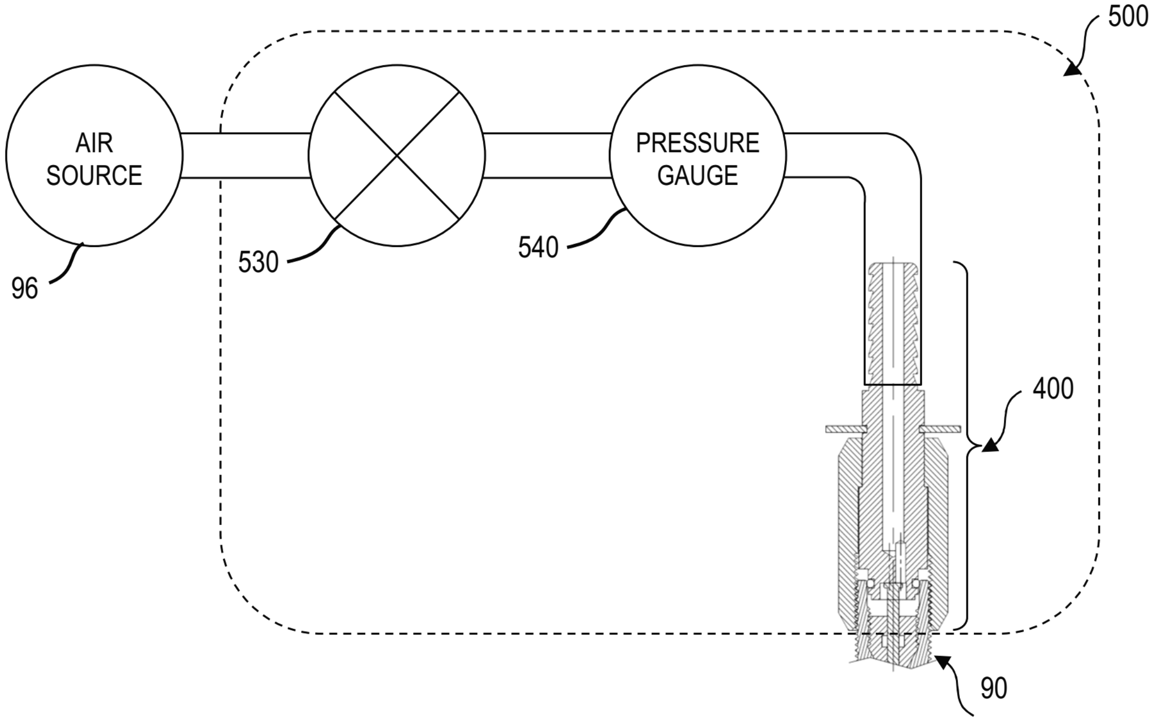


FIG. 5C

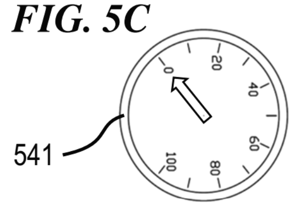
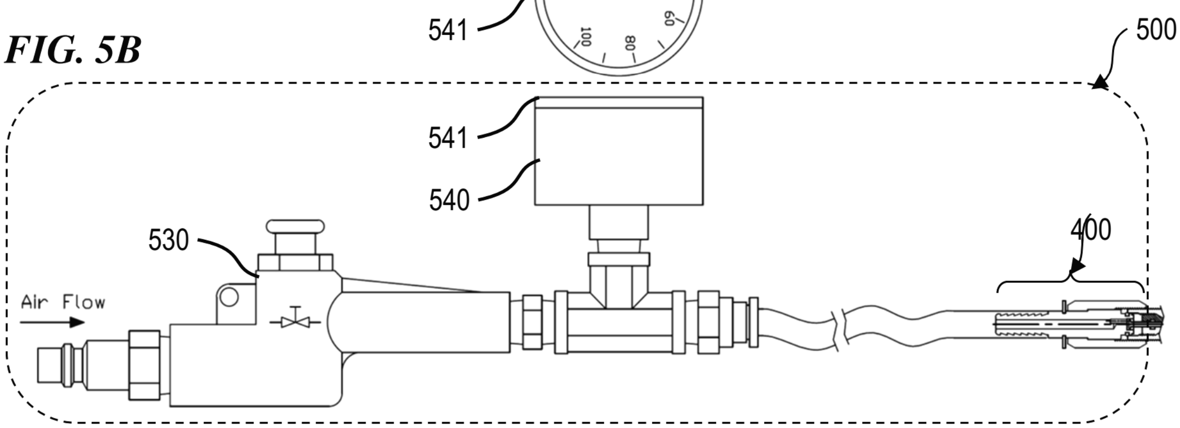


FIG. 5B



AIR CHUCK WITH LEAK-PREVENTION AND SINGLE ROTARY ATTACHMENT FUNCTION

CROSS-REFERENCE TO RELATED APPLICATION

This application is related to U.S. patent application Ser. No. 18/983,742, filed Dec. 17, 2024 by Richard Midtlyng and titled "Air chuck with leak-prevention and single rotary attachment function," which is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

The present invention relates to devices and methods for pneumatic attachment, and in particular to an air chuck designed for use with tire stems equipped with a Schrader valve, wherein the air chuck, when being attached, attaches with a single rotary motion that, upon multiple rotations successively engaging successive threads of the valve stem, first seals the pneumatic path in the air chuck to the tire stem and then, upon further rotations. opens the Schrader valve, and wherein the air chuck, when being removed, is removed with a single (multiple rotation) rotary motion that first allows the Schrader valve to close the pneumatic path from the tire stem, and then unseals the pneumatic path from the tire stem to the air chuck.

BACKGROUND OF THE INVENTION

Prior-art air chucks often suffer from air leaks during attachment and detachment to Schrader valves, reducing air-pressure measurement accuracy and filling efficiency, and causing inconvenience. Prior-art air chucks that have an internal rubber gasket that presses against the end of the tire stem can be difficult to press sufficiently to get a good seal and tend to leak air when connecting and when disconnecting. Some prior-art no-loss air chucks attempt to address this problem using two or more rotary mechanisms—for example, one rotary mechanism to attach such an air chuck to the threaded tire stem, and another rotary mechanism to open the Schrader valve. Other prior-art low-loss modular quick connector caps, such as part number MQC-F available from the Clippard company (e.g., www.clippard.com/part/MQC-F), have a protrusion, which is used to open a subject valve, that extends further than the distal end of the inside threads used to connect such modular quick connectors to the outer threads of a subject valve stem, and this arrangement and valve-opening protrusion prevents use of such modular quick connectors for low-loss or lossless connection (needed for accurate measurement of tire pressure) to the tire stems of tires of motor vehicles or many types of bicycles, due to the valve opening upon contact with the protrusion before a seal is possible.

As used herein, the term "Schrader valve" refers to, and is defined as, a pneumatic valve mechanism, within a tire stem, that is recessed (by distance **348** of FIG. **3**E) no more than 0.03 inches (0.76 mm), and typically about 0.01 inches (0.26 mm) from the distal end of the tire stem, and that valve is selectively opened and closed by moving a piston extending from a valve core towards the external distal end of the valve stem. According to wiki.com: "The Schrader valve (also called American valve) is a type of pneumatic tire valve used on virtually every motor vehicle in the world today. The Schrader company, for which [the Schrader valve] was named, was founded in 1844 by August Schrader. The original Schrader valve design was invented in 1891, and patented in the United States in 1893." August Schrader is listed as an inventor on U.S. Pat. No. 495,064, patented Apr. 11, 1893, and U.S. Pat. No. 505,486 patented Sep. 26, 1893, each of which is incorporated herein by reference.

The Schrader valve has since changed over time, and typically includes a valve core that is threaded into an interior channel in a valve stem (for tires, the valve stem is referred to as a tire stem). The valve core typically includes a spring-loaded poppet valve that is opened by pressing against a piston that extends through the exterior end of the core. Schrader valves are used on many types of bicycle tires as well as virtually every motor vehicle in the world today, as mentioned above.

SUMMARY OF THE INVENTION

The present invention provides an air chuck that prevents air leaks by incorporating an O-ring seal that interfaces with the inner surface of the tire stem. The air chuck attaches to the tire stem with a single rotary motion, ensuring a secure seal before opening the Schrader valve. This design simplifies operation and enhances reliability, making it suitable for use in automotive, bicycle, and other pneumatic applications.

Some embodiments provide an air-chuck system for use with a tire stem having a Schrader valve. This air-chuck system provides: an air chuck that includes: a twist-on cap; and a pneumatic seal-and-valve-actuator core held partially within the twist-on cap. In some embodiments, the twist-on cap has interior threads that engage outer threads of the tire stem to allow a user to easily attach the air chuck to the tire stem, seal the air pathway, and actuate opening of the Schrader valve with a single rotational motion of the twist-on cap, the pneumatic core includes an air passageway extending from an outer end to an inner end, a first portion of the pneumatic core includes a flexible, resilient seal positioned on the pneumatic core to seal against an inner circumference of the tire stem to form a seal of the air passageway to the tire stem, and the first portion is configured to be gradually urged into the tire stem as the twist-on cap is rotated relative to the tire stem to engage successive ones of the outer threads of the tire stem, such that upon rotation of the twist-on cap by a sufficient number of turns, the flexible, resilient seal seals to an inner circumference of the tire stem, and upon further rotation of the twist-on cap, the pneumatic core actuates the Schrader valve to open after the seal is established.

In some embodiments of the air-chuck system, the first portion of the pneumatic core includes an outer circumferential O-ring groove, wherein the flexible, resilient seal is an O-ring made of rubber or a similar elastomeric material that is positioned in the O-ring groove to seal between the first portion of the pneumatic core and an inner cylindrical surface of the tire stem, wherein the first portion of the pneumatic core includes a surface (in some embodiments, a flat surface, or, in other embodiments, the surface of a pin or protrusion), configured to engage and open the Schrader valve after the air passageway is sealed to the tire stem, wherein an outer portion of the pneumatic core includes a circumferential retainer-ring groove, and wherein the air chuck further includes a retainer ring that is positioned in the retainer-ring groove and configured to engage the retainer-ring groove to prevent dislodgement of the pneumatic core during operation.

BRIEF DESCRIPTION OF THE FIGURES

FIG. **1**A is a top-end view of twist-on cap **100**, according to some embodiments of the present invention.

FIG. **1**B is a longitudinal cross-section view of twist-on cap **100**, according to some embodiments of the present invention.

FIG. **1**C is a bottom-end view of twist-on cap **100**, according to some embodiments of the present invention.

FIG. **2**A is a top-end view of pneumatic seal-and-valve-actuator core **200**, according to some embodiments of the present invention.

FIG. **2**B is a longitudinal cross-section view of pneumatic seal-and-valve-actuator core **200**, according to some embodiments of the present invention.

FIG. **2**C is a bottom-end view of pneumatic seal-and-valve-actuator core **200**, according to some embodiments of the present invention.

FIG. **3**A is a top-end view of retainer clip **300**, according to some embodiments of the present invention.

FIG. **3**B is a longitudinal cross-section view of retainer clip **300**, according to some embodiments of the present invention.

FIG. **3**C is a top-end view of O-ring **310**, according to some embodiments of the present invention.

FIG. **3**D is a longitudinal cross-section view of O-ring **310**, according to some embodiments of the present invention.

FIG. **3**E is a schematic longitudinal cross-section view of tire stem **90** with piston **99** not depressed, according to some embodiments of the present invention.

FIG. **3**F is a schematic longitudinal cross-section view of tire stem **90** with piston **99** depressed, according to some embodiments of the present invention.

FIG. **4**A is a longitudinal cross-section view of air chuck **400** with leak-prevention and single rotary attachment function, shown in a first position **401**A, according to some embodiments of the present invention.

FIG. **4**B is a longitudinal cross-section view of air chuck **400**, shown in a second position **401**B, according to some embodiments of the present invention.

FIG. **4**C is a longitudinal cross-section view of air chuck **400**, shown in a third position **401**C, according to some embodiments of the present invention.

FIG. **4**D is a longitudinal cross-section view of a portion of air chuck **400**, to illustrate certain dimensions and distances, according to some embodiments of the present invention.

FIG. **5**A is a schematic block diagram of an air chuck system **500** with inflator valve and pressure gauge with leak-prevention and single rotary attachment function, according to some embodiments of the present invention.

FIG. **5**B is a side view of air chuck system **500** that includes a longitudinal cross-section view of air chuck **400**, according to some embodiments of the present invention.

FIG. **5**C is a top view of an analog air gauge display **541**, according to some embodiments of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Although the following detailed description contains many specifics for the purpose of illustration, a person of ordinary skill in the art will appreciate that many variations and alterations to the following details are within the scope of the invention. Specific examples are used to illustrate particular embodiments; however, the invention described in the claims is not intended to be limited to only these examples, but rather includes the full scope of the attached claims. Accordingly, the following preferred embodiments of the invention are set forth without any loss of generality to, and without imposing limitations upon the claimed invention. Further, in the following detailed description of the preferred embodiments, reference is made to the accompanying drawings that form a part hereof, and in which are shown by way of illustration specific embodiments in which the invention may be practiced. It is understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

It is specifically contemplated that the present invention includes embodiments having combinations and subcombinations of the various embodiments and features that are individually described herein (i.e., rather than listing every combinatorial of the elements, this specification includes descriptions of representative embodiments and contemplates embodiments that include some of the features from one embodiment combined with some of the features of another embodiment, including embodiments that include some of the features from one embodiment combined with some of the features of embodiments described in the patents and application publications incorporated by reference in the present application). Further, some embodiments include fewer than all the components described as part of any one of the embodiments described herein.

The leading digit(s) of reference numbers appearing in the Figures generally corresponds to the Figure number in which that component is first introduced, such that the same reference number is used throughout to refer to an identical component which appears in multiple Figures. Signals and connections may be referred to by the same reference number or label, and the actual meaning will be clear from its use in the context of the description.

Components of air chuck **400**:

a. Twist-on cap **100**: a threaded connector, also called a rotary attachment mechanism, that engages the outer threads of the tire stem to allow the user to easily attach the air chuck to a valve stem **90** (when valve stem **90** is attached to a tire, it is referred to as tire stem **90**) with a single (multiple rotation) rotational motion.

b. Pneumatic seal-and-valve-actuator core **200**, that is gradually urged against the tire stem as the twist-on cap **100** successively engages the outer threads of the tire stem, and that seals the air passageway, a portion of which is channel **208**, between an air source **96** and the tire stem, then actuates the Schrader valve of core **95** to open after the seal is established; pneumatic seal-and-valve-actuator core **200** is the main body of the air chuck and is made of durable material such as brass, polymer or aluminum, designed to withstand high pressures. Pneumatic seal-and-valve-actuator core **200** includes:

   i. O-ring groove **218**: a seat that retains O-ring **310** and that forms part of the seal.

   ii. Valve actuator **206**: A surface portion or pin recessed in pneumatic core **200** further in than the distal edge of O-ring groove **218** such that the O-ring seal is sealed before the valve actuator surface **206** reaches the valve piston, and recessed well within the distal end of twist-on cap **100** of air chuck **400** that opens the Schrader valve after the pneumatic passageway is sealed.

   iii. Air passageway **208**: A pneumatic conduit within the pneumatic core **200** that allows air to flow from the connected air source to the tire stem once the Schrader valve is opened.

   iv. Retainer-ring groove **214**.

c. Retainer clip **300**.

d. O-ring **310**: A flexible, resilient seal positioned at the junction between pneumatic core **200** and inner circumference of tire stem **90**. In some embodiments, O-ring **310** is made of rubber or similar elastomeric material and is seated in a dedicated groove **218** of pneumatic core **200** inside twist-on cap **100**. In some embodiments, groove **218** is 0.035" wide (width **237** in FIG. **2**B) from its top wall **228** (i.e., the proximal wall relative to the first end **201** pneumatic core **200**) to its bottom wall **238**, and the inner diameter of grove **218** is 0.152" and the cross-section thickness of the O-ring is 0.032", so the depth of groove is 0.024" so that the O-ring **310** protrudes radially. In some embodiments, valve actuator surface **206** is recessed into pneumatic seal-and-valve-actuator core **200** further than the bottom wall **238**.

Operation:

a. The user aligns the air chuck **400** with the tire stem **90** and rotates the twist-on cap **100**, engaging the rotary mechanism of twist-on cap **100** (e.g., interior threads **137**) with the outer threads of tire stem **90**.

b. As the twist-on cap **100** advances on threads of the tire stem, the O-ring **310** compresses against the inner surface of the tire stem **90**, creating an airtight seal.

c. Continued rotation brings the valve actuator **306** into contact with the Schrader valve piston **99**, depressing Schrader valve piston **99** to open the Schrader valve **95** to allow air flow.

d. To detach, the user rotates the twist-on cap **100** in the opposite direction, retracting the valve actuator **206** before breaking the seal, preventing sudden air loss.

Advantages:

a. Accuracy: The air-pressure measurement reflects the end pressure in the tire, since the air passageway from the tire stem to a connected air gauge remains sealed until disengagement of the air chuck **400** has first closed the Schrader valve in the tire stem.

b. Leak Prevention: The O-ring ensures a tight seal, minimizing air leakage during attachment and detachment.

c. Ease of Use: The single rotary motion simplifies the process, reducing the time and effort required.

d. Compatibility: The design is compatible with standard Schrader valves, making it versatile and widely applicable.

e. Durability: The use of robust materials ensures long-term reliability and resistance to wear.

FIG. **1**A is a top-end view of twist-on cap **100**, according to some embodiments of the present invention. In some embodiments, for example, twist-on cap **100** has a hexagonal external cross section shape **130**, a chamfered top conical surface **132** that extends up to top flat surface **131** that provides a bearing surface for pushing against retainer clip **300** during disengagement of the air chuck (see FIG. **4**A). In other embodiments, the external shape of twist-on cap **100** has other suitable profiles, such as a knurled, generally cylindrical profile, a winged profile with two relatively large metal "wings," one on each side, such as are commonly used for wing nuts (also called butterfly nuts), or other suitable shape to facilitate manual rotation connection of twist-on cap **100** to a complementary tire stem **99**. Note that pneumatic seal-and-valve-actuator core **200** is rotatably retained in place in twist-on cap **100** by retainer clip **300** (see FIG. **3**A) on the outside, and by interior ledge **139** (see FIG. **1**B) of twist-on cap **100** that rests against outer ledge **216** (see FIG. **2**B) of pneumatic seal-and-valve-actuator core **200** (see FIG. **2**A). The remaining reference numbers are described below.

FIG. **1**B is a longitudinal cross-section view of twist-on cap **100**, according to some embodiments of the present invention. In some embodiments, twist-on cap **100** includes a central channel **108** having a smaller-diameter first cylindrical inner wall **135** and slightly larger-diameter second cylindrical inner wall **136** both centered on center longitudinal axis **109**, with a planar ledge **139** at the junction between first cylindrical inner wall **135** and second cylindrical inner wall **136**. The lower portion of central channel **108** between top surface **131** and bottom surface **134** (note that central channel **108** is isolated from air passageway **208** once the seal is established between pneumatic seal-and-valve-actuator core **200** and tire stem **90**) is threaded with inside threads **137** that match corresponding outer threads **93** of a tire stem **90** such as shown in FIGS. **3**E-**3**F and **4**A-**4**C. FIG. **1**C shows the location of cutline **1**B for the cross section of FIG. **1**B.

FIG. **1**C is a bottom-end view of twist-on cap **100**, according to some embodiments of the present invention. This view shows the bottom of planar ledge **139** at the junction between first cylindrical inner wall **135** and second cylindrical inner wall **136**, and a dashed line indicating the outermost depth of threads **137** (in some embodiments, the innermost edge of threads **137** is the same as the diameter of cylindrical inner wall **136**). This view also shows the bottom end surface **134** and the conical chamfer **133** that goes from hex outer surface **130** to bottom end surface **134**.

FIG. **2**A is a top-end view of pneumatic seal-and-valve-actuator core **200**, according to some embodiments of the present invention. In some embodiments, though-hole channel **208** is drilled or otherwise formed centered on center longitudinal axis **209** through most of the length between top-end surface **201** and bottom-end surface **202** (see FIG. **2**B), with one or more smaller holes (e.g., **207**A, **207**B and **207**C) through the remaining length between top-end surface **201** and bottom-end surface **202**, completing the air passageway through pneumatic core **200**. The outer circumferences of barbed air-hose attachment section **213**, first cylindrical section **215** and larger second cylindrical section **217** are shown.

FIG. **2**B is a longitudinal cross-section view of pneumatic seal-and-valve-actuator core **200**, according to some embodiments of the present invention. In some embodiments, pneumatic seal-and-valve-actuator core **200** includes a barbed air-hose attachment section **213** that includes a plurality of barbs **212**, each having a conical top surface and flat bottom surface to facilitate one-way attachment of an air hose, as is well known in the art. In some embodiments, first cylindrical section **215** is sized to fit into, and easily rotate in first cylindrical inner wall **135** of twist-on cap **100**, second cylindrical section **217** is sized to fit into, and easily rotate in second cylindrical inner wall **136** of twist-on cap **100**, with ledge **139** of twist-on cap **100** pressing against, and rotating relative to, ledge **216** as twist-on cap **100** is rotated and screwed onto a tire stem **90**. In some embodiments, circumferential groove **214** (in some embodiments, a cylindrical groove) in first cylindrical section **215** receives and retains a retaining clip **300** (e.g., an "E-clip" or other suitably shaped retaining device). In some embodiments, circumferential groove **218** (in some embodiments, a cylindrical groove) in third cylindrical section **219** receives and retains a flexible, resilient seal such as an O-ring **310**). FIG. **2**C shows the location of cutline **2**B for the cross section of FIG. **2**B, which indicates that one of the one or more spaced-apart bottom-drilled or otherwise formed holes (e.g., hole **207**A in FIG. **2**B) extends an air passageway from the bottom cylindrical depression having wall **204** through to top-drilled or otherwise formed hole **208**. Surface **206**, through which the spaced-apart one or more bottom-drilled or otherwise formed holes (e.g., hole **207**A) are made, provides the actuating surface that presses against the piston **99** of the Schrader valve in tire stem **90**. Cylindrical section **219** is sized to fit within the cylindrical top opening **92** in tire stem **90** such that O-ring **310** forms a seal between cylindrical top opening **92** and groove **218**. In some embodiments, in order to avoid pressing against the inner threads **94** of tire stem **90**, a small cylindrical section **220** is formed next to bottom surface **202**, or in other embodiments (not shown), that bottom portion is conically chamfered. In some embodiments, groove **218** is 0.035" wide (width **237**) from its top wall **228** to its bottom wall **238**, and the inner diameter of grove **218** is 0.152" and the cross-section thickness of the O-ring is 0.032", and the depth of groove is 0.024" so that the O-ring **310** protrudes radially. In some embodiments, valve actuator surface **206** is recessed by a distance **249** from, or relative to, bottom end **202** of pneumatic seal-and-valve-actuator core **200** further than the bottom wall **238**. In some embodiments, when ledge **139** is urged against ledge **216**, the recessed depth (distance **258**) of surface **206** inside the bottom **134** of the inside threads **137** of twist-on cap **100** is approximately 180" such that at least three threads, and typically about five to seven threads of a typical tire stem having 32 threads-per-inch (TPI, not necessarily shown to scale in the Figures), are engaged before actuator surface **206** comes into contact with piston **99**. In some embodiments, actuator surface **206** is recessed by a distance **248** (e.g., in some embodiments, the distance (vertical distance in the Figure) from actuator surface **206** to O-ring groove bottom wall **238** is about 0.018"), actuator surface **206** is further from bottom end **202** of pneumatic seal-and-valve-actuator core **200** than is O-ring-groove bottom wall **238**, which in some embodiments, distance **248** is about 0.045".

FIG. **2**C is a bottom-end view of pneumatic seal-and-valve-actuator core **200**, according to some embodiments of the present invention. This view shows the outer diameters of cylindrical section **217**, cylindrical section **219**, cylindrical section **220**, the cylindrical wall **204**, the three spaced-apart holes **207**A, **207**B and **207**C of this embodiment, that leaves surface **206** used to actuate the Schrader valve in tire stem **90** once the air passageway is sealed.

FIG. **3**A is a top-end view of retainer clip **300**, according to some embodiments of the present invention. In some embodiments, for example, an E-shaped retainer ("E-clip"), as shown here, is used for retainer clip **300**. In other embodiments, any of a number of suitable retainer clip shapes are used.

FIG. **3**B is a longitudinal cross-section view of retainer clip **300**, according to some embodiments of the present invention.

FIG. **3**C is a top-end view of O-ring **310** used for the flexible, resilient seal between pneumatic seal-and-valve-actuator core **200** and the tire stem **90**, according to some embodiments of the present invention. In some embodiments, the flexible, resilient seal is a toroid-shaped O-ring **310** is used. In other embodiments, other shapes or types of flexible, resilient seal are used for the air-passageway-sealing function of the present invention.

FIG. **3**D is a longitudinal cross-section view of O-ring **310**, according to some embodiments of the present invention.

FIG. **3**E is a schematic longitudinal cross-section view of tire stem **90**, according to some embodiments of the present invention. This view shows tire stem **90** with piston **99** (for the pneumatic valve mechanism, within tire stem **90**, that is recessed by distance **348** that is no more than 0.03 inches (0.76 mm), and typically about 0.01 inches (0.26 mm) from the distal end **91** of the tire stem **90**) and its bottom seal **87** (which are a movable portion of valve insert, or core, **95**, and which together with piston **99** and bottom seal **87** form a Schrader valve) in a not-depressed position (which would leave the valve closed to air). In some embodiments, tire stem **90** has exterior threads **93**, interior threads **94** that are recessed relative to top surface **91** by a cylindrical inner wall **92** having a larger diameter that the inner diameter of interior threads **94**. Resilient gasket **83** seals the valve core **95** to valve-stem housing **85**. In some embodiments, cylindrical wall **92** provides a sliding surface against which O-ring **310** seals.

FIG. **3**F is a schematic longitudinal cross-section view of tire stem **90** with piston **99** depressed, according to some embodiments of the present invention. This view shows tire stem **90** with piston **99 99** and its bottom seal **89** in a depressed position (which leave the valve space **98** open to air flow).

FIG. **4**A is a longitudinal cross-section view of air chuck **400** with leak-prevention and single rotary attachment, sealing and actuation function, shown in a first arrangement or position **401**A, according to some embodiments of the present invention. What is meant by "single rotary attachment, sealing and valve-actuation function" is that rotation of twist-on cap, upon multiple rotations successively engaging successive threads of the valve stem, then seals the pneumatic path in the air chuck **400** to the valve stem **90** and then, upon further rotations. opens the Schrader valve, and wherein the air chuck **400**, when being removed, is removed with a single (multiple rotation) rotary motion that first allows the Schrader valve to close the pneumatic path from the valve stem **90**, and then unseals the pneumatic path from the tire stem to the air chuck **400**. In first arrangement **401**A, twist-on cap **100** has been twisted onto several of the exterior threads **93** of tire stem **90**, but piston **99** has not yet been contacted by actuator surface **206** of pneumatic seal-and-valve-actuator core **200**. This extended position **99**A (extended in the upward direction in this Figure) of piston **99** means that the Schrader valve of tire stem **90** is still closed. In some embodiments, the tip of cylindrical inner wall **92** has just started to touch O-ring **310**.

Note that, in some embodiments, air chuck **400** (see FIGS. **4**A-**4**C) is assembled by placing O-ring **310** into groove **218**, then pneumatic seal-and-valve-actuator core **200** is inserted through central channel **108** of twist-on cap **100** from the bottom, and the E-clip **300** is installed in groove **214** such that pneumatic core **200** is held by ridge **216** against ridge **139** of twist-on cap **100** on the lower end of first cylindrical section **215**, and by retaining ring **300** against top surface **131** at the top of twist-on cap **100**. Note that, while cylindrical walls **135** and **136** of twist-on cap **100** are sized to easily rotate around pneumatic core **200**, there is no requirement for these interfaces to be air tight since the seal for the air passageway is formed by O-ring **310**.

FIG. **4**B is a longitudinal cross-section view of air chuck **400**, shown in a second arrangement or position **401**B, according to some embodiments of the present invention. In second arrangement **401**B, twist-on cap **100** has been twisted a few more full rotations (each such full rotation advances twist-on cap **100** one more thread) onto several of the exterior threads **93** of tire stem **90**, such that piston **99** has just first contacted by actuator surface **206** of pneumatic seal-and-valve-actuator core **200**. This contact position **99**B of piston **99** means that the valve of tire stem **90** is still closed, but the O-ring **310** is now sealing the air passageway from hole **208** to the interior of tire stem **90**. In some embodiments, the tip of cylindrical inner wall **92** has passed much or all of O-ring **310**, forming an air-tight seal.

FIG. **4**C is a longitudinal cross-section view of air chuck **400**, shown in a third arrangement or position **401**C, according to some embodiments of the present invention. In third arrangement **401**C, twist-on cap **100** has been twisted a yet more full rotations (each such full rotation advances twist-on cap **100** one more thread) onto several of the exterior threads **93** of tire stem **90**, such that piston **99** has been depressed by actuator surface **206** of pneumatic seal-and-valve-actuator core **200**. This depressed position **99**C of piston **99** means that the valve of tire stem **90** is fully open (note that the air channel **97** through Schrader valve **95**, when the Schrader valve is open, extends through space **98** at the bottom of Schrader valve **95**), and O-ring **310** is still sealing the air passageway from hole **208** to the interior of tire stem **90**. In some embodiments, the sealing is enhanced by air-tool grease or oil applied the O-ring **310**.

FIG. **4**D is a longitudinal cross-section view of a portion of air chuck **400**, to illustrate certain dimensions and distances, according to some embodiments of the present invention. In other embodiments, variations of these distances are used, in order that air chuck **400** provides: first, a supporting connection to the outer threads of tire stem **90** such that the plane **269** O-ring **310** is generally perpendicular to center axis **209**, second, a seal to O-ring **310** is established, and third, actuator surface **206** presses against piston **99** and opens the Schrader valve.

FIG. **5**A is a schematic block diagram of an air chuck system **500** with inflator valve **530** and pressure gauge **540** with leak-prevention and single multi-turn rotary attachment function, according to some embodiments of the present invention. In some embodiments, air chuck system **500** includes an air valve **530**, an air-pressure gauge **540**, and an air chuck **400**, as described above. In some embodiments, air valve **530** is configured to receive pressurized air from air source **96** (e.g., an air compressor), and to selectively open and close (e.g., in some embodiments, using a manually operated trigger lever or other actuator), and when open to supply air to air chuck **400**, and when closed, to allow air-pressure gauge **540** to measure the air pressure in the tire or other air vessel connected to tire stem **90**.

FIG. **5**B is a side view of air chuck system **500** that includes a longitudinal cross-section view of air chuck **400**, according to some embodiments of the present invention.

FIG. **5**C is a top view of an analog air gauge display **541** of pressure gauge **540**, according to some embodiments of the present invention. In other embodiments, a digital air-pressure gauge is used instead.

In some embodiments, the present invention provides an air-chuck system for use with a tire stem having a Schrader valve. This air-chuck system includes: an air chuck that includes: a twist-on cap **100**; and a pneumatic seal-and-valve-actuator core **200** held partially within the twist-on cap, wherein the twist-on cap **100** has interior threads that engage outer threads of the tire stem to allow a user to attach the air chuck to the tire stem **90** with a single multi-turn rotational motion of the twist-on cap, wherein the pneumatic core **200** includes an air passageway extending from an outer end to an inner end, wherein a first portion of the pneumatic core **200** includes a flexible, resilient seal positioned on pneumatic core **200** to seal against an inner circumference of tire stem **90** to form a seal of the air passageway to the tire stem, wherein the first portion is configured to be gradually urged into the tire stem as the twist-on cap **100** is rotated relative to the tire stem to engage successive ones of the outer threads of the tire stem, such that upon rotation of twist-on cap **100** by a sufficient number of turns, the flexible, resilient seal seals to an inner circumference of the tire stem, and upon further rotation of twist-on cap **100**, pneumatic core **200** actuates the Schrader valve to open after the seal is established.

In some embodiments of the air-chuck system, the first portion of the pneumatic core **200** includes an outer circumferential O-ring groove, wherein the flexible, resilient seal is an O-ring made of rubber or a similar elastomeric material that is positioned in the O-ring groove to seal between the first portion of the pneumatic core **200** and an inner cylindrical surface of the tire stem, wherein the first portion of the pneumatic core **200** includes a surface (in some embodiments, a flat surface **206**, or, in other embodiments, the surface of a pin or protrusion, not shown here) configured to engage and open the Schrader valve after the air passageway is sealed to the tire stem, wherein an outer portion of the pneumatic core **200** includes a circumferential retainer-ring groove, and wherein the air chuck further includes a retainer ring **300** that is positioned in the retainer-ring groove and configured to engage the retainer-ring groove, wherein retainer ring **300** presses against top surface **131** of twist-on cap **100** as twist-on cap **100** is rotated to disengage from tire stem **90**, and ledge **139** of twist-on cap **100** presses against ledge **216** of pneumatic core **200** when twist-on cap **100** is rotated to engage on tire stem **90** by advancing on threads of tire stem **90**, to prevent dislodgement of the pneumatic core during operation.

In some embodiments of the air-chuck system, the flexible, resilient seal is made of rubber or a similar elastomeric material.

In some embodiments of the air-chuck system, the first portion of the pneumatic core **200** includes a circumferential O-ring groove, and wherein the flexible, resilient seal includes an O-ring made of rubber or a similar elastomeric material that is positioned in the O-ring groove.

In some embodiments of the air-chuck system, the O-ring groove is configured to securely position the O-ring within the tire stem to ensure a leak-proof seal between an inner surface of the tire stem and the first portion of the pneumatic core **200**.

In some embodiments of the air-chuck system, the first portion of the pneumatic core **200** includes a surface (in some embodiments, a flat surface **206**, or, in other embodiments, the surface of a pin or protrusion, not shown here) configured to engage and open the Schrader valve after the air passageway is sealed to the tire stem.

In some embodiments of the air-chuck system, an outer portion of the pneumatic core **200** includes a circumferential retainer-ring groove, and wherein the air chuck further includes a retainer ring that is positioned in the retainer-ring groove and configured to engage the retainer-ring groove to prevent dislodgement of the pneumatic core during operation.

In some embodiments of the air-chuck system, the air passageway allows air to flow from a connected air source to the tire stem upon the actuation of the Schrader valve.

Some embodiments of the air-chuck system further include an air valve having an input port and an output port; and an air-pressure gauge operatively coupled to the output port, wherein the air valve is configured to receive pressurized air from an air supply connected to the input port and to selectively open to allow air flow though the output port which is coupled to the air chuck, or to close to isolate the air supply from the air chuck and thus allow the air-pressure gauge to measure air pressure from the tire stem.

Some embodiments of the air-chuck system further include an air valve having an input port and an output port; and an air-pressure gauge operatively coupled to the output port, wherein the air valve is configured to receive pressurized air from an air supply connected to the input port and to selectively open to allow air flow though the output port which is coupled to the air chuck, or to close to isolate the air supply from the air chuck and thus allow the air-pressure gauge to measure air pressure from the tire stem, wherein the first portion of the pneumatic core **200** includes an outer circumferential O-ring groove, wherein the flexible, resilient seal is an O-ring made of rubber or a similar elastomeric material that is positioned in the O-ring groove to seal between the first portion of the pneumatic core **200** and an inner cylindrical surface of the tire stem, wherein the first portion of the pneumatic core **200** includes a surface, (in some embodiments, a flat surface **206**, or, in other embodiments, the surface of a pin or protrusion) configured to engage and open the Schrader valve after the air passageway is sealed to the tire stem, wherein an outer portion of the pneumatic core **200** includes a circumferential retainer-ring groove, and wherein the air chuck further includes a retainer ring that is positioned in the retainer-ring groove and configured to engage the retainer-ring groove to prevent dislodgement of the pneumatic core during operation.

In some embodiments of the air-chuck system, pneumatic seal-and-valve-actuator core **200** is made of brass.

In some embodiments of the air-chuck system, pneumatic seal-and-valve-actuator core **200** is made of metal selected from the group consisting of aluminum, brass, and stainless steel.

In some embodiments of the air-chuck system, twist-on cap **100** is made of brass.

In some embodiments of the air-chuck system, twist-on cap **100** is made of metal selected from the group consisting of aluminum, brass, and stainless steel.

In some embodiments of the air-chuck system, pneumatic seal-and-valve-actuator core **200** and/or twist-on cap **100** are entirely made of, or partially made of, a polymer.

In some embodiments of the air-chuck system, pneumatic seal-and-valve-actuator core is at least partially made of a polymer.

In some embodiments of the air-chuck system, twist-on cap is at least partially made of a polymer.

In some embodiments of the air-chuck system, pneumatic seal-and-valve-actuator core **200** includes: an O-ring groove **218**, and wherein the air chuck includes an O-ring **310** positioned substantially within the O-ring groove **218**, and a valve actuator surface **206** such as a surface portion or pin of pneumatic core **200** that opens the Schrader valve after the pneumatic passageway is sealed, air passageway **208** that is a pneumatic conduit within the pneumatic core **200** that allows air to flow from the connected air source to the tire stem once the Schrader valve is opened. Some embodiments further include retainer-ring groove **214**, and retainer clip **300**, wherein O-ring **310** is a flexible, resilient seal positioned at a junction between pneumatic core **200** and an inner circumference of tire stem **90**. In some embodiments, O-ring **310** is made of rubber or similar elastomeric material and is seated in the dedicated groove **218** of pneumatic core **200** inside twist-on cap **100**.

In some embodiments of the air-chuck system, the first cylindrical portion of the pneumatic core includes an outer circumferential O-ring groove, wherein the flexible, resilient seal is an O-ring made of rubber or a similar elastomeric material that is positioned in the O-ring groove to seal between the first portion of the pneumatic core and an inner cylindrical surface of the tire stem, wherein the first portion of the pneumatic core includes a surface configured to engage and open the Schrader valve after the air passageway is sealed to the tire stem, wherein the twist-on cap includes a through-hole that has bottom section with interior threads, a middle section that has a cylindrical wall of a first diameter and a upper section that has a cylindrical wall of a second diameter that is smaller than the first diameter, wherein the pneumatic core includes a cylindrical second portion that has a larger diameter than the first cylindrical portion and that is sized to rotatably fit in the middle section of the twist-on cap, and wherein the pneumatic core includes a cylindrical third portion that has a smaller diameter than the second cylindrical portion and that is sized to rotatably fit in the upper section of the twist-on cap, wherein the cylindrical third portion of the pneumatic core includes a circumferential retainer-ring groove, and wherein the air chuck further includes a retainer ring that is positioned in the retainer-ring groove and configured to engage the retainer-ring groove to prevent dislodgement of the pneumatic core during operation.

In some other embodiments, the present invention provides a second air-chuck system for use with a tire stem having a Schrader valve, This second air-chuck system includes: an air chuck that includes twist-on cap; a pneumatic seal-and-valve-actuator core held partially within the twist-on cap; an O-ring made of a flexible resilient material; and a retaining clip, wherein the twist-on cap includes: a central channel having a first section having a cylindrical inner wall and a second section having a cylindrical inner wall that has a slightly larger-diameter than first cylindrical inner wall, and a third section having a threaded inner wall that matches corresponding outer threads of the tire stem, wherein the first section, the second section and the third section are each centered on a central longitudinal axis, an inner planar ledge located at a junction between the cylindrical inner wall of the first section and the cylindrical inner wall of the second section, and wherein the pneumatic seal-and-valve-actuator core **200** includes: a barbed air-hose attachment section **213** that includes a plurality of barbs **212**, each having a conical top surface and flat bottom surface to facilitate one-way attachment of an air hose, a first cylindrical section that is sized to fit into, and easily rotate in the first section of the twist-on cap, a second cylindrical section that is sized to fit into, and easily rotate in the second section of the twist-on cap, an outer planar ledge located at a junction between the first cylindrical section and the second cylindrical section of the pneumatic seal-and-valve-actuator core, wherein the inner planar ledge of the twist-on cap presses against, and rotates relative to, the outer planar ledge of the pneumatic seal-and-valve-actuator core as the twist-on cap is rotated to advance on threads of the tire stem, a circumferential groove formed in the first cylindrical section of the pneumatic seal-and-valve-actuator core that receives and retains the retaining clip, a third cylindrical section that is sized to fit into an inner portion of the tire stem, wherein the third cylindrical section includes an O-ring groove, wherein the O-ring is positioned at least partially in the O-ring groove, wherein the third cylindrical section includes a cylindrical depression formed in a bottom portion of the third cylindrical section, and wherein the cylindrical depression has a top surface, an air passageway formed by a first hole drilled from a top end of the pneumatic seal-and-valve-actuator core, and one or more spaced-apart bottom-drilled holes through the top wall of the cylindrical depression, wherein the one or more spaced-apart bottom-drilled holes open into the first hole to extend the air passageway from the bottom cylindrical depression to the first hole **208** and wherein the top surface of the cylindrical depression, through which the spaced-apart one or more bottom-drilled holes (e.g., hole **207**A) are made, provides an actuating surface that presses against a piston of the Schrader valve in the tire stem as the twist-on cap advances on threads of the tire stem after the O ring seals the air passageway to an inner portion of the tire stem.

Some embodiments further include an air valve having an input port and an output port; and an air-pressure gauge operatively coupled to the output port, wherein the air valve is configured to receive pressurized air from an air supply connected to the input port and to selectively open to allow air flow though the output port which is coupled to the air chuck, or to close to isolate the air supply from the air chuck and thus allow the air-pressure gauge to measure air pressure from the tire stem.

It is to be understood that the above description is intended to be illustrative, and not restrictive. Although numerous characteristics and advantages of various embodiments as described herein have been set forth in the foregoing description, together with details of the structure and function of various embodiments, many other embodiments and changes to details will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should be, therefore, determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled. In the appended claims, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein," respectively. Moreover, the terms "first," "second," and "third," etc., are used merely as labels, and are not intended to impose numerical requirements on their objects.

The invention claimed is:

1. An air-chuck system with single rotary attachment, sealing and valve-actuation function for use with a tire stem having a Schrader valve, the air-chuck system comprising:

an air chuck that includes:

a twist-on cap; and

a pneumatic seal-and-valve-actuator core held partially within the twist-on cap,

wherein the twist-on cap has a first end that is open and an opposite second end having an interior ledge that engages with an exterior ledge of the pneumatic seal-and-valve-actuator core, and having interior threads that engage outer threads of the tire stem to allow a user to attach the air chuck to the tire stem with a rotational motion of the twist-on cap,

wherein the pneumatic seal-and-valve-actuator core includes an air passageway extending from an outer end to an inner end of the pneumatic seal-and-valve-actuator core,

wherein no part of the inner end of the pneumatic seal-and-valve-actuator core extends beyond a plane defined by the first end of the twist-on cap,

wherein a cylindrical first portion of the pneumatic seal-and-valve-actuator core includes an elastomeric seal positioned around the first portion of the pneumatic seal-and-valve-actuator core to seal against an inner circumference of the tire stem to form a seal of the air passageway to the tire stem,

wherein the first portion of the pneumatic seal-and-valve-actuator core includes a Schrader-valve-actuation surface that is recessed within the pneumatic seal-and-valve-actuator core further from the first end of the twist-on cap than a proximal edge of the elastomeric seal, and

wherein the first portion of the pneumatic seal-and-valve-actuator core is configured to be progressively urged into the tire stem as the twist-on cap is rotated relative to the tire stem to engage successive ones of the outer threads of the tire stem, such that upon rotation of the twist-on cap by a sufficient number of turns, the elastomeric seal seals to an inner circumference of the tire stem before the Schrader-valve actuation-surface opens the Schrader valve, and upon further rotation of twist-on cap, the pneumatic seal-and-valve-actuator core actuates the Schrader valve to open after the seal is established.

2. The air-chuck system of claim **1**, wherein the first portion of the pneumatic seal-and-valve-actuator core includes an outer circumferential O-ring groove, wherein the elastomeric is an O-ring made of rubber or a similar elastomeric material that is positioned in the O-ring groove to seal between the first portion of the pneumatic seal-and-valve-actuator core and an inner cylindrical surface of the tire stem, wherein the first portion of the pneumatic seal-and-valve-actuator core includes a surface configured to engage and open the Schrader valve after the air passageway is sealed to the tire stem, wherein an outer portion of the pneumatic seal-and-valve-actuator core includes a circumferential retainer-ring groove, and wherein the air chuck further includes a retainer ring that is positioned in the retainer-ring groove and configured to engage the retainer-ring groove to prevent dislodgement of the pneumatic seal-and-valve-actuator core during operation.

3. The air-chuck system of claim **1**, wherein the elastomeric seal is made of rubber or a similar elastomeric material.

4. The air-chuck system of claim **1**, wherein the first portion of the pneumatic seal-and-valve-actuator core includes a circumferential O-ring groove, and wherein the elastomeric seal includes an O-ring made of rubber or a similar elastomeric material that is positioned in the O-ring groove.

5. The air chuck system of claim **4**, wherein the O-ring groove is configured to securely position the O-ring within the tire stem to ensure a leak-proof seal between an inner surface of the tire stem and the first portion of the pneumatic seal-and-valve-actuator core.

6. The air-chuck system of claim **1**, wherein an outer portion of the pneumatic seal-and-valve-actuator core includes a circumferential retainer-ring groove, and wherein the air chuck further includes a retainer ring that is positioned in the retainer-ring groove and configured to engage the retainer-ring groove to prevent dislodgement of the pneumatic seal-and-valve-actuator core during operation.

7. The air chuck system of claim **1**, wherein the air passageway allows air to flow from a connected air source through the tire stem upon the actuation of the Schrader valve.

8. The air chuck system of claim **1**, further comprising:

an air valve having an input port and an output port; and

an air-pressure gauge operatively coupled to the output port, wherein the air valve is configured to receive pressurized air from an air supply connected to the input port and to selectively open to allow air flow though the output port which is coupled to the air chuck, or to close to isolate the air supply from the air chuck and thus allow the air-pressure gauge to measure air pressure from the tire stem.

9. The air-chuck system of claim **1**, further comprising:

an air valve having an input port and an output port; and

an air-pressure gauge operatively coupled to the output port, wherein the air valve is configured to receive pressurized air from an air supply connected to the input port and to selectively open to allow air flow though the output port which is coupled to the air chuck, or to close to isolate the air supply from the air chuck and thus allow the air-pressure gauge to measure air pressure from the tire stem, wherein the first portion of the pneumatic seal-and-valve-actuator core includes an outer circumferential O-ring groove, wherein the elastomeric seal is an O-ring made of rubber or a similar elastomeric material that is positioned in the O-ring groove to seal between the first portion of the pneumatic seal-and-valve-actuator core and an inner cylindrical surface of the tire stem, wherein the first portion of the pneumatic seal-and-valve-actuator core includes a surface configured to engage and open the Schrader valve after the air passageway is sealed to the tire stem, wherein an outer portion of the pneumatic seal-and-valve-actuator core includes a circumferential retainer-ring groove, and wherein the air chuck further includes a retainer ring that is positioned in the retainer-ring groove and configured to engage the retainer-ring groove to prevent dislodgement of the pneumatic seal-and-valve-actuator core during operation.

10. The system of claim **1**, wherein pneumatic seal-and-valve-actuator core is made of brass.

11. The system of claim **1**, wherein pneumatic seal-and-valve-actuator core is made of metal selected from the group consisting of aluminum, brass, and stainless steel.

12. The system of claim **1**, wherein twist-on cap is made of brass.

13. The system of claim **1**, wherein twist-on cap is made of metal selected from the group consisting of aluminum, brass, and stainless steel.

14. The system of claim **1**, wherein pneumatic seal-and-valve-actuator core is at least partially made of a polymer.

15. The system of claim **1**, wherein twist-on cap is at least partially made of a polymer.

16. The system of claim **1**, wherein the pneumatic seal-and-valve-actuator core includes:

a dedicated O-ring groove, wherein the air chuck further includes an O-ring positioned substantially within the O-ring groove, wherein the O-ring is made of rubber or similar elastomeric material and is seated in the dedicated O-ring groove of the pneumatic seal-and-valve-actuator core;

an air passageway that is a pneumatic conduit within the pneumatic seal-and-valve-actuator core that allows air to flow from the connected air source through the tire stem once the Schrader valve is opened; and

a retainer-ring groove, wherein the air chuck further includes a retainer clip positioned in the retainer-ring groove.

17. The air-chuck system of claim **1**, wherein the first cylindrical portion of the pneumatic seal-and-valve-actuator core includes an outer circumferential O-ring groove, wherein the elastomeric seal is an O-ring made of rubber or a similar elastomeric material that is positioned in the O-ring groove to seal between the first portion of the pneumatic seal-and-valve-actuator core and an inner cylindrical surface of the tire stem, wherein the twist-on cap includes a through-hole that has bottom section with interior threads, a middle section that has a cylindrical wall of a first diameter and a upper section that has a cylindrical wall of a second diameter that is smaller than the first diameter, wherein the pneumatic seal-and-valve-actuator core includes a cylindrical second portion that has a larger diameter than the first cylindrical portion and that is sized to rotatably fit in the middle section of the twist-on cap, and wherein the pneumatic seal-and-valve-actuator core includes a cylindrical third portion that has a smaller diameter than the second cylindrical portion and is sized to rotatably fit in the upper section of the twist-on cap, wherein the cylindrical third portion of the pneumatic seal-and-valve-actuator core includes a circumferential retainer-ring groove, and wherein the air chuck further includes a retainer ring that is positioned in the retainer-ring groove and configured to engage the retainer-ring groove, wherein the retainer ring presses against a top surface of the twist-on cap as the twist-on cap is rotated to disengage from the tire stem, and an inner ledge of the twist-on cap presses against an outer ledge of the pneumatic seal-and-valve-actuator core when the twist-on cap is rotated to engage on the tire stem by advancing on threads of the tire stem, in order to prevent dislodgement of the pneumatic seal-and-valve-actuator core during operation.

18. An air-chuck system with single rotary attachment, sealing and valve-actuation function for use with a tire stem having a Schrader valve, the air-chuck system comprising:

an air chuck that includes:

a twist-on cap;

a pneumatic seal-and-valve-actuator core held partially within the twist-on cap;

an O-ring made of an elastomeric material; and

a retaining clip,

wherein the twist-on cap includes:

a central channel having a first section having a cylindrical inner wall and a second section having a cylindrical inner wall that has a slightly larger diameter than first cylindrical inner wall, and a third section having a threaded inner wall that matches corresponding outer threads of the tire stem, wherein the first section, the second section and the third section are each centered on a central longitudinal axis,

an inner planar ledge located at a junction between the cylindrical inner wall of the first section and the cylindrical inner wall of the second section, and

wherein the pneumatic seal-and-valve-actuator core includes:

an air-hose attachment section that facilitates attachment of an air hose,

a first cylindrical section that is sized to fit into, and easily rotate in the first section of the twist-on cap,

a second cylindrical section that is sized to fit into, and easily rotate in the second section of the twist-on cap,

an outer planar ledge located at a junction between the first cylindrical section and the second cylindrical section of the pneumatic seal-and-valve-actuator core, wherein the inner planar ledge of the twist-on cap presses against, and rotates relative to, the outer planar ledge of the pneumatic seal-and-valve-actuator core as the twist-on cap is rotated to advance on threads of the tire stem,

a circumferential groove formed in the first cylindrical section of the pneumatic seal-and-valve-actuator core that receives and retains the retaining clip,

a third cylindrical section that is sized to fit into an inner portion of the tire stem, wherein the third cylindrical section includes an O-ring groove, wherein the O-ring is positioned at least partially in the O-ring groove, wherein the third cylindrical section includes a cylindrical depression formed in a bottom portion of the third cylindrical section, and wherein the cylindrical depression has a valve-actuation top surface that is recessed within the third cylindrical section of the pneumatic seal-and-valve-actuator core further than a proximal edge of the O-ring groove, and

an air passageway formed by a first hole drilled from a top end of the pneumatic seal-and-valve-actuator core, and one or more spaced-apart bottom-drilled holes through the valve-actuation top surface of the cylindrical depression, wherein the one or more spaced-apart bottom-drilled holes open into the first hole to extend the air passageway from the bottom cylindrical depression to the first hole, wherein the valve-actuation top surface of the cylindrical depression, through which the spaced-apart one or more bottom-drilled holes are made, provides an actuating surface that presses against a piston of the Schrader valve in the tire stem as the twist-on cap advances on threads of the tire stem after the O-ring seals the air passageway to an inner portion of the tire stem.

19. The air chuck system of claim **18**, further comprising:

an air valve having an input port and an output port; and

an air-pressure gauge operatively coupled to the output port, wherein the air valve is configured to receive pressurized air from an air supply connected to the input port and to selectively open to allow air flow though the output port which is coupled to the air chuck, or to close to isolate the air supply from the air chuck and thus allow the air-pressure gauge to measure air pressure from the tire stem.

20. An air-chuck system for use with a tire stem having a Schrader valve, the air-chuck system comprising:

an air chuck that includes:

a twist-on cap, wherein the twist-on cap has an open first end, and interior threads that engage outer threads of the tire stem enabling attachment of the air chuck to the tire stem through rotational motion of the twist-on cap; and

a pneumatic seal-and-valve-actuator core held partially within the twist-on cap,

wherein the pneumatic seal-and-valve-actuator core includes an air passageway extending from an outer end to an inner end of the pneumatic seal-and-valve-actuator core,

wherein a first portion of the pneumatic seal-and-valve-actuator core includes an elastomeric O-ring positioned around the first portion and configured to seal against an inner circumference of the tire stem thereby sealing the air passageway to the tire stem,

wherein the first portion of the pneumatic seal-and-valve-actuator core includes a Schrader-valve actuation surface that is recessed within the pneumatic seal-and-valve-actuator core at a position further from the open first end of the twist-on cap than is a proximal edge of the elastomeric O-ring, and

wherein the first portion of the pneumatic seal-and-valve-actuator core is configured to be progressively urged into the tire stem as the twist-on cap is rotated relative to the tire stem engaging successive outer threads of the tire stem, such that:

upon rotation of the twist-on cap by a sufficient number of turns, the elastomeric O-ring seals to an inner circumference of the tire stem before the Schrader-valve actuation surface opens the Schrader valve, and

upon further rotation of twist-on cap, the pneumatic seal-and-valve-actuator core actuates the Schrader valve to open after the seal is established.

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