US012390820B2

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Ross et al.

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(45) **Date of Patent: Aug. 19, 2025**

(54) **FLUID CARTRIDGE FOR A PLURAL COMPONENT SPRAYER**

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(73) Assignee: **Graco Minnesota Inc.**, Minneapolis, 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.: **18/121,277**

(22) Filed: **Mar. 14, 2023**

(65) **Prior Publication Data**

US 2023/0211363 A1 Jul. 6, 2023

Related U.S. Application Data

(63) Continuation of application No. 16/664,048, filed on Oct. 25, 2019, now Pat. No. 11,633,748.
(Continued)

(51) **Int. Cl.**
B05B 7/04 (2006.01)
B01F 35/52 (2022.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B05B 7/0408*** (2013.01); ***B01F 35/522*** (2022.01); ***B05B 7/04*** (2013.01); ***B05B 7/08*** (2013.01); ***B05B 7/1254*** (2013.01)

(58) **Field of Classification Search**
CPC B05B 7/0408; B05B 7/08; B05B 7/1254; B05B 7/04; B05B 7/1209; B01F 35/522
(Continued)

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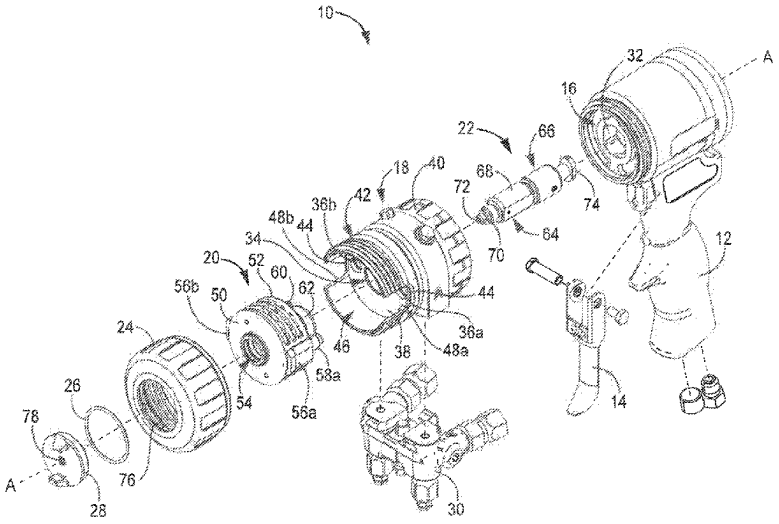
Primary Examiner — Arthur O. Hall
Assistant Examiner — Kevin Edward Schwartz
(74) *Attorney, Agent, or Firm* — Kinney & Lange, P.A.

(57) **ABSTRACT**

A fluid cartridge for a plural component sprayer is configured to receive first and second component materials and purge air from the sprayer and provide the first and second component materials and purge air to a mix chamber for spraying. The fluid cartridge includes a cartridge body, material flowpaths extending from a second end to a cartridge bore, and a purge path extending from the second end to the cartridge bore. Fluid checks are disposed in the material flowpaths and purge path to prevent backflow out of the fluid cartridge. Side seals are disposed in the material paths and are pre-loaded to extend into the cartridge bore and engage a mix chamber within the cartridge bore.

15 Claims, 16 Drawing Sheets



Related U.S. Application Data

(60) Provisional application No. 62/800,659, filed on Feb. 4, 2019, provisional application No. 62/751,148, filed on Oct. 26, 2018.

(51) **Int. Cl.**
B05B 7/08 (2006.01)
B05B 7/12 (2006.01)

(58) **Field of Classification Search**
USPC 239/413, 414, 112
See application file for complete search history.

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11,213,840	B2	1/2022	Owens et al.	
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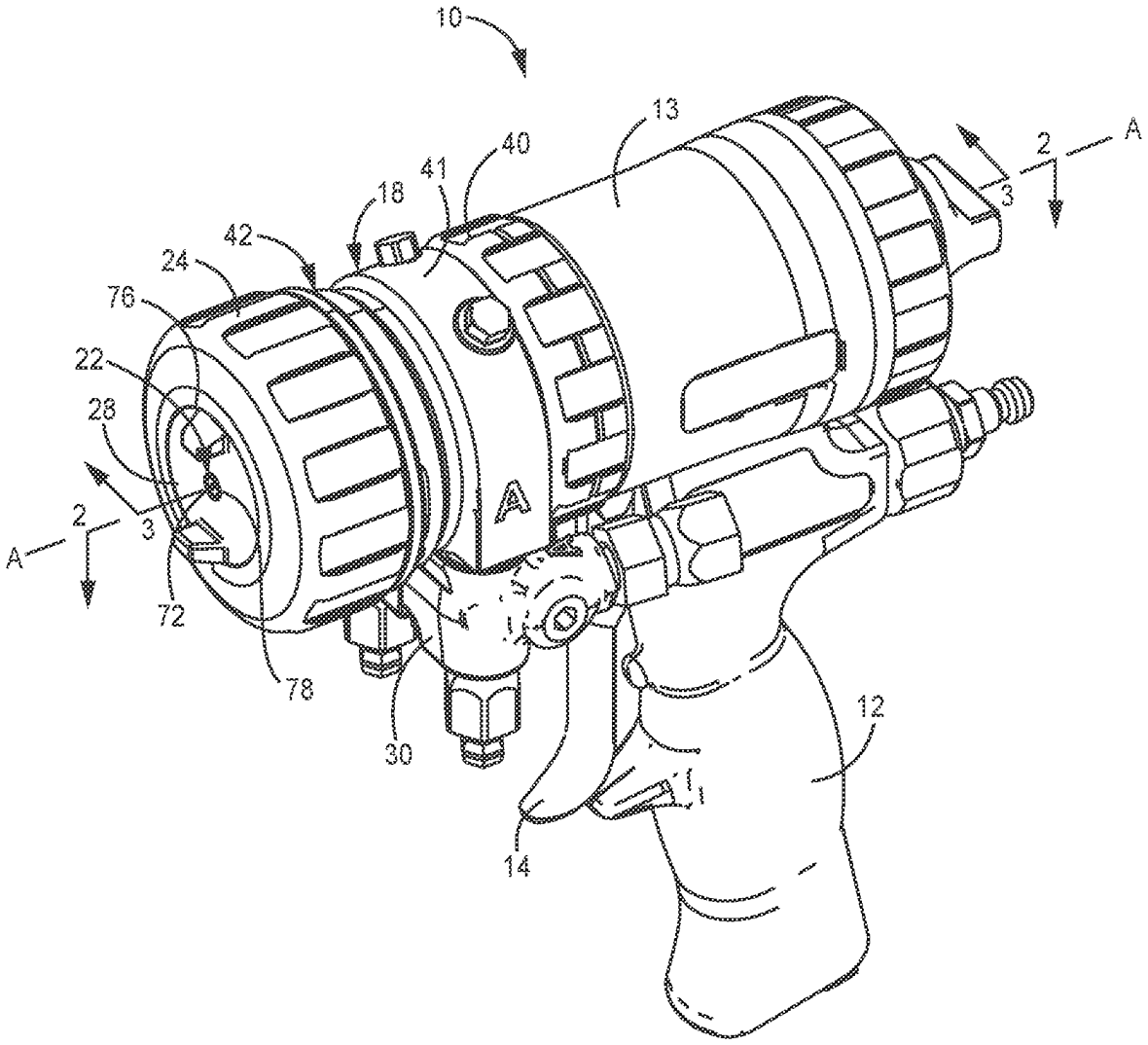
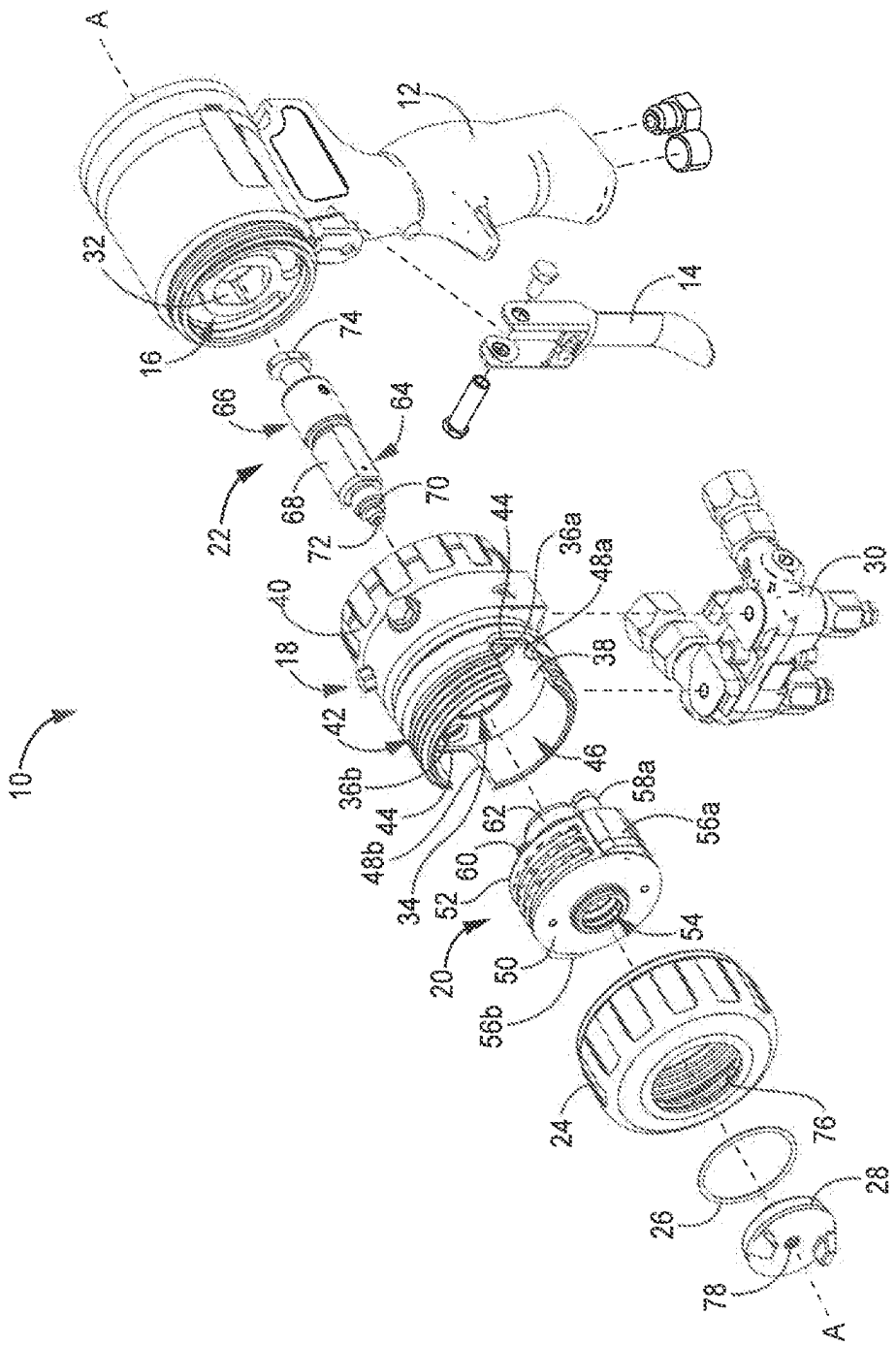


FIG. 1A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32
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74
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66
64
68
70
22
72
44
36a
48a
40
30
18
38
42
36b
46
58a
44
62
56a
48b
60
34
52
54
20
50
56b
24
76
26
28
78
A
10

FIG. 1B

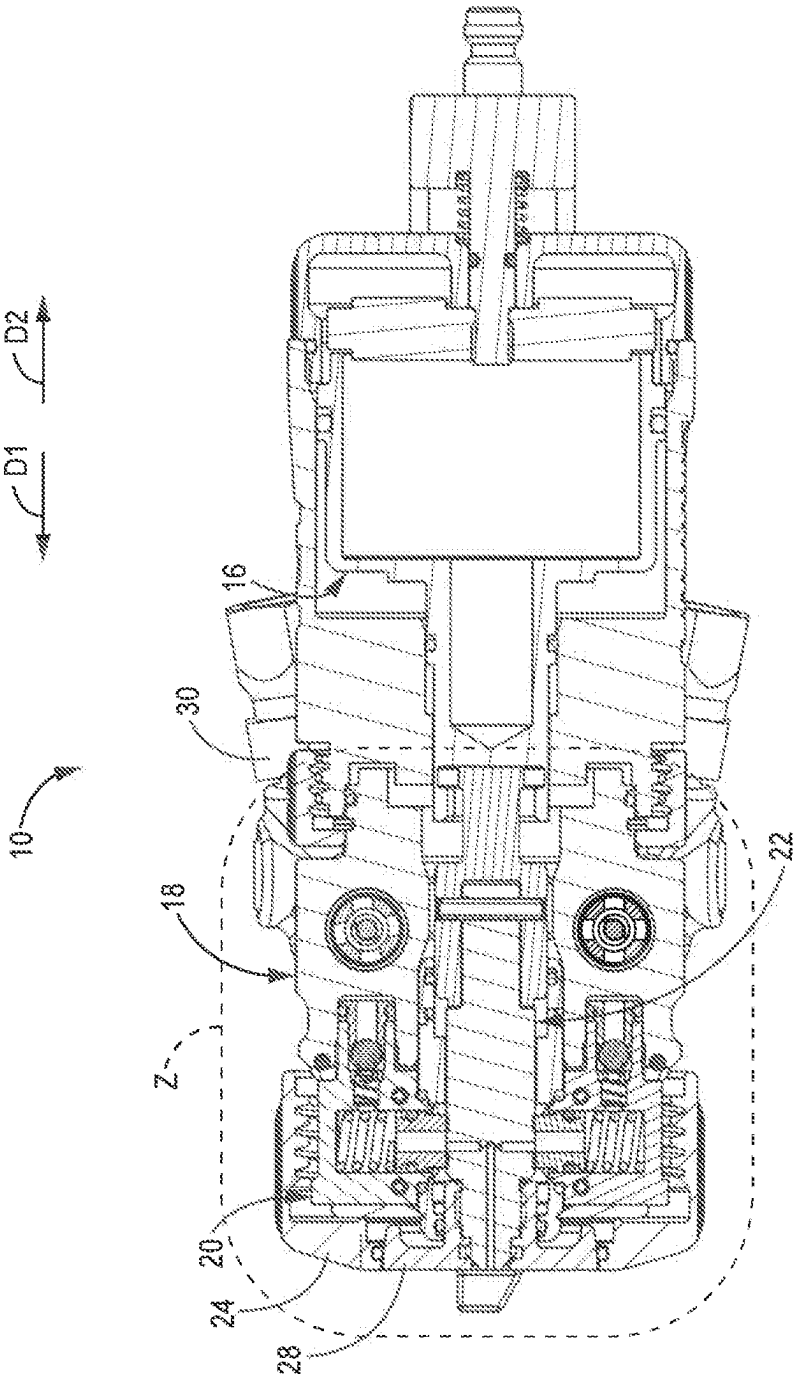
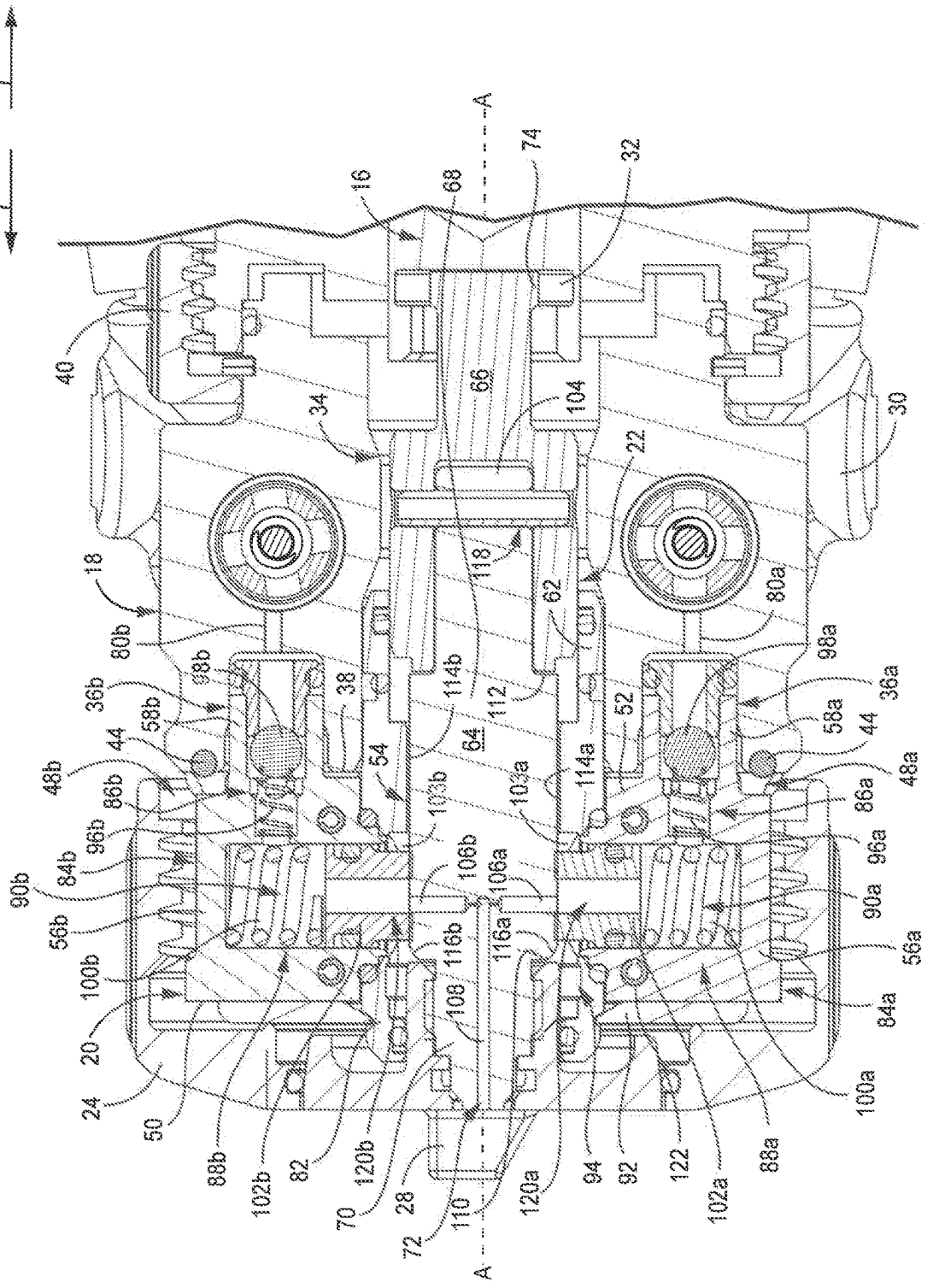


FIG. 2A


D1
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A
16
68
74
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40
66
104
34
30
22
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118
62
80b
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98b
98a
36b
36a
38
114b
112
58b
58a
52
44
64
54
114a
48b
48a
86b
86a
103b
103a
96b
96a
84b
106b
106a
90b
90a
56b
116b
116a
56a
100b
108
84a
20
100a
24
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88b
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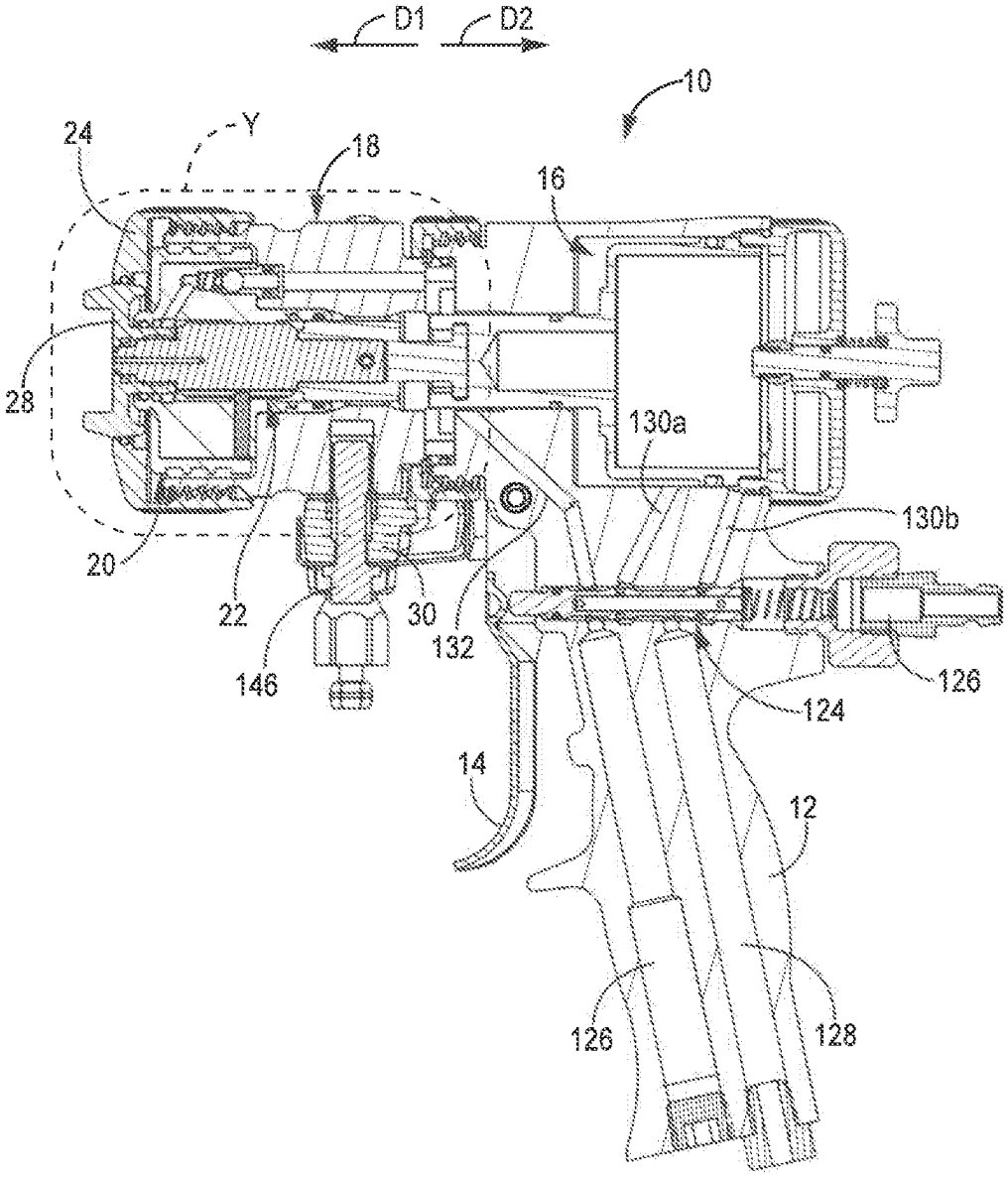
102b
82
120b
94
92
122
102a
70
28
110
120a
72

FIG. 2B


D1
D2
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Y
24
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130a
130b
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22
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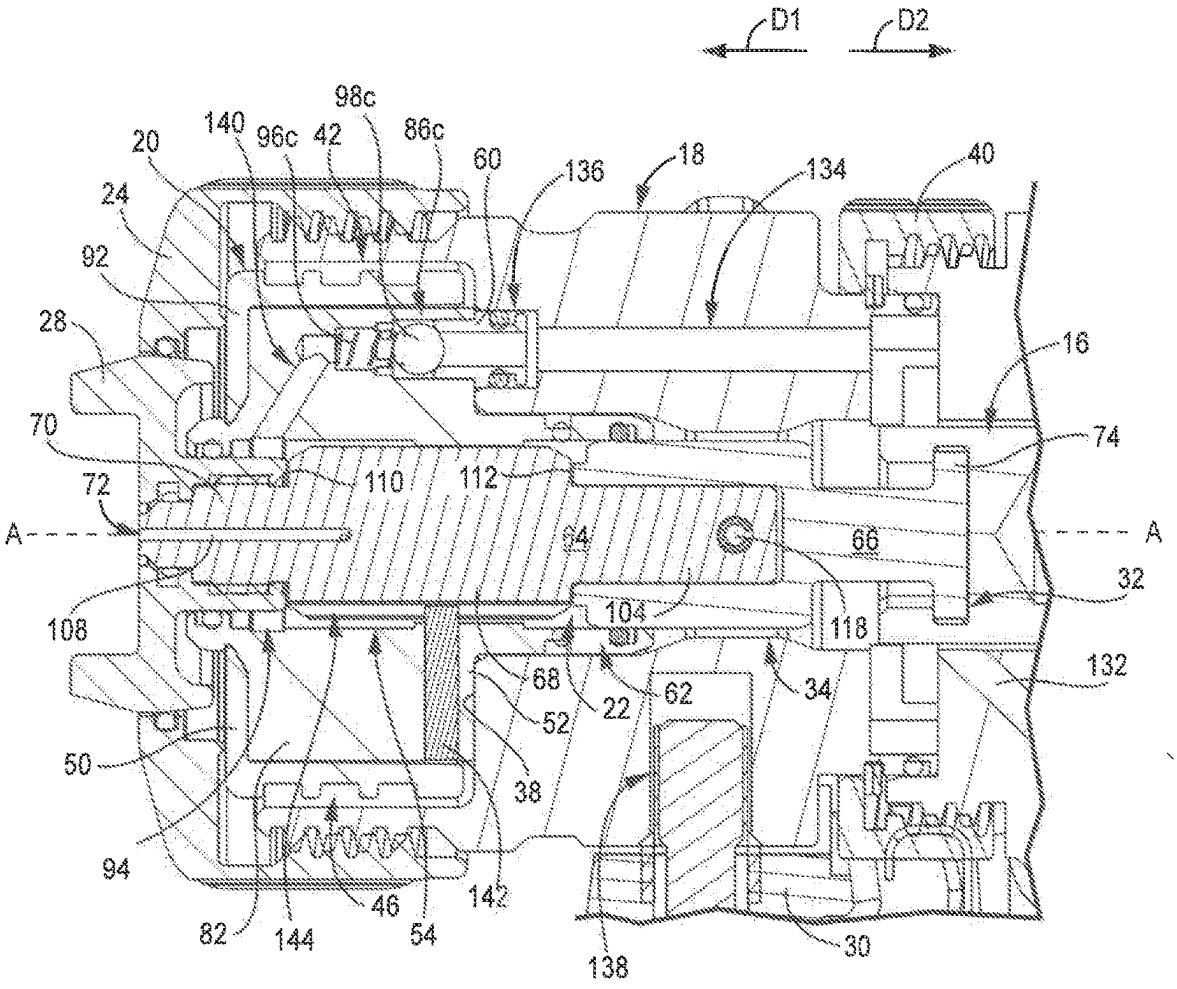
14
12
126
128

FIG. 3A


D1
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16
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110
112
A
A
66
32
108
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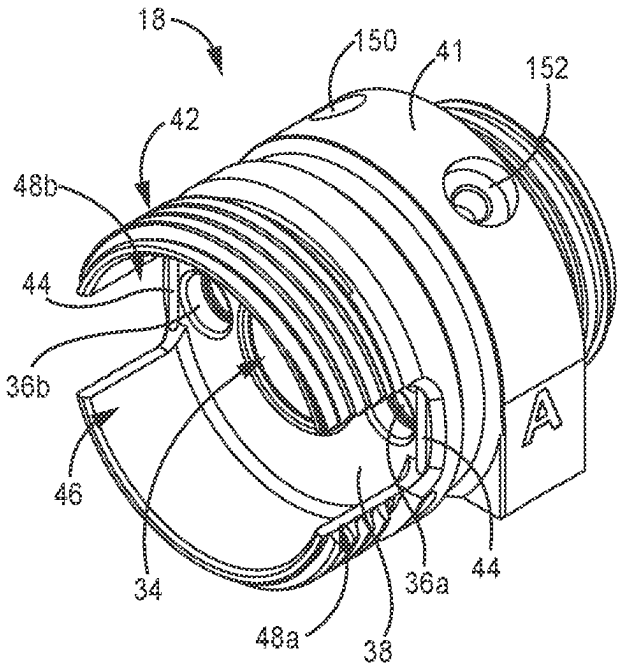
138
30

FIG. 3B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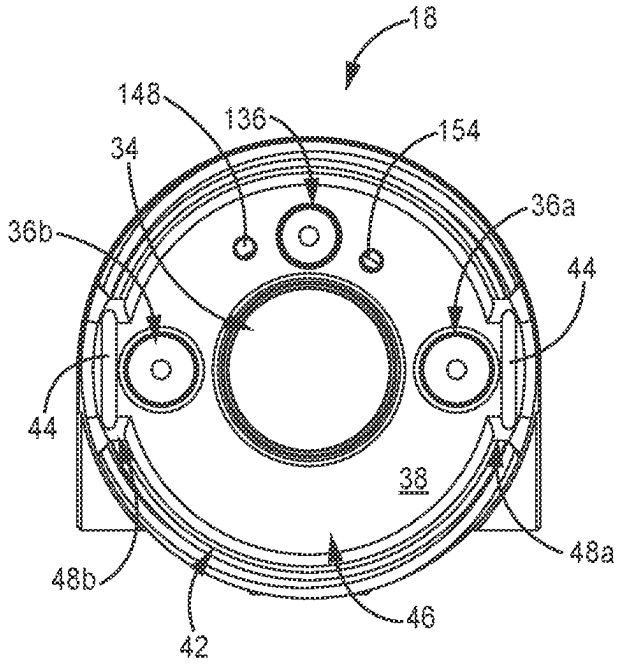
48a
38
36a
44
A

FIG. 4A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148
136
154
34
36a
36b
44
44
38
48a
48b
46
42

FIG. 4B

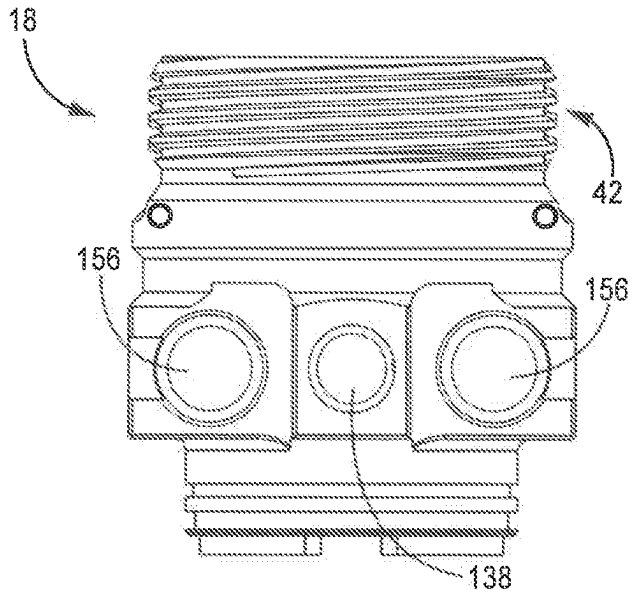
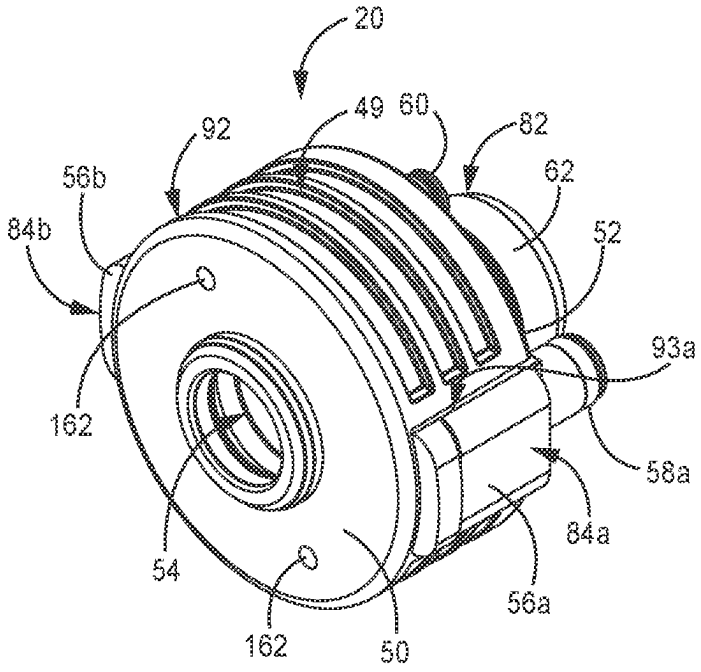


FIG. 4C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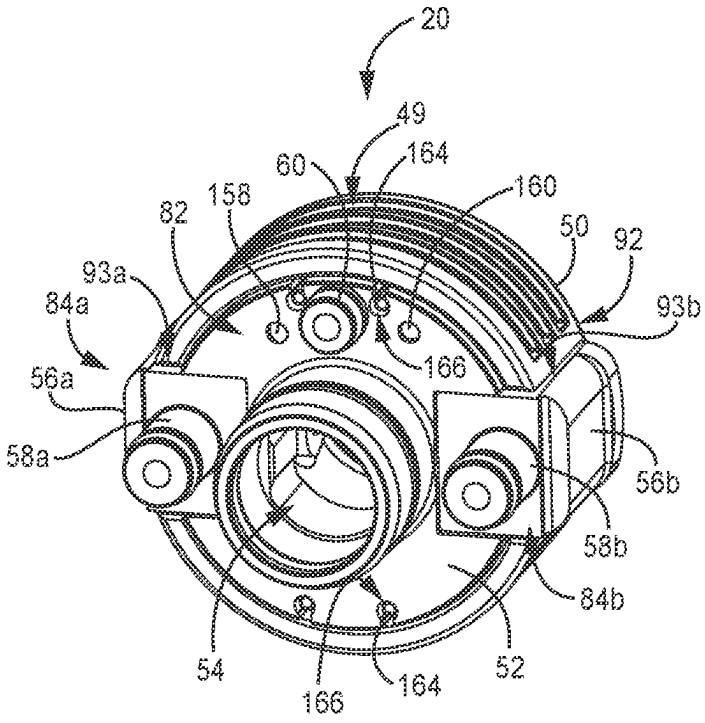
58a
84a
54
56a
162
50

FIG. 5A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49
164
60
160
158
82
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84a
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56a
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56b
58b
84b
54
166
164
52

FIG. 5B

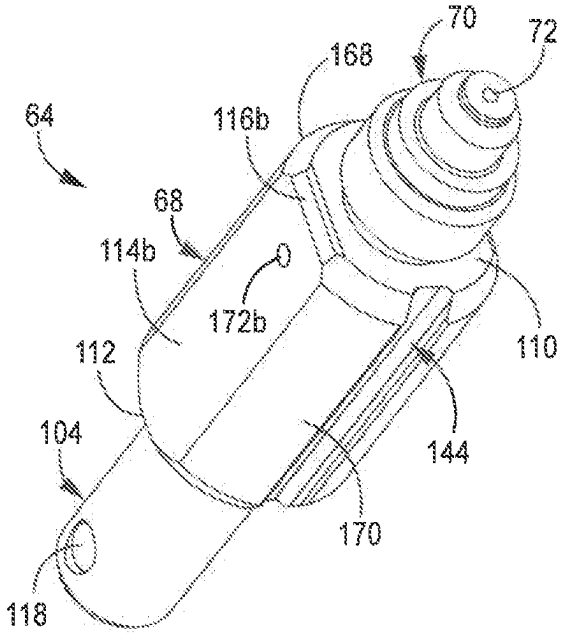

70
72
168
64
116b
68
114b
172b
110
112
104
144
170
118

FIG. 6A

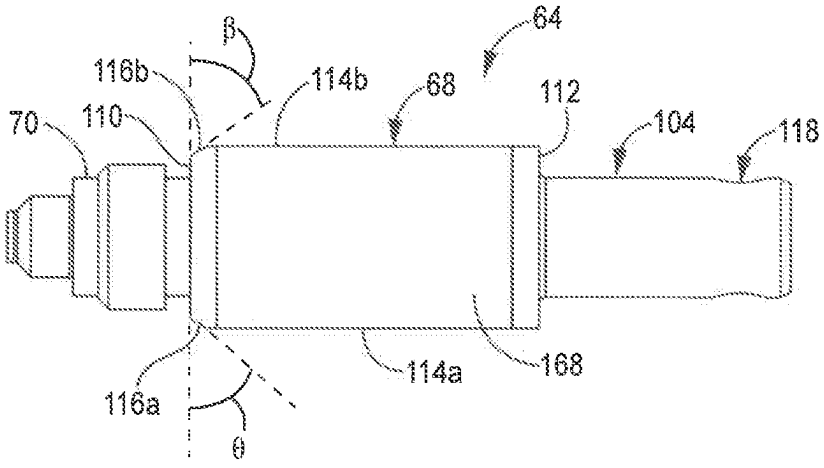

β
64
116b
114b
68
112
70
110
104
118
114a
168
116a
θ

FIG. 6B

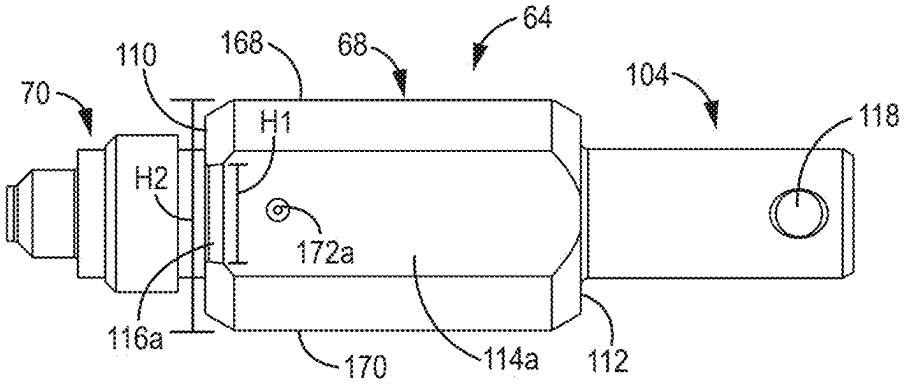


FIG. 6C

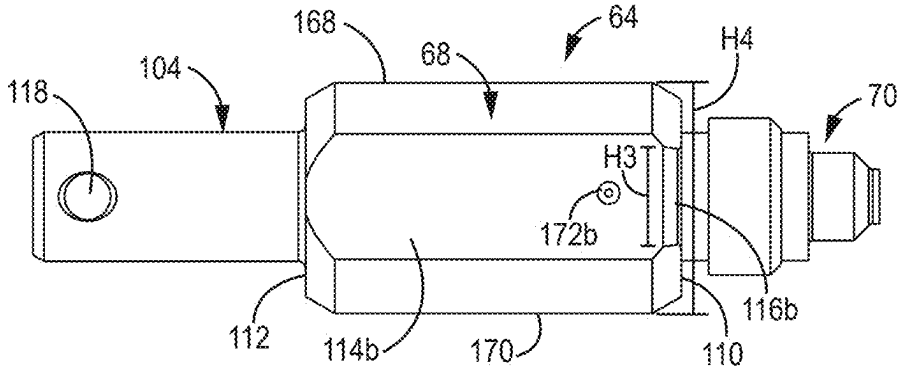


FIG. 6D

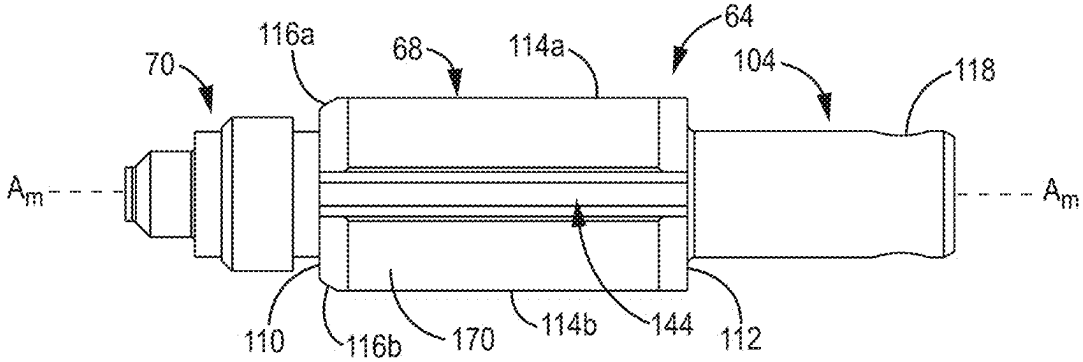


FIG. 6E

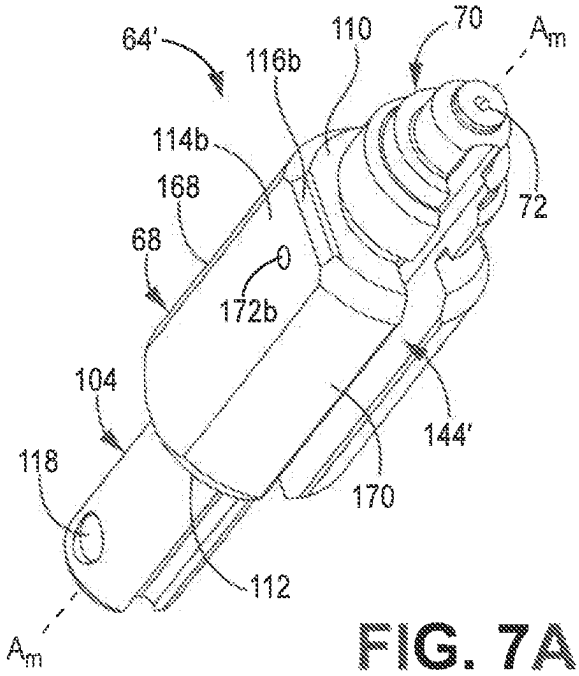
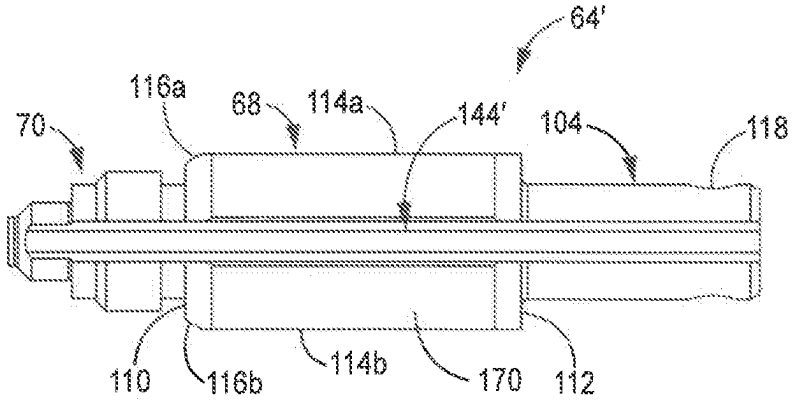

64'
110
70
A_m
116b
114b
168
72
68
0
172b
104
144'
118
170
112
A_m

FIG. 7A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116a
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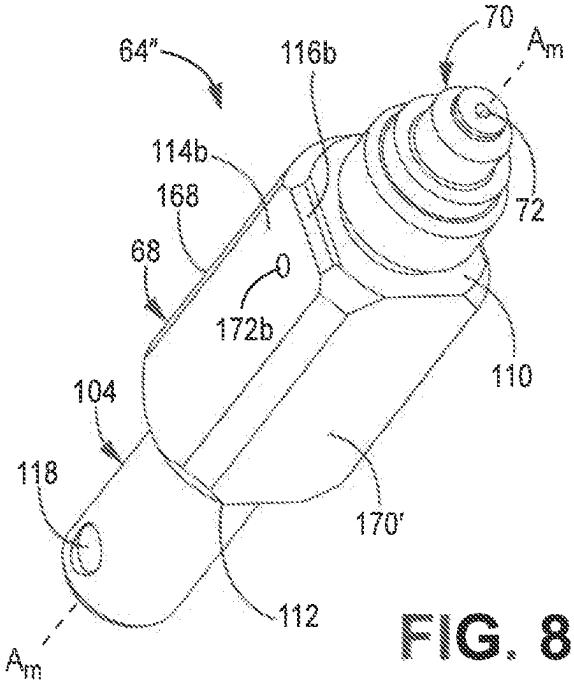
114a
144'
104
118
70
110
116b
114b
170
112

FIG. 7B


64"
116b
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A_m
114b
168
72
68
O
172b
110
104
118
170'
112
A_m

FIG. 8A

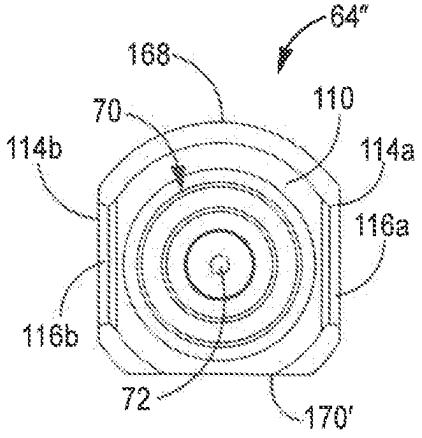
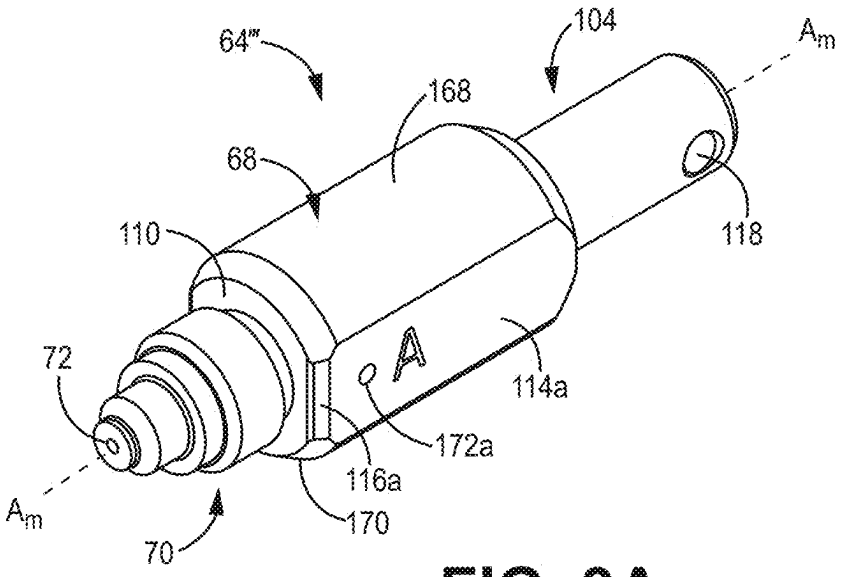

64"
168
110
70
114b
114a
116a
116b
72
170'

FIG. 8B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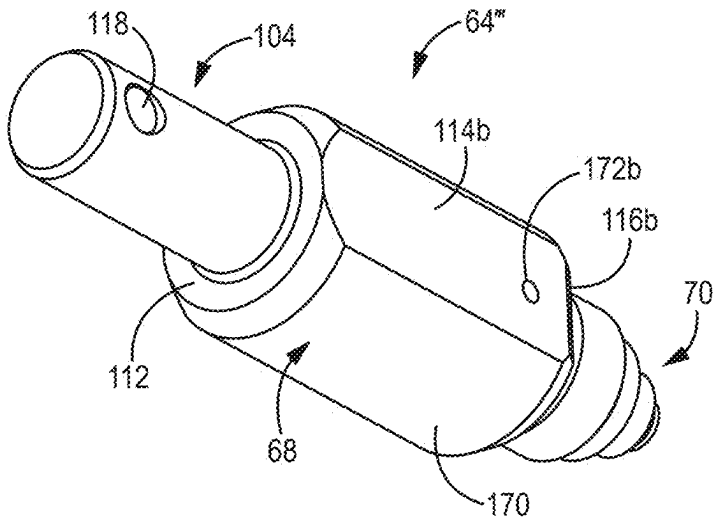
A_m
168
68
110
118
72
A
114a
172a
116a
170
A_m
70

FIG. 9A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64'''
114b
172b
116b
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112
68
170

FIG. 9B

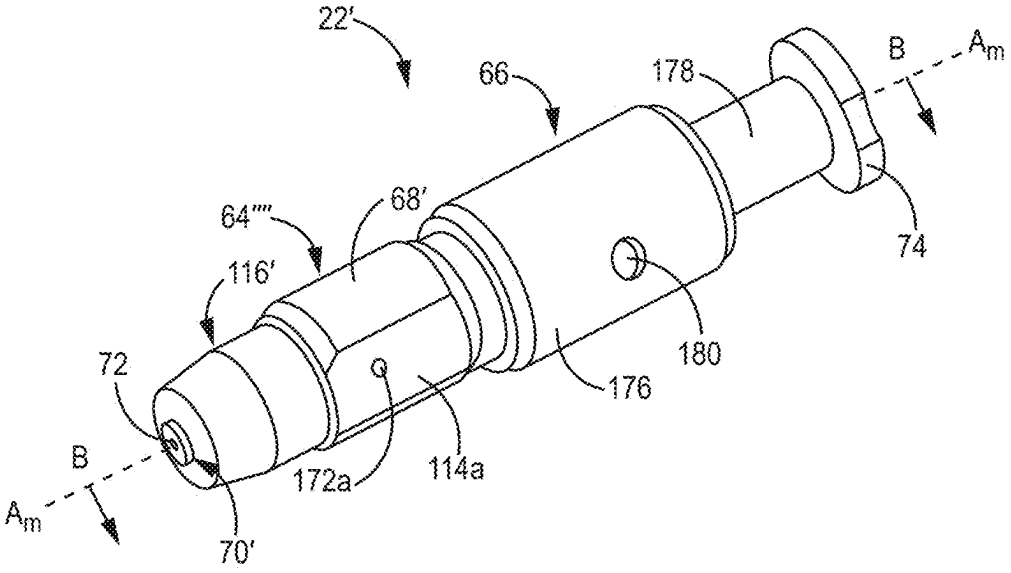

FIG. 10A

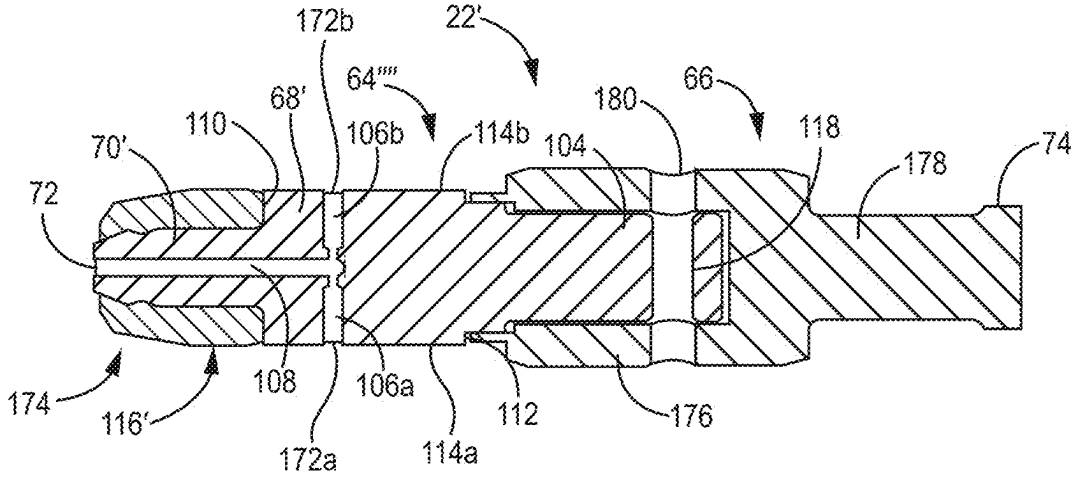

FIG. 10B

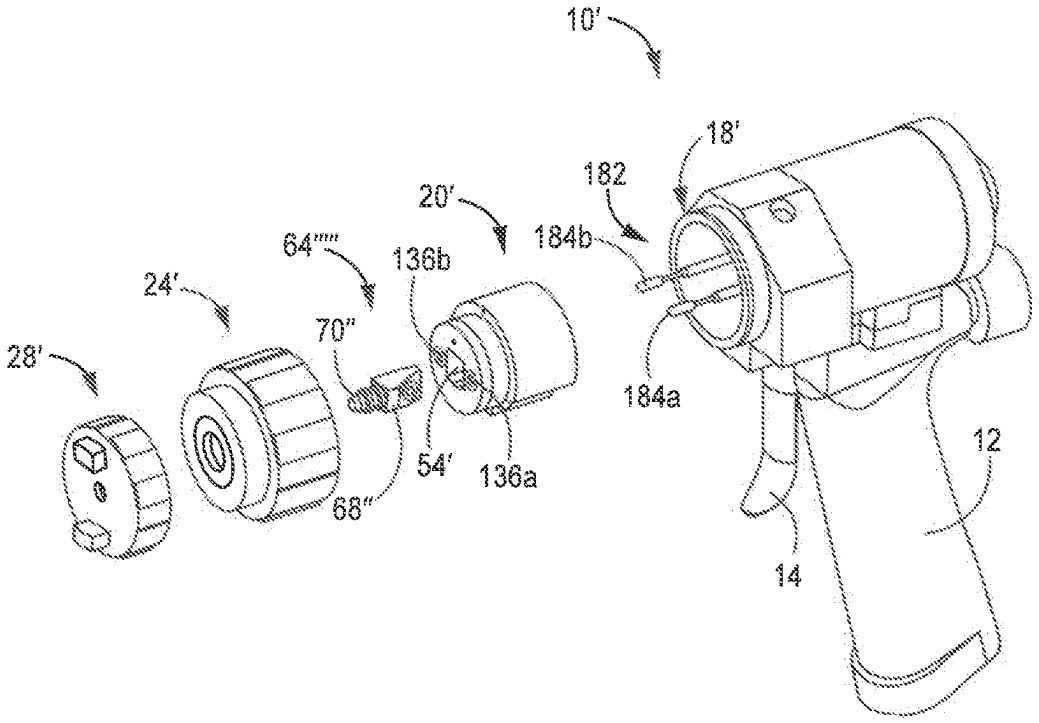

FIG. 11

FLUID CARTRIDGE FOR A PLURAL COMPONENT SPRAYER

CROSS-REFERENCE TO RELATED APPLICATION(S)

This application is a continuation of U.S. application Ser. No. 16/664,048 filed Oct. 25, 2019 for "FLUID CARTRIDGE FOR A PLURAL COMPONENT SPRAYER," which in turn claims the benefit of U.S. Provisional Application No. 62/751,148, filed Oct. 26, 2018, and entitled "REPLACEABLE HEAD FOR PLURAL COMPONENT SPRAYER (GUN)," and claims the benefit of U.S. Provisional Application No. 62/800,659, filed Feb. 4, 2019, and entitled "MIXING CARTRIDGE AND MIXING CARTRIDGE ASSEMBLY FOR PLURAL COMPONENT SPRAYER," the disclosures of which are hereby incorporated by reference in their entirety.

BACKGROUND

This disclosure is related to sprayers. More particularly, this disclosure is related to plural component spray guns.

Plural component sprayers receive multiple component materials and combine the multiple component materials to form a plural component material. For example, some plural component sprayers receive catalysts, such as isocyanate, and resin that combine to form a spray foam. Spray foam insulation can be applied to substrates to provide thermal insulation. The spray gun is triggered to open a pathway out of the gun and eject the plural component material. The component materials can cross-over into the pathway of the other component material, which can lead to curing within the gun. Repair of a plural component sprayer requires disassembly of the entire fluid head for service, maintenance, and to address any issues that may have caused a failure to spray.

SUMMARY

According to one aspect of the disclosure, a mix chamber is configured to be disposed in a cartridge bore in a spray gun to receive a first component fluid from a first fluid channel in the spray gun and a second component fluid from a second fluid channel in the spray gun, a first side seal is disposed in the first fluid channel to seal against the mix chamber and a second side seal is disposed in the second fluid channel to seal against the mix chamber. The mix chamber includes a chamber body extending between a first end and a second end and elongate along a body axis, the chamber body including a first flat lateral side and a second flat lateral side. The mix chamber further includes a first inlet bore extending into the first flat lateral side and to a mix bore extending to a spray orifice, the first inlet bore configured to receive the first component fluid from the first fluid channel; a second inlet bore extending into the second flat lateral side and to the mix bore, the second inlet bore configured to receive the second component fluid from the second fluid channel; and a ramp feature disposed proximate the first end. The ramp feature is configured to contact and push the first and second side seals, respectively, away from the body axis as the mix chamber shifts in a first direction through the cartridge bore to increase a gap between the first side seal and the second side seal such that the first side seal engages the first lateral side and the second side seal engages the second lateral side.

According to another aspect of the present disclosure, a method of assembling in a plural component spray gun includes attaching a mix chamber to an actuator of the plural component spray gun; passing a fluid cartridge in a first direction and over the mix chamber such that the mix chamber enters a rear opening of a cartridge bore through the fluid cartridge; engaging first and second seal members disposed in the fluid cartridge with a ramp feature of the mix chamber, the ramp feature being a first part of the mix chamber to contact the first and second seal members, wherein the first and second seal members are pre-loaded such that spring forces bias the first and second seal members at least partially into the cartridge bore; pushing the first and second seal members away from a chamber axis with the ramp feature to widen a gap between the first and second seal members; and passing the first seal member onto a first flat lateral side of the mix chamber from the ramp feature and passing the second seal member onto a second flat lateral side of the mix chamber.

According to yet another aspect of the disclosure, a fluid cartridge for a plural component sprayer includes a cartridge body having a first end and a second end; a cartridge bore extending axially through the cartridge body between the first end and the second end; a first material flowpath extending from the second end to the cartridge bore and a second material flowpath extending from the second end to the cartridge bore; a first fluid check disposed in the first material path proximate a first inlet of the first material path and a second fluid check disposed in the second material path proximate a second inlet of the second material path, the first and second fluid checks disposed to prevent backflow of material through the first and second inlets; a first side seal disposed in the first material path proximate the cartridge bore, the first side seal including a first seal member and a first side spring biasing the first seal member at least partially into the cartridge bore such that the first side seal is pre-loaded; and a second side seal disposed in the second material path proximate the cartridge bore, the second side seal including a second seal member and a second side spring biasing the second seal member at least partially into the cartridge bore such that the second side seal is pre-loaded.

According to yet another aspect of the disclosure, a fluid cartridge for use in a plural component sprayer is configured to receive first and second component materials from the plural component sprayer and to receive purge air from the plural component sprayer. The fluid cartridge includes a cartridge body defining a cartridge bore; a first seal housing mounted to the cartridge body, the first seal housing including a first post extending rearward from the first seal housing and configured to be received in a first material port to receive the first component material from the first material port; a second seal housing mounted to the cartridge body, the second seal housing including a second post extending rearward from the second seal housing and configured to be received in a second material port to receive the second component material from the second material port; a third post extending rearward from the cartridge body and configured to be received in a purge port to receive purge air from the purge port; a first fluid check disposed in a first material path extending through the first seal housing from the first post to the cartridge bore; a second fluid check disposed in a second material path extending through the second seal housing from the second post to the cartridge bore; a third fluid check disposed in a purge path extending through the cartridge body from the third post to the a purge chamber in the cartridge bore; a first side seal disposed in the first material path proximate the cartridge bore, the first side seal including a first seal member and a first side spring

biasing the first seal member at least partially into the cartridge bore such that the first side seal is pre-loaded; and a second side seal disposed in the second material path proximate the cartridge bore, the second side seal including a second seal member and a second side spring biasing the second seal member at least partially into the cartridge bore such that the second side seal is pre-loaded.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1**A is an isometric view of a plural component sprayer.

FIG. **1**B is an exploded view of a plural component sprayer.

FIG. **2**A is a cross-sectional view taken along line **2**-**2** in FIG. **1**A.

FIG. **2**B is an enlarged view of detail Z in FIG. **2**A.

FIG. **3**A is a cross-sectional view taken along line **3**-**3** in FIG. **1**A.

FIG. **3**B is an enlarged view of detail Y in FIG. **3**A.

FIG. **4**A is a front isometric view of a mounting head.

FIG. **4**B is a front elevation view of the mounting head shown in FIG. **4**A.

FIG. **4**C is a bottom plan view of the mounting head shown in FIG. **4**A.

FIG. **5**A is a first isometric view of a fluid cartridge.

FIG. **5**B is a second isometric view of the fluid cartridge shown in FIG. **5**A.

FIG. **6**A is an isometric view of a mix chamber.

FIG. **6**B is a first plan view of the mix chamber shown in FIG. **6**A.

FIG. **6**C is a first side elevation view of the mix chamber shown in FIG. **6**A.

FIG. **6**D is a second side elevation view of the mix chamber shown in FIG. **6**A.

FIG. **6**E is a second plan view of the mix chamber shown in FIG. **6**A.

FIG. **7**A is an isometric view of a mix chamber.

FIG. **7**B is a plan view of the mix chamber shown in FIG. **7**A.

FIG. **8**A is an isometric view of a mix chamber.

FIG. **8**B is a front elevation view of the mix chamber shown in FIG. **8**A.

FIG. **9**A is a first isometric view of a mix chamber.

FIG. **9**B is a second isometric view of the mix chamber shown in FIG. **9**A.

FIG. **10**A is an isometric view of a mix chamber assembly.

FIG. **10**B is a cross-sectional view taken along line B-B in FIG. **10**A.

FIG. **11** is an isometric, partially exploded view of a plural component sprayer.

DETAILED DESCRIPTION

FIG. **1**A is an isometric view of plural component sprayer **10**. FIG. **1**B is an exploded view of plural component sprayer **10**. FIGS. **1**A and **1**B will be discussed together. Plural component sprayer **10** includes handle **12**, trigger **14**, actuator **16** (FIG. **1**B), mounting head **18**, fluid cartridge **20** (FIG. **1**B), mix chamber assembly **22**, retaining cap **24**, cap seal **26** (FIG. **1**B), air cap **28**, and manifold **30**. Actuator **16** includes tab lock **32** (FIG. **1**B). Mounting head **18** includes central bore **34** (FIG. **1**B); material ports **36***a*, **36***b* (FIG. **1**B); chamber wall **38** (FIG. **1**B); head connector **40**; receiving portion **42**; and pins **44** (FIG. **1**B). Receiving portion **42** defines head chamber **46** (FIG. **1**B) and includes slots **48***a*, **48***b* (FIG. **1**B). Fluid cartridge **20** includes first end **50** (FIG. **1**B), second end **52** (FIG. **1**B), cartridge bore **54** (FIG. **1**B), projections **56***a*, **56***b* (FIG. **1**B), fluid posts **58***a*, **58***b* (FIG. **1**B) (only one of which is shown), purge post **60** (FIG. **1**B), and central extension **62** (FIG. **1**B). Mix chamber assembly **22** includes mix chamber **64** (FIG. **1**B) and chamber connector **66** (FIG. **1**B). Body **68** (FIG. **1**B), head **70** (FIG. **1**B), and spray orifice **72** of mix chamber **64** are shown. Chamber connector **66** includes locking tab **74** (FIG. **1**B). Retaining cap **24** includes cap bore **76**. Air cap **28** includes opening **78**.

Plural component sprayer **10** is configured to receive and mix multiple component materials to form a plural component material for application on a surface. The component materials are driven to plural component sprayer **10** by upstream pressure sources, such as pumps. The upstream pressures drive the component materials and the resulting plural component material through plural component sprayer **10** causing the spray. For example, plural component sprayer **10** can receive a first component material, such as a resin, and a second component material, such as a catalyst (e.g., isocyanate), that combine to form a spray foam. The spray foam is ejected in a spray from plural component sprayer **10** and applied to the surface.

Handle **12** is configured to be grasped by the hand of a user. Trigger **14** is pivotably mounted on the body of plural component sprayer **10**. Trigger **14** can be actuated by the hand grasping handle **12**. Trigger **14** controls spraying by plural component sprayer **10**. Actuator **16** is disposed in a chamber within plural component sprayer **10**. Tab lock **32** is formed on actuator **16** and secures mix chamber assembly **22** to actuator **16**. Trigger **14** is configured to cause displacement of actuator **16**, which in turn displaces mix chamber assembly **22** to control spraying by plural component sprayer **10**. For example, actuator **16** can include a pneumatic piston disposed within plural component sprayer **10**. In such an example, trigger **14** controls the flow of compressed air to the pneumatic piston to control displacement of the pneumatic piston.

Manifold **30** is attached to mounting head **18**. Manifold **30** is configured to receive fluid lines (not shown) providing the first and second component materials to plural component sprayer **10**. Manifold **30** provides the first and second component materials to mounting head **18**. Manifold **30** can include internal valves that allow the user to turn off flow through manifold **30** during assembly and disassembly of plural component sprayer **10**.

Mounting head **18** mounts to plural component sprayer **10**. More specifically, head connector **40** of mounting head **18** secures mounting head **18** to plural component sprayer **10**. In the example shown, head connector **40** and plural component sprayer **10** include interfaced threading. Head connector **40** is rotatable relative to mounting head **18** to thread onto plural component sprayer **10**. It is understood, however, that mounting head **18** can be attached to plural component sprayer **10** in any desired manner. Central bore **34** extends axially through mounting head **18** on axis A-A. Material ports **36***a*, **36***b* are formed in mounting head **18** extend into chamber wall **38**. Material ports **36***a*, **36***b* provide exit ports through which the first and second component materials can exit mounting head **18**.

Receiving portion **42** extends from the body **41** of mounting head **18** on an opposite side of the body from head connector **40**. Chamber wall **38** defines a base of head chamber **46**. Slots **48***a*, **48***b* extend axially into receiving portion **42** towards the body of mounting head **18**. As shown, slots **48***a*, **48***b* are disposed on opposite lateral sides of receiving portion **42**. Slots **48***a*, **48***b* can be offset by about 180-degrees. It is understood, however, that slots **48***a*, **48***b*

can be disposed at any desired location on receiving portion **42**. In addition, slots **48***a*, **48***b* can be offset by any desired degree. In some examples, mounting head **18** includes only a single slot **48***a*, **48***b*. In other examples, mounting head **18** includes more than two slots **48***a*, **48***b*, such as three, four, or more slots **48***a*, **48***b*. Slots **48***a*, **48***b* can provide mistake-proofing by preventing installation of any fluid cartridge **20** that cannot mate with slots **48***a*, **48***b* to mount in head chamber **46**.

Pins **44** are disposed at the closed ends of slots **48***a*, **48***b* proximate the body of mounting head **18**. Pins **44** are formed from a resilient material, such as hardened steel, and provide braces against which a user can brace a tool to facilitate removal of fluid cartridge **20** from mounting head **18**. For example, the user can pry fluid cartridge **20** from mounting head **18** using a lever arm, such as a screwdriver, braced against one of pins **44**. Pins **44** prevent the lever from damaging mounting head **18**, which can be made from a less resilient material, such as plastic.

Fluid cartridge **20** is mounted within head chamber **46** of mounting head **18**. Receiving portion **42** extends around fluid cartridge **20**. Projections **56***a*, **56***b* extend into slots **48***a*, **48***b*, respectively. Projections **56***a*, **56***b* interfacing with slots **48***a*, **48***b* prevents undesired rotation of fluid cartridge **20** relative to mounting head **18**. Cartridge bore **54** extends through fluid cartridge **20** and is disposed on axis A-A. Fluid posts **58***a*. **58***b* project from second end **52** of fluid cartridge **20**. Fluid posts **58***a*. **58***b* extend into material ports **36***a*, **36***b* to form fluid connections between mounting head **18** and fluid cartridge **20**. Fluid posts **58***a*, **58***b* receive the first and second component materials from mounting head **18**. Purge post **60** projects from second end **52**. Purge post **60** extends into a purge air port, such as purge port **136** (shown in FIGS. **3**A and **3**B), formed in chamber wall **38** of mounting head **18**. Purge post **60** receives purge air from mounting head **18**.

Fluid cartridge **20** incorporates approximately 15 parts of prior plural component heads into one cartridge, which results in quicker head changes compared to the prior plural component heads used to apply binary compounds, like epoxy, which required that the point where the two components combine be cleaned or replaced regularly in order to operate. In many embodiments, metal and/or plastic housings for A(iso) and B(resin) contain side seals, side seal o-rings, springs, check valves designed in a way for easy removal and replacement to minimize down time. Fluid cartridge **20** may be disposable to minimize servicing time and for easy preventive maintenance.

Mix chamber assembly **22** extends through central bore **34** and cartridge bore **54** and is movable along axis A-A. Mix chamber assembly **22** is movable between a spray state, where mix chamber **64** receives the first and second component materials and sprays a resulting plural component material through spray orifice **72**, and a purge state, where mix chamber **64** receives purge air and sprays the purge air through spray orifice **72**. Chamber connector **66** is mounted to mix chamber **64** to form mix chamber assembly **22**.

Mix chamber assembly **22** is connected to actuator **16** such that actuator **16** drives mix chamber assembly **22** between the spray state and the purge state. Locking tab **74** projects from an end of chamber connector **66** opposite mix chamber **64**. Locking tab **74** forms a mounting feature of mix chamber assembly **22**. Locking tab **74** extends into tab lock **32** and is locked against axial displacement relative to actuator **16** by tab lock **32**. As such, actuator **16** can drive mix chamber assembly **22** between the spray and purge states along axis A-A. Tab lock **32** can be formed on actuator **16** or on another component attached to actuator **16**. The interface between mix chamber assembly **22** and actuator **16** facilitates simple and quick assembly and disassembly of plural component sprayer **10**. Mix chamber assembly **22** is attached to actuator **16** by aligning locking tab **74** with the orientation of the opening of tab lock **32**. Locking tab **74** is inserted into tab lock **32** through the opening and rotated such that locking flanges of tab lock **32** cover and axially secure locking tab **74** in tab lock **32**. Mix chamber assembly **22** can be removed by reversing the twisting motion and pulling mix chamber assembly **22** axially away from tab lock **32**. While mix chamber assembly **22** is described as mounting to actuator **16** by locking tab **74** and tab lock **32**, it is understood that mix chamber assembly **22** can be mounted to actuator **16** via any suitable connecting interface.

Mix chamber **64** receives the first and second component material and emits the plural component material from spray orifice **72**. Head **70** extends from an end of body **68** opposite chamber connector **66**. Spray orifice **72** is formed in the end of head **70**. Air cap **28** is configured to mount to head **70**. In the example shown, air cap **28** and head **70** can include interfaced threading to secure air cap **28** to mix chamber **64**. It is understood, however, that air cap **28** and mix chamber **64** can connect in any desired manner. With air cap **28** secured to mix chamber **64**, spray orifice **72** is disposed at opening **78** of air cap **28**. Air flows through openings (not shown) in air cap to assist in cleaning off of mix chamber **64**.

Retaining cap **24** connects to receiving portion **42** and secures fluid cartridge **20** within head chamber **46**. In the example shown, retaining cap **24** includes internal threading configured to interface with external threading on receiving portion **42**. It is understood, however, that retaining cap **24** can be secured to receiving portion **42** in any desired manner. Retaining cap **24** includes cap bore **76** disposed on axis A-A. A portion of mix chamber **64** extends through cap bore **76**. Cap seal **26** is disposed in retaining cap **24** about cap bore **76**. Cap seal **26** interfaces with air cap **28** when mix chamber **64** is in the spray state to ensure that the clean-off air flows through air cap **28**.

Plural component sprayer **10** can be easily assembled and disassembled. Plural component sprayer **10** thereby reduces downtime and increases the efficiency of spray operations. To assemble plural component sprayer **10**, locking tab **74** is aligned with the opening in tab lock **32** and inserted into tab lock **32**. Mix chamber assembly **22** is rotated, thereby securing locking tab **74** within tab lock **32**. Mounting head **18** is passed over mix chamber assembly **22** such that mix chamber assembly **22** extends through central bore **34**. Mounting head **18** is mounted to plural component sprayer **10** by head connector **40**. Manifold **30** is attached to mounting head **18**. Fluid cartridge **20** is inserted into head chamber **46** such that projections **56***a*, **56***b* are disposed in slots **48***a*, **48***b*. Fluid posts **58***a*, **58***b* extend into material ports **36***a*, **36***b*. Central extension **62** extends into central bore **34** and mix chamber assembly **22** passes through cartridge bore **54**. Purge post **60** extends into the purge port. Retaining cap **24** is mounted on receiving portion **42** to secure fluid cartridge **20** within head chamber **46**. Air cap **28** is attached to head **70** of mix chamber **64**. Plural component sprayer **10** is thus ready to initiate spraying.

Plural component sprayer **10** can require disassembly and replacement of parts. Air cap **28** is detached from head **70** and retaining cap **24** is removed from receiving portion **42**. Fluid cartridge **20** can then be pulled axially away from mounting head **18** and out of head chamber **46**. The user can place a lever arm, such as a screwdriver, between pin **44** and a portion of fluid cartridge **20**, such as projections **56***a*, **56***b*,

and brace the lever arm against pin **44** to assist in removal of fluid cartridge **20** from head chamber **46**. As discussed above, fluid cartridge **20** incorporates multiple replacement parts into a single module. A new fluid cartridge **20** can be mounted to mounting head **18**. Plural component sprayer **10** can be reassembled and returned to operation.

In some cases, mix chamber assembly **22** may also require replacement. The user can remove mounting head **18** from plural component sprayer **10** to expose mix chamber assembly **22**. Mix chamber assembly **22** is dismounted by rotating mix chamber assembly **22** and then pulling mix chamber assembly **22** axially away from actuator **16** such that locking tab **74** exits tab lock **32**. A new mix chamber assembly **22** can be mounted to actuator **16** and plural component sprayer **10** can be quickly reassembled and returned to operation. Mix chamber assembly **22** facilitates tool-less replacement of mix chamber **64**.

During operation, the first and second component materials enter manifold **30** and flow into mounting head **18**. The first component material enters fluid cartridge **20** at fluid post **58***a*, which is disposed in material port **36***a*, and the second component material enters fluid cartridge **20** at fluid post **58***b*, which is disposed in material port **36***b*. Mix chamber **64** is initially in the purge state such that the first and second component materials are blocked from flowing to spray orifice **72**, as discussed further herein.

The user actuates trigger **14**, which activates actuator **16** such that mix chamber **64** shifts to the spray state. The component materials enter mix chamber **64** and mix together to form the plural component material. The plural component material flows through mix chamber **64** and is ejected as a spray through spray orifice **72**. The upstream pressure driving the component materials to plural component sprayer **10** drives the first and second component materials, and the resulting plural component material, through manifold **30**, mounting head **18**, fluid cartridge **20**, and mix chamber **64** and out through spray orifice **72**.

The user releases trigger **14**, which causes actuator **16** to shift such that mix chamber **64** is driven back to the purge state by actuator **16**. Mix chamber **64** fluidly disconnects from the component material flowpaths in fluid cartridge **20**, stopping the flow of both the first component material and the second component material into mix chamber **64**. In the purge state, purge air flows through mix chamber **64** and out of spray orifice **72** to blow any remaining material out of mix chamber **64**. The purge air can continually flow through mix chamber **64** when mix chamber **64** is in the purge state. The purge air prevents curing within mix chamber **64**, which can destroy the operability of mix chamber **64**.

Plural component sprayer **10** provides significant advantages. Plural component sprayer **10** can be simply and quickly assembled and disassembled. The quick assembly reduces downtime due to part replacement, increasing productivity. Fluid cartridge **20** further facilities quick assembly by providing a single module containing various seals and other components that previously required individual assembly on-site. Fluid cartridge **20** can be disposable and replaced with a new fluid cartridge **20** to resume spray operations. Fluid cartridge **20** provides a single replacement part that also reduces the part count that the user is required to track, simplifying operations and providing easier tracking for the user. Mix chamber assembly **22** is also easily removed and replaced, further reducing downtime and increasing productivity.

FIG. **2**A is a cross-sectional view of plural component sprayer **10** taken along line **2**-**2** in FIG. **1**A. FIG. **2**B is an enlarged view of detail Z in FIG. **2**A. FIGS. **2**A and **2**B will be discussed together. Actuator **16**, mounting head **18**, fluid cartridge **20**, mix chamber assembly **22**, retaining cap **24**, air cap **28**, and manifold **30**. Actuator **16** includes tab lock **32**. Central bore **34**, material ports **36***a*. **36***b*; chamber wall **38**; head connector **40**; pins **44**; slots **48***a*, **48***b*; and material passages **80***a*, **80***b* of mounting head **18** are shown. First end **50**, second end **52**, cartridge bore **54**, projections **56***a*, **56***b*; fluid posts **58***a*, **58***b*; central extension **62**; mixer body **82**; seal housings **84***a*, **84***b*; fluid checks **86***a*, **86***b*; side seals **88***a*, **88***b*; material pathways **90***a*, **90***b*; cartridge cover **92**; purge chamber **94**; and retaining members **103***a*, **103***b* of fluid cartridge **20** are shown. Fluid checks **86***a*, **86***b* include springs **96***a*, **96***b* and balls **98***a*, **98***b*, respectively. Side seals **88***a*, **88***b* include side springs **100***a*, **100***b* and seal members **102***a*, **102***b*, respectively. Seal members **102***a*, **102***b* include seal passages **120***a*. **120***b*, respectively. Mix chamber assembly **22** includes mix chamber **64** and chamber connector **66**. Body **68**, head **70**, spray orifice **72**, tail **104**, inlet bores **106***a*, **106***b*; and mix bore **108** of mix chamber **64** are shown. Body **68** includes first body end **110**, second body end **112**, lateral sides **114***a*, **114***b* and ramps **116***a*, **116***b*. Tail **104** includes pin bore **118**. Chamber connector **66** includes locking tab **74**.

Mounting head **18** is mounted to the body of plural component sprayer **10**. Head connector **40** is rotatably disposed on mounting head **18**. Head connector **40** secures mounting head **18** to plural component sprayer **10**. Material passages **80***a*, **80***b* extend through mounting head **18** and convey the first and second component materials from manifold **30** to material ports **36***a*, **36***b*, respectively. Material ports **36***a*, **36***b* extend into chamber wall **38** of mounting head **18**. Central bore **34** extends axially through mounting head **18**. Slots **48***a*, **48***b* are formed in receiving portion **42** (FIGS. **1**B and **3**A-**4**B) of mounting head **18**. Slots **48***a*, **48***b* ensure proper alignment of fluid cartridge **20** during assembly and prevent rotation of fluid cartridge **20** relative to mounting head **18** to assist in maintaining fluid cartridge **20** in the proper position during assembly and operation. Pins **44** are disposed at the closed ends of slots **48***a*, **48***b*.

Fluid cartridge **20** is fluidly connected to mounting head **18** and secured within the receiving portion **42**. Retaining cap **24** is attached to mounting head **18** and secures fluid cartridge **20** within the head chamber **46**. Seal housings **84***a*, **84***b* are disposed on opposite sides of mixer body **82**. Projections **56***a*, **56***b* are formed by portions of seal housings **84***a*, **84***b*. Projections **56***a*, **56***b* are received in slots **48***a*, **48***b*. Cartridge cover **92** extends over portions of seal housings **84***a*, **84***b* and mixer body **82** to secure seal housings **84***a*, **84***b* and mixer body **82** together to form fluid cartridge **20**. In some examples, cartridge cover **92** can form a permanent connection such that disassembling fluid cartridge **20** would destroy the operability of one or more parts forming fluid cartridge **20**. In some examples, fasteners **122**, such as pins or screws, among other options, extend through mixer body **82** and seal housings **84***a*, **84***b* to join mixer body **82** and seal housings **84***a*, **84***b* together. Cartridge cover **92** can cover the openings that fasteners **122** extend through. While fluid cartridge **20** is described as formed from separate seal housings **84***a*, **84***b*; mixer body **82**; and cartridge cover **92**, it is understood that fluid cartridge **20** can be formed as a unitary part. For example, fluid cartridge **20** can be formed by molding, casting, additive manufacturing, or any other suitable manufacturing process. In addition, the components forming fluid cartridge **20** can be permanently joined in some examples, such that disassembling the components destroys the operability of fluid cartridge **20**.

Material pathways **90***a*, **90***b* extend through seal housings **84***a*, **84***b*, respectively. Material pathways **90***a*, **90***b* provide

flowpaths for the first and second component materials to flow through fluid cartridge **20** to central bore **34**. Fluid checks **86***a*, **86***b* are disposed at the inlet ends of material pathways **90***a*, **90***b*, respectively. Fluid posts **58***a*, **58***b* project from second end **52** of fluid cartridge **20** and are configured to extend into material ports **36***a*, **36***b*, respectively. Fluid checks **86***a*, **86***b* are disposed at the inlet ends of material pathways **90***a*, **90***b* and are, in the example shown, at least partially disposed in fluid posts **58***a*, **58***b*. Balls **98***a*, **98***b* are disposed in material pathways **90***a*, **90***b* and springs **96***a*, **96***b* interface with balls **98***a*, **98***b* to bias balls **98***a*, **98***b* into closed positions. The seats of each fluid check **86***a*, **86***b* is formed by a component attached to fluid posts **58***a*, **58***b*. The seat portion can be attached to fluid posts **58***a*, **58***b* in any desired manner, such as press-fitting or threading, among other options. Fluid checks **86***a*, **86***b* prevent fluid from backflowing out of fluid cartridge **20** into material passages **80***a*, **80***b* of mounting head **18**. As such, fluid checks **86***a*, **86***b* ensure that any cross-over cannot flow into and contaminate mounting head **18**.

Side seals **88***a*, **88***b* are at least partially disposed in material pathways **90***a*, **90***b*, respectively. Side springs **100***a*, **100***b* are disposed in material pathways **90***a*, **90***b* and bias seal members **102***a*, **102***b* towards axis A-A. Seal members **102***a*, **102***b* include flat faces to engage and seal against the flat lateral sides **114***a*, **114***b* of mix chamber **64**. Seal members **102***a*, **102***b* provide the component materials to inlet bores **106***a*, **106***b*. Seal members **102***a*, **102***b* include seal passages **120***a*. **120***b* through which the component materials flow. Side seals **88***a*, **88***b* are pre-loaded, meaning that side springs **100***a*, **100***b* exert force on seal members **102***a*, **102***b* to bias seal members **102***a*, **102***b* into cartridge bore **54** prior to installation of mix chamber assembly **22**. Seal members **102***a*, **102***b* project partially out of material pathways **90***a*, **90***b* and into cartridge bore **54**. Retaining members **103***a*, **103***b*, such as clips, are disposed in material pathways **90***a*, **90***b* proximate cartridge bore **54** and interface with seal members **102***a*, **102***b* to retain seal members **102***a*, **102***b* in material pathways **90***a*, **90***b* and limit the extent to which seal members **102***a*, **102***b* can project into cartridge bore **54**. Seal members **102***a*, **102***b* project into cartridge bore **54** prior to installation of mix chamber assembly **22** to ensure proper engagement and sealing between seal members **102***a*, **102***b* and lateral sides **114***a*, **114***b*.

Central extension **62** is formed by a portion of mixer body **82** that extends beyond second end **52** of fluid cartridge **20**. Central extension **62** extends into central bore **34** of mounting head **18**. Cartridge bore **54** extends axially through fluid cartridge **20**. Purge chamber **94** is formed in a portion of cartridge bore **54**. Mix chamber **64** is disposed in cartridge bore **54** and movable along axis A-A.

Mix chamber assembly **22** is disposed on axis A-A. Mix chamber assembly **22** is attached to actuator **16** to be moved along axis A-A. Mix chamber assembly **22** receives the first and second component materials. The plural component material is formed in mix chamber assembly **22** and sprayed from spray orifice **72** formed in mix chamber **64**. Chamber connector **66** is mounted to tail **104** by a pin extending through chamber connector **66** and pin bore **118**. It is understood, however, that chamber connector **66** can be attached to mix chamber **64** in any desired manner, such as by interfaced threading, among other options. Locking tab **74** is disposed at an end of chamber connector **66** opposite mix chamber **64**. Locking tab **74** is received by tab lock **32** to secure mix chamber assembly **22** to actuator **16**.

Body **68** extends between first body end **110** and second body end **112**. Body **68** can also be referred to as a chamber body. Head **70** projects from first body end **110**. Air cap **28** is mounted on head **70** and can be attached to head **70** in any desired manner. For example, head **70** and air cap **28** can include interfaced threading, among other options. Tail **104** extends from second body end **112**. Pin bore **118** projects through tail **104**.

Lateral sides **114***a*, **114***b* extend between first body end **110** and second body end **112**. Lateral sides **114***a*, **114***b* form flat axial faces that facilitate sliding engagement between seal members **102***a*, **102***b* and lateral sides **114***a*, **114***b*. Ramps **116***a*, **116***b* form a transition between first end **50** and second end **52**. Ramps **116***a*, **116***b* facilitate installation of mix chamber **64**, which is inserted into cartridge bore **54** from second end **52** and in direction D1. Ramps **116***a*, **116***b* engage seal members **102***a*, **102***b* and push seal members **102***a*, **102***b* away from axis A-A to widen the gap between seal members **102***a*, **102***b* and allow mix chamber **64** to pass under seal members **102***a*, **102***b* so seal members **102***a*, **102***b* pass onto and engage lateral sides **114***a*, **114***b*. Ramps **116***a*, **116***b* form a transition feature of mix chamber **64** that facilitates installation of mix chamber **64** through pre-loaded side seals **88***a*, **88***b*.

Inlet bores **106***a*, **106***b* extend into lateral sides **114***a*, **114***b*, respectively, and through body **68** to mix bore **108**. In some examples, inlet bores **106***a*, **106***b* extend radially through body **68**. It is understood, however, that inlet bores **106***a*, **106***b* can be disposed at any desired orientation relative to axis A-A that provide fluid flow paths to mix bore **108**. Mix bore **108** extends through mix chamber **64** between inlet bores **106***a*, **106***b* and spray orifice **72**. Mix bore **108** receives fluid from inlet bores **106***a*, **106***b* and provides the fluid to spray orifice **72**. Mix chamber **64** moves along axis A-A between a first position associated with the spray state, where mix chamber **64** receives the individual component materials from inlet bores **106***a*, **106***b* and provides the resulting plural component material to spray orifice **72**, and a second position associated with the purge state, where mix chamber receives purge air from inlet bores **106***a*, **106***b* and provides the purge air to spray orifice **72**.

Mix chamber assembly **22**, mounting head **18**, and fluid cartridge **20** are removable from plural component sprayer **10**. During assembly, mix chamber assembly **22** is mounted to actuator **16**. Locking tab **74** is inserted into tab lock **32** and rotated to secure locking tab **74** to actuator **16**. Mounting head **18** is moved axially in direction D2 such that mix chamber **64** passes through central bore **34**. Head connector **40** is secured to gun body **13**.

Fluid cartridge **20** is moved axially in direction D2 and onto mounting head **18**. Fluid posts **58***a*, **58***b* extend into and are received by material ports **36***a*, **36***b*, thereby forming fluid and mechanical connections between fluid cartridge **20** and mounting head **18**. Central extension **62** extends into and is received by central bore **34**. Projections **56***a*, **56***b* are received by slots **48***a*, **48***b*, facilitating proper alignment of fluid cartridge **20** and mounting head **18** as fluid cartridge **20** is shifted into position on mounting head **18**.

As fluid cartridge **20** shifts in direction D2, mix chamber **64** passes through cartridge bore **54**. Ramps **116***a*, **116***b* are the first portion of mix chamber **64** to contact seal members **102***a*, **102***b*. Ramps **116***a*, **116***b* form a sloped transition feature that pushes seal members **102***a*, **102***b* away from axis A-A, widening the gap between seal members **102***a*, **102***b* as mix chamber **64** passes through cartridge bore **54**. Lateral sides **114***a*, **114***b* pass under seal members **102***a*, **102***b* and are sealingly engaged by seal members **102***a*, **102***b*. Seal

members **102***a*, **102***b* form sliding seals that maintain engagement with lateral sides **114***a*, **114***b* throughout operation.

Cartridge cover **92** is attached to mounting head **18** to secure fluid cartridge **20** in place on mounting head **18**. Air cap **28** is attached to head **70**. Manifold **30** is attached to mounting head **18**. Plural component sprayer **10** is thus ready for operation. While mounting head **18** and fluid cartridge **20** are described as separately formed components, it is understood that mounting head **18** and fluid cartridge **20** can be permanently attached or unitarily formed such that mounting head **18** and fluid cartridge **20** form a removable mounting and mixing assembly.

Fluid cartridge **20** facilitates quick and easy replacement of fluid scaling components, such as side seals **88***a*, **88***b*, thereby reducing downtime during operation. In addition, fluid cartridge **20** incorporates the fluid scaling components into a single assembly, thereby reducing the number of replacement parts to one, further reducing downtime and increasing productivity. To replace fluid cartridge **20**, the user removes air cap **28** and cartridge cover **92**. Fluid cartridge **20** is pulled axially in direction D**1**, removing fluid posts **58***a*, **58***b* from material ports **36***a*, **36***b* and central extension **62** from central bore **34**. Mix chamber **64** shifts in direction D**2** through cartridge bore **54** and removed from cartridge bore **54**. A new fluid cartridge **20** can then be installed as described above. Plural component sprayer **10** is ready to spray.

If a new mix chamber **64** is required, mounting head **18** can be disconnected from gun body **13** and pulled in direction D**1** off of mix chamber **64**. Manifold **30** can remain connected to mounting head **18** during disassembly. Mix chamber assembly **22** is rotated and pulled in direction D**1** to remove locking tab **74** from tab lock **32**. A new mix chamber **64** assembly can be attached at tab lock **32** and mounting head **18** and fluid cartridge **20** can be installed as described above. In some examples, the pin can be pulled from pin bore **118**, thereby disconnecting chamber connector **66** from mix chamber **64**. A new mix chamber **64** can be attached to chamber connector **66** to form a new mix chamber assembly **22**. In some examples, the user can swap different mix chamber assemblies **22** having different spray orifice configurations to provide different spray patterns. Mix chamber assembly **22** facilitates easy removal and replacement of the fluid handling components of plural component sprayer **10**.

During operation, actuator **16** is driven in direction D**1** to stop spraying of the plural component material and in direction D**2** to initiate spraying of the plural component material. It is understood, however, that plural component sprayer **10** can be configured such that actuator **16** is driven in direction D**1** to initiate spraying and in direction D**2** to stop spraying. For example, mix chamber **64** can be configured such that inlet bores **106***a*, **106***b* are disposed on an opposite side of seal members **102***a*, **102***b* from spray orifice **72** with mix chamber **64** in the purge state.

Actuator **16** and mix chamber assembly **22** are shown in the spray state in FIGS. **2**A and **2**B. Initially, mix chamber assembly **22** is in a first position, where inlet bores **106***a*, **106***b* are shifted in direction D**1** relative to seal members **102***a*, **102***b* such that inlet bores **106***a*, **106***b* are forward of seal members **102***a*, **102***b* and fluidly isolated from material pathways **90***a*, **90***b* by seal members **102***a*, **102***b*. In the first position, inlet bores **106***a*. **106***b* are positioned in purge chamber **94** to receive purge air, as discussed further below with regard to FIGS. **3**A and **3**B. The purge air flows through inlet bores **106***a*, **106***b* and mix bore **108** and out of spray orifice **72**. In some examples, the purge air continuously flows to purge chamber **94** and thus through mix chamber **64** when mix chamber **64** is in the purge state. The purge air blows any component material that remains in mix chamber **64** out of mix chamber **64** through spray orifice **72**, preventing curing in mix chamber **64** and maintaining the operability of mix chamber **64**.

The first component material enters mounting head **18** and flows through material passage **80***a* to material port **36***a*. The upstream pressure of the first component material opens fluid check **86***a* and drives the first component material through fluid check **86***a*. The first component material flows through material pathway **90***a* and seal member **102***a* and deadheads against lateral side **114***a*. The upstream pressure pushes seal member **102***a* into engagement with lateral side **114***a*, enhancing the seal formed therebetween. In the example shown, seal member **102***a* forms an annular seal on lateral side **114***a*. Side seal **88***a* further wipes lateral side **114***a* as mix chamber **64** shifts positions to prevent any first component material residue from residing on lateral side **114***a*, which material could cure on lateral side **114***a* and damage seal member **102***a*.

The second component material enters mounting head **18** and flows through material passage **80***b* to material port **36***b*. The upstream pressure of the second component material opens fluid check **86***b* and drives the second component material through fluid check **86***b*. The second component material flows through material pathway **90***b* and seal member **102***b* and deadheads against lateral side **114***b*. The upstream pressure further pushes seal member **102***b* into engagement with lateral side **114***b*, enhancing the seal formed therebetween. In the example shown, seal member **102***b* forms an annular seal on lateral side **114***b*. Side seal **88***b* wipes lateral side **114***b* as mix chamber **64** shifts positions to prevent any second component material residue from residing on lateral side **114***b*, which material could cure on lateral side **114***b* and damage seal member **102***b*.

To initiate spraying, actuator **16** is driven in direction D**2**. Actuator **16** pulls mix chamber assembly **22** in direction D**2** and into the spray state. Inlet bores **106***a*, **106***b* pass under seal members **102***a*, **102***b* and into fluid communication with material pathways **90***a*, **90***b*. The upstream pressure in material pathway **90***a* drives the first component material through inlet bore **106***a* to mix bore **108**. The upstream pressure in material pathway **90***b* drives the second component material through inlet bore **106***b* to mix bore **108**. The first and second component materials combine in mix bore **108** to form the plural component material. The plural component material is ejected as a spray through spray orifice **72**.

To stop spraying, actuator **16** is driven in direction D. Actuator **16** pushes mix chamber assembly **22** in direction D**1** and into the purge state. Inlet bores **106***a*. **106***b* pass under seal members **102***a*, **102***b* and out of fluid communication with material pathways **90***a*. **90***b*. The purge air flows through inlet bores **106***a*, **106***b* and mix bore **108** and blows the material remaining in inlet bores **106***a*, **106***b* and mix bore **108** out of spray orifice **72**.

In some cases, the first or second component material can cross-over into the opposite material passage **80***a*, **80***b*, causing curing at that location. For example, such cross-over can occur when the upstream pressures of the first and second component materials are imbalanced. Fluid checks **86***a*, **86***b* prevent any such cross-over from exiting fluid cartridge **20**. As such, the cross-over and contamination is contained within fluid cartridge **20**. Fluid checks **86***a*. **86***b* prevent mounting head **18** from being contaminated in the

event of cross-over. As discussed above, fluid cartridge **20** can be easily removed and a new fluid cartridge **20** installed to return plural component sprayer **10** to operation.

Plural component sprayer **10** provides significant advantages. Fluid cartridge **20** facilitates quick and easy replacement of the fluid handling components that can be contaminated by cross-over. Fluid cartridge **20** provides a single replacement part, reducing the user's part count and inventory, reducing downtime, and increasing operational efficiency. Mix chamber **64** facilities installation through the pre-loaded side seals **88***a*, **88***b* within fluid cartridge **20**. Mix chamber assembly **22** can easily be attached to and detached from actuator **16**, facilitating quick replacement, reducing downtime, and increasing operational efficiency.

FIG. **3**A is a cross-sectional view of plural component sprayer **10** taken along line **3-3** in FIG. **1**A. FIG. **3**B is an enlarged view of detail Y in FIG. **3**A. FIGS. **3**A and **3**B will be discussed together. Plural component sprayer **10** includes handle **12**; trigger **14**; actuator **16**; mounting head **18**; fluid cartridge **20**; mix chamber assembly **22**; retaining cap **24**; air cap **28**; manifold **30**; control valve **124** (FIG. **3**A); air inlets **126** (FIG. **3**A); air exhaust **128** (FIG. **3**A); control paths **130***a*, **130***b* (FIG. **3**A); and purge air path **132**. Actuator **16** includes tab lock **32**. Central bore **34**, head connector **40**, chamber wall **38**, receiving portion **42**, purge bore **134**, purge port **136**, and fastener bore **138** of mounting head **18** are shown. Receiving portion **42** defines head chamber **46**. First end **50**, second end **52**, cartridge bore **54**, purge post **60**, central extension **62**, mixer body **82**, fluid check **86***c*, cartridge cover **92**, purge chamber **94**, purge path **140**, and locating pin **142** of fluid cartridge **20** are shown. Fluid check **86***c* includes spring **96***c* and ball **98***c*. Mix chamber assembly **22** includes mix chamber **64** and chamber connector **66**. Body **68**, head **70**, spray orifice **72**, tail **104**, and mix bore **108** of mix chamber **64** are shown. Body **68** includes first body end **110**, second body end **112**, and slot **144**. Tail **104** includes pin bore **118**. Chamber connector **66** includes locking tab **74**.

Air inlets **126** extend into plural component sprayer **10** and are configured to receive an air supply line (not shown) extending from a pressurized air source (not shown), such as an air compressor or an air tank. Air inlets **126** provide pathways for the compressed air to enter plural component sprayer **10**. The multiple air inlets **126** provide alternative connecting points for the air supply line. The air inlet **126** not in use can be plugged. Air inlets **126** extend to control valve **124**. Air exhaust **128** extends from control valve **124** through handle **12**. Air exhaust **128** provides a pathway for compressed air to exhaust from plural component sprayer **10**.

Actuator **16** is disposed in plural component sprayer **10** and is configured to actuate mix chamber **64** between the spray state, where mix chamber **64** is positioned to receive the first and second component materials and eject the plural component material from spray orifice **72**, and the purge state, where mix chamber **64** is fluidly disconnected from the first and second component materials and is instead positioned receive purge air from purge chamber **94**. In the example shown, actuator **16** is a pneumatic piston.

Control valve **124** is disposed in plural component sprayer **10** and controls the flow of air through control paths **130***a*, **130***b* to and from actuator **16**. Trigger **14** is pivotably connected to plural component sprayer **10** and actuates control valve **124** between a first position, where control valve **124** directs compressed air from an air inlet **126** to actuator **16** via control path **130***a* and directs spent compressed air from actuator **16** to air exhaust **128** via control path **130***b*, and a second position, where control valve **124** directs compressed air from an air inlet **126** to actuator **16** via control path **130***b* and directs spent compressed air from actuator **16** to air exhaust **128** via control path **130***a*. Directing the compressed air via control path **130***a* drives actuator **16**, and thus mix chamber assembly **22**, in direction D**2** to place mix chamber assembly **22** in the spray state such that mix chamber **64** receives the first and second component fluids. Directing the compressed air via control path **130***b* drives actuator **16**, and thus mix chamber assembly **22**, in direction D**1** to fluidly disconnect mix chamber assembly **22** from the first and second component fluid flows and place mix chamber assembly **22** in the purge state.

Purge air path **132** extends from control valve **124** to purge port **136** in mounting head **18**. Purge air path **132** is continuously connected to the flow of compressed air entering plural component sprayer **10** via air inlet **126**. The purge air is a portion of the compressed air provided via air inlet **126** that flows through purge air path **132** to mounting head **18**.

Mounting head **18** is mounted to plural component sprayer **10**. Head connector **40** secures mounting head **18** to gun body **13**. In the example shown, head connector **40** and plural component sprayer **10** include interfaced threading. Manifold **30** is mounted to mounting head **18** to provide the first and second component materials to mounting head **18**. In the example shown, manifold fastener **146** extends into fastener bore **138** formed in mounting head **18**. It is understood, however, that manifold **30** can be mounted to mounting head **18** in any desired manner.

Receiving portion **42** extends from an opposite end of mounting head **18** from head connector **40**. Head chamber **46** is defined by receiving portion **42** and is configured to receive fluid cartridge **20**. Purge bore **134** extends through mounting head **18** to purge port **136**. Purge port **136** extends into chamber wall **38**. Purge bore **134** receives purge air from purge air path **132**. Purge bore **134** provides the purge air to fluid cartridge **20** at purge bore **134**.

Fluid cartridge **20** is disposed in head chamber **46**. Central extension **62** extends along axis A-A and projects beyond second end **52** of fluid cartridge **20**. Central extension **62** is formed by a part of mixer body **82** extending beyond second end **52**. Central extension **62** extends into central bore **34** of mounting head **18**. Cartridge bore **54** extends through fluid cartridge **20** from first end **50** through central extension **62**. Cartridge bore **54** receives mix chamber **64**. Mix chamber **64** can shift axially along axis A-A within cartridge bore **54**. Slot **144** is formed in a bottom of body **68**. Slot **144** extends along axis A-A between first body end **110** and second body end **112**. Locating pin **142** is mounted to mixer body **82** and extends into cartridge bore **54**. Locating pin **142** is disposed within and slides along slot **144** as mix chamber **64** shifts between the spray and purge states. Locating pin **142** interfacing with slot **144** ensures proper installation and alignment of mix chamber **64**. Locating pin **142** and slot **144** ensure that the correct mix chamber **64** is installed, as locating pin **142** will prevent incorrectly configured mix chambers **64** from passing through cartridge bore **54**. In addition, locating pin **142** and slot **144** provide mistake-proofing by preventing mix chamber **64** from being installed inverted. While locating pin **142** is shown as separately formed from body **68**, it is understood that locating pin **142** and body **68** can be formed as a unitary part, in some examples. While fluid cartridge **20** is shown as including locating pin **142**, it is understood that fluid cartridge **20** can include a projection of any desired type suitable for inter-

facing with slot **144**. For example, locating pin **142** can be formed as a rail or other elongate projection or as a series of discrete projections.

Purge post **60** projects from second end **52**. Purge post **60** extends into purge bore **134** of mounting head **18**. Fluid check **86***c* is disposed in fluid cartridge **20** and retained within fluid cartridge **20** by purge post **60**. In the example shown, a portion of purge post **60** forms the seat for ball **98** of fluid check **86***c*. Spring **96** biases ball **98** into a closed position such that ball **98** is normally seated in a closed position.

Purge path **140** extends through fluid cartridge **20** from purge post **60** to cartridge bore **54**. Purge path **140** is configured to provide purge air to purge chamber **94** of cartridge bore **54**. Fluid check **86***c* allows purge air to enter purge path **140** while preventing backflow of either air or material into mounting head **18** from purge path **140**. For example, if cross-over or other leakage of the component materials occurs, the component materials could flow into purge path **140**. Fluid check **86***c* prevents the material from backflowing into purge bore **134** from fluid cartridge **20**. As such, fluid check **86***c* keeps the air paths within mounting head **18** and plural component sprayer **10** free from material contamination. If such contamination does occur in fluid cartridge **20**, the contamination is limited to fluid cartridge **20** such that the user only need replace fluid cartridge **20**, not mounting head **18** or other upstream components, to return plural component sprayer **10** to operation. While fluid check **86***c* is shown as a ball check valve, it is understood that fluid check **86***c* can be of any desired configuration suitable for ensuring one-way flow through purge post **60**.

Mix chamber assembly **22** is operatively connected to actuator **16**. Chamber connector **66** is disposed on and connected to tail **104** of mix chamber **64**. Locking tab **74** projects from an end of chamber connector **66** opposite mix chamber **64**. Locking tab **74** is disposed in tab lock **34** of actuator **16**.

During operation, control valve **124** is initially positioned to direct compressed air via control path **130***b*. The compressed air flows to the chamber housing actuator **16** and pushes actuator **16** in direction D1. Actuator **16** pushes mix chamber assembly **22** in direction D1 and into the purge state. The purge air portion of the compressed air flows from control valve **124** through purge air path **132** in plural component sprayer **10** and through purge bore **134** in mounting head **18**. The purge air has sufficient pressure to open fluid check **86***c*. The purge air flows through purge path **140** and to purge chamber **94**. With mix chamber assembly **22** in the purge state, inlet bores **106***a*, **106***b* (best seen in FIGS. **2**A and **2**B) are fluidly connected to purge chamber **94**. The purge air enters mix chamber **64** through inlet bores **106***a*, **106***b* and flows through mix bore **108** to spray orifice **72**. The purge air carries any component material or residue in mix chamber **64** out through spray orifice **72**, preventing undesired curing within mix chamber **64**.

To initiate spraying, the user actuates trigger **14**, which actuates control valve **124** such that control valve **124** fluidly connects air inlet **126** with control path **130***a* and fluidly connects control path **130***b* with air exhaust. The portion of compressed air that biased actuator **16** in direction D1 is exhausted through control path **130***b* and air exhaust **128**. Another portion of compressed air is provided to actuator **16** via control path **130***a*. That portion of compressed air drives actuator **16** in direction D2. Actuator **16** pulls mix chamber **64** to the spray state. Mix chamber **64** receives the first and second component materials and emits a spray of the plural component material from spray orifice **72**. The purge air continues to flow to purge chamber but is prevented from entering mix chamber by seal members **102***a*, **102***b* (FIGS. **2**A and **2**B).

The user releases trigger **14** and control valve **124** returns to the initial position. Compressed air drives actuator **16** in direction D1 and actuator **16** pushes mix chamber **64** to the purge state. The purge air clears any remaining material from mix bore **108**.

Fluid cartridge **20** provides significant advantages. Fluid cartridge **20** facilitates quick and easy replacement of the fluid handling components that can be contaminated by cross-over. Fluid cartridge **20** provides a single replacement part, reducing the user's part count and inventory, reducing downtime, and increasing operational efficiency. Fluid check **86***c* allows purge air to enter fluid cartridge **20** but prevents any upstream flow out of purge path **140** to mounting head **18**. As such, any contamination that may occur in fluid cartridge **20** is confined to fluid cartridge **20**. The air paths upstream of fluid check **86***c* are protected from contamination.

FIG. **4**A is a front isometric view of mounting head **18**. FIG. **4**B is a front elevation view of mounting head **18**. FIG. **4**C is a bottom plan view of mounting head **18**. FIGS. **4**A-**4**C will be discussed together. Mounting head **18** includes central bore **34** (FIGS. **4**A and **4**B), material ports **36***a*, **36***b* (FIGS. **4**A and **4**B); chamber wall **38** (FIGS. **4**A and **4**B), receiving portion **42**, pins **44** (FIGS. **4**A and **4**B), purge port **136** (FIG. **4**B), fastener bore **138** (FIG. **4**C), clean-off air port **148** (FIG. **4**B), clean-off control port **150** (FIG. **4**A), grease inlet **152** (FIG. **4**A), grease outlet **154** (FIG. **4**B), and inlet ports **156** (FIG. **4**C). Receiving portion **42** defines head chamber **46** (FIGS. **4**A and **4**B) and includes slots **48***a*, **48***b* (FIGS. **4**A and **4**B).

Mounting head **18** connects to plural component sprayer (best seen in FIGS. **1**A, **1**B. **2**A, and **3**A) and receives the first and second component materials from manifold **30** (best seen in FIG. **1**B). A connector, such as head connector **40** (FIGS. **1**A-**3**B), is connected to an end of mounting head **18** opposite receiving portion **42**. Receiving portion **42** projects from mounting head **18** and is configured to receive fluid cartridge **20** (best seen in FIGS. **2**B, **3**B, **5**A, and **5**B). Chamber wall **38** defines the end of receiving portion **42**. Receiving portion **42** includes external threading to receive a cover, such as retaining cap **24** (FIGS. **1**A-**3**B), to secure fluid cartridge **20** within receiving portion **42**. Central bore **34** extends axially through mounting head **18**. Central bore **34** provides a passage through which a mix chamber assembly, such as mix chamber assembly **22** (FIGS. **1**B-**3**B), can extend.

Slots **48***a*, **48***b* extend axially into receiving portion **42** towards the body of mounting head **18**. It is understood, however, that slots **48***a*, **48***b* can be disposed at any desired location on receiving portion **42**. Slots **48***a*, **48***b* are configured to receive projections **56***a*, **56***b* (best seen in FIGS. **1**B, **5**A, and **5**B) of fluid cartridge **20** to ensure proper alignment of fluid cartridge **20** in receiving portion **42** during assembly and to prevent fluid cartridge **20** from rotating relative to mounting head **18**. Pins **44** are disposed at the closed ends of slots **48***a*, **48***b* proximate the body of mounting head **18**. Pins **44** are formed from a resilient material, such as hardened steel, and provide braces against which a user can brace a lever arm, such as a screwdriver, to facilitate removal of fluid cartridge **20** from mounting head **18**.

Grease inlet **152** extends into mounting head **18**. Grease inlet **152** provides a port through which a user can supply grease to components of plural component sprayer **10**. The grease flows through mounting head **18** from grease inlet

152 to grease outlet 154. Clean-off air port 148 extends into chamber wall 38. Clean-off air port 148 is configured to provide clean off air to an air cap, such as air cap 28 (FIGS. 1A-3B). The clean off air exits fluid head at clean-off air port 148 and flows through fluid cartridge 20 to air cap 28. A control valve, such as a needle valve, can be mounted to mounting head 18 at clean-off control port 150 to control the flow of clean off air through mounting head 18. Air cap 28 includes internal passages configured to eject the clean-off air proximate the spray orifice of the mix chamber.

Fastener bore 138 extends into a bottom of mounting head 18. Fastener bore 138 is configured to receive a fastener, such as a bolt, to secure manifold 30 to mounting head 18. Inlet ports 156 extend into a bottom of mounting head 18 and are configured to receive the individual component materials from manifold 30. Material ports 36*a*, 36*b* extend into chamber wall 38 of mounting head 18. Each material ports 36*a*. 36*b* is fluidly connected to one of inlet ports 156. Material ports 36*a*, 36*b* are configured to receive fluid posts projecting from fluid cartridge 20. Material ports 36*a*, 36*b* provide the component materials to fluid cartridge 20. Purge port 136 extends into chamber wall 38. Purge port 136 is configured to receive a purge post projection from fluid cartridge 20 to provide purge air to fluid cartridge 20.

Mounting head 18 facilitates quick and simple assembly and disassembly of plural component sprayer 10. Mounting head 18 can be connected and disconnected from plural component sprayer 10 via the connector. In some examples, mounting head 18 facilitates retrofitting of existing plural component sprayers. For example, previous components can be removed and mounting head 18 can be connected to the gun body of the prior sprayer. Mounting head 18 provides the necessary flowpaths to provide component materials, air, and grease to the fluid handling components, such as fluid cartridge 20 and mix chamber 64, of plural component sprayer 10.

FIG. 5A is a first isometric view of fluid cartridge 20. FIG. 5B is a second isometric view of fluid cartridge 20. FIGS. 5A and 5B will be discussed together. Fluid cartridge 20 includes cartridge body 49 that includes first end 50, second end 52, cartridge bore 54, projections 56*a*, 56*b*, fluid posts 58*a*, 58*b*, purge post 60, central extension 62, mixer body 82, seal housings 84*a*, 84*b*, and cartridge cover 92. Fluid cartridge 20 further includes grease port 158; clean-off inlet 160; and clean-off outlets 162. Cartridge cover 92 includes cover slots 93*a*, 93*b*.

Seal housings 84*a*, 84*b* are disposed on opposite sides of mixer body 82. Central extension 62 is formed by a portion of mixer body 82 extending beyond second end 52. Cartridge bore 54 extends axially through fluid cartridge 20 from first end 50 and through central extension 62. Central extension 62 extends into central bore 34 (FIGS. 1B-4B) of mounting head 18 (best seen in FIGS. 4A-4C). Central bore 34 receives a mix chamber, such as mix chamber 64 (best seen in FIGS. 6A-6D), mix chamber 64' (FIGS. 7A and 7B), mix chamber 64" (FIGS. 8A and 8B), mix chamber 64"' (FIGS. 9A and 9B), and mix chamber 64"" (FIGS. 10A and 10B). Side seals 88*a*, 88*b* (FIGS. 2A and 2B) disposed within seal housings 84*a*, 84*b* are preloaded and seal members 102*a*, 102*b* (FIGS. 2A and 2B) of the side seals 88*a*, 88*b* project into central bore 34 from seal housings 84*a*, 84*b*.

Fluid posts 58*a*, 58*b* extend from seal housings 84*a*, 84*b*, respectively. Fluid posts 58*a*, 58*b* project from second end 52 of fluid cartridge 20. In the example shown, fluid posts 58*a*, 58*b* project from seal housings 84*a*. 84*b*. Fluid posts 58*a*. 58*b* are configured to extend into material ports 36*a*. 36*b* (best seen in FIG. 2B) of mounting head 18. Fluid post 58*a* receives a first component material and fluid post 58*b* receives a second component material from mounting head 18. As discussed above, check valves are disposed in fluid cartridge 20 proximate fluid posts 58*a*, 58*b* to prevent material from backflowing out of fluid posts 58*a*. 58*b*. Flowpaths extend through fluid cartridge 20 from fluid posts 58*a*, 58*b* to cartridge bore 54 to provide the first and second component materials to the mix chamber disposed in cartridge bore 54. Fluid posts 58*a*, 58*b* are disposed on opposite sides of central extension 62. It is understood, however, that fluid posts 58*a*, 58*b* can be disposed at any desired location corresponding to the locations of material ports 36*a*, 36*b*.

Projections 56*a*, 56*b* are formed by seal housings 84*a*, 84*b*, respectively. Cartridge cover 92 includes cover slots 93*a*, 93*b* that extend around projections 56*a*, 56*b*. Projections 56*a*, 56*b* are configured to extend into slots 48*a*, 48*b* (best seen in FIGS. 4A and 4B) of mounting head 18. Projections 56*a*, 56*b* provide a grip point for the user to manipulate fluid cartridge 20, ensure proper alignment of fluid cartridge 20 during installation, and prevent rotation of fluid cartridge 20 relative to mounting head 18.

Purge post 60 extends from second end 52 of fluid cartridge 20. Purge post 60 is configured to extend into purge port 136 (FIGS. 3B and 4B) of mounting head 18. Purge post 60 receives purge air from mounting head 18. An internal flowpath through fluid cartridge 20 provides the purge air to cartridge bore 54. As discussed above, a check valve is disposed in fluid cartridge 20 proximate purge post 60. The check valve prevents fluid from backflowing through purge post 60.

Grease port 158 extends into second end 52 of fluid cartridge 20. A flowpath extends from grease port 158 through mixer to cartridge bore 54 to provide grease to cartridge bore 54. Clean-off inlet 160 extends into second end of fluid cartridge 20. Clean-off outlets 162 extend into first end 50 of fluid cartridge 20. In the example shown, clean-off outlets 162 extend through cartridge cover 92. Flowpaths extends through mixer body 82 to provide clean off air from clean-off inlet 160 to clean-off outlets 162.

Cartridge cover 92 extends over mixer body 82 and portions of seal housings 84*a*, 84*b*. Cartridge cover 92 provides a uniform exterior surface to facilitate user manipulation of fluid cartridge 20. In some examples, cartridge cover 92 holds seal housings 84*a*, 84*b* and mixer body 82 together to form fluid cartridge 20. Cartridge cover 92 covers and protects mixer body 82 and seal housings 84*a*, 84*b* from impact damage. Cartridge cover 92 can include rearwardly extending posts 164 configured to fit within grooves 166 formed in mixer body 82. Posts 164 reside in grooves 166 to lock cartridge cover 92 to mixer body 82 ensure proper alignment during assembly of fluid cartridge 20.

In the example shown, cartridge cover 92 includes exterior grooves configured to facilitate gripping of fluid cartridge 20 by the user. While cartridge cover 92 is shown as including grooves, it is understood that cartridge cover 92 can include features of any desired configuration suitable for enhancing gripping of fluid cartridge 20 by the user. For example, cartridge cover 92 can include a grooved, knurled, textured, or an otherwise non-smooth surface.

Fluid cartridge 20 incorporates approximately fifteen parts of prior plural component heads into one cartridge, which results in quicker head changes compared to the prior plural component heads used to apply binary compounds, like epoxy, which required that the point where the two components combine be cleaned or replaced regularly in order to operate. Fluid cartridge 20 thereby provides a single

replaceable cartridge incorporating all replacement parts. In many embodiments, metal and/or plastic seal housings **84***a*, **84***b* contain side seals, side seal o-rings, springs, check valves designed in a way for easy removal and replacement to minimize down time. Fluid cartridge **20** may be disposable to minimize servicing time and for easy preventive maintenance. Fluid cartridge **20** thereby facilitates quick and easy replacement of parts that typically require service in plural component sprayers.

Fluid cartridge **20** provides significant advantages. As discussed above, the first and second component materials are mixed to form the plural component material in the mix chamber disposed in central bore **34**. If cross-over occurs, the plural component material can be formed within the scaling components and passageways within fluid cartridge **20**, causing those components to seize. In the event of such cross-over, fluid cartridge **20** can be removed from plural component sprayer **10** and replaced with a new fluid cartridge **20**, thereby replacing all of those seized components. In addition, the check valves at fluid posts **58***a*, **58***b* and purge post **60** prevent any cross-over from flowing upstream from fluid cartridge **20** into mounting head **18**. As such, fluid cartridge **20** prevents contamination of mounting head **18**. As such, fluid cartridge **20** provides a single replacement part that can be quickly replaced with a new fluid cartridge **20**. This reduces downtime, increases the efficiency of the spray process, and eliminates the need of the user to track multiple small replacement parts. Seal housings **84***a*, **84***b* also contain most or all sealing elements in a pre-assembled fluid cartridge **20**. This prevents the user from having to track multiple small parts during repair and replacement. Fluid cartridge **20** also facilitates mounting of different mix chambers having different configurations, providing modularity to plural component sprayer **10** (best seen in FIGS. **1**A and **1**B).

FIG. **6**A is an isometric view of mix chamber **64**. FIG. **6**B is a top plan view of mix chamber **64**. FIG. **6**C is a left side elevation view of mix chamber **64**. FIG. **6**D is a right side elevation view of mix chamber **64**. FIG. **6**E is a bottom plan view of mix chamber **64**. FIGS. **6**A-**6**E will be discussed together. Mix chamber **64** includes body **68**, head **70**, spray orifice **72**, and tail **104**. Body **68** includes first body end **110**; second body end **112**; lateral sides **114***a*, **114***b*; ramps **116***a*, **116***b*; top side **168**; and bottom side **170**. Lateral sides **114***a*, **114***b* respectively include inlet ports **172***a*, **172***b*. Tail **104** includes pin bore **118**. Bottom side **170** includes slot **144**. Mix chamber **64** is elongate along chamber axis A_M-A_M.

Head **70** extends from first body end **110** of body **68**. Head **70** is configured to connect to an air cap, such as air cap **28** (FIGS. **1**A-**3**B). For example, head **70** can include external threading configured to connect to external threading on the air cap. Tail **104** extends from second body end **112** of body **68**. Pin bore **118** extends laterally through tail **104**. Tail **104** is configured to receive a connector, such as chamber connector **66** (FIGS. **1**B-**3**B and **10**A-**10**B) that facilitates connecting mix chamber **64** to an actuator of a plural component sprayer, such as actuator **16** (best seen in FIGS. **2**A and **3**A) of plural component sprayer **10** (best seen in FIGS. **1**A and **1**B). A pin can extend through pin bore **118** to secure the connector to tail **104**.

Slot **144** is formed on bottom side **170** of mix chamber **64**. Slot **144** extends axially along body **68** from first body end **110** to second body end **112**. Slot **144** is configured to receive a projection, such as locating pin **142** (FIG. **3**B), a fin, a rail, or other such projection. The projection can be formed in central bore **34** (FIGS. **1**B-**4**B) of mounting head **18** (best seen in FIGS. **4**A-**4**C) and/or formed in cartridge bore **54** (FIGS. **1**B-**3**B, **5**A, and **5**B) of fluid cartridge **20** (best seen in FIGS. **5**A and **5**B). Slot **144** receiving the projection provides mistake-proofing by preventing a user from inadvertently installing mix chamber **64** in an inverted position. In addition, slot **144** provides a keying feature to prevent installation of an incorrect mix chamber in plural component sprayer **10**. While slot **144** is described as formed on bottom side **170**, it is understood that slot **144** can be formed on top side **168**. While slot **144** is shown as extending from first body end **110** to second body end **112**, it is understood that slot **144** can extend partway along the axial length of body **68** such that slot **144** includes one open end and one closed end.

Inlet ports **172***a*, **172***b* extend into lateral sides **114***a*, **114***b*, respectively. Inlet ports **172***a*, **172***b* receive component materials and purge air and communicate the component materials and purge air to inlet bores **106***a*, **106***b* (FIGS. **2**B and **10**B) and a material pathway in mix chamber **64**, such as to mix bore **108** (FIGS. **2**B, **3**B, and **10**B). Spray orifice **72** is disposed at the distal end of head **70** opposite first body end **110**. Spray orifice **72** emits the material and air from the material pathway.

Lateral sides **114***a*, **114***b* are flat sides disposed on opposite sides of body **68**. First body end **110** is disposed orthogonal to lateral sides **114***a*, **114***b*. Top side **168** extends between lateral sides **114***a*, **114***b* and is curved in the example shown. Bottom side **170** extends between lateral sides **114***a*, **114***b* and is curved in the example shown.

Ramp **116***a* is disposed between first body end **110** and lateral side **114***a* and forms a transition between first body end **110** and lateral side **114***a*. Ramp **116***b* is disposed between first body end **110** and lateral side **114***b* and forms a transition between first body end **110** and lateral side **114***b*. Ramps **116***a*, **116***b* together form a ramp feature of mix chamber **64**. In the example shown, ramps **116***a*, **116***b* are integrally formed on mix chamber **64**.

As shown in FIG. **6**B, ramp **116***a* is disposed at angle Θ and ramp **116***b* is disposed at angle β. Angle Θ is between about 7-30 degrees. Angle β is between about 7-30 degrees. In some examples, angle Θ and angle β have the same value, but it is understood that angle Θ and angle β can differ.

As shown in FIG. **6**C, ramp **116***a* has a height H**1**, while the flat portion forming lateral side **114***a* has a height H**2**. Height H**1** is smaller than height H**2**. It is understood, however, that in some examples height H**1** is the same as or larger than height H**2**. As shown in FIG. **6**D, ramp **116***b* has height H**3** and the flat portion forming lateral side **114***b* has a height H**4**. Height H**3** is smaller than height H**4**. It is understood, however, that in some examples height H**3** is the same as or larger than height H**4**.

Ramps **116***a*, **116***b* facilitate installation of mix chamber **64** in fluid cartridge **20**. Side seals **88***a*, **88***b* (FIGS. **2**A and **2**B) project into the central bore **34** and are pre-loaded such that a spring force biases the seal members **102***a*, **102***b* (FIGS. **2**A and **2**B) into central bore. During installation, mix chamber **64** is pushed past side seals **88***a*, **88***b* and side seals **88***a*, **88***b* engage and seal against lateral sides **114***a*, **114***b*, respectively. Ramps **116***a*, **116***b* are the first part of mix chamber **64** to engage the side seals **88***a*, **88***b* during installation. Ramps **116***a*, **116***b* push seal members **102***a*, **102***b* away from axis A-A (best seen in FIG. **2**B) such that the gap between side seals **88***a*, **88***b* widens to a sufficient width for side seals **88***a*, **88***b* to pass onto and engage lateral sides **114***a*, **114***b*.

Mix chamber **64** provides significant advantages. Mix chamber **64** is easily insertable and removable from fluid cartridge **20** to allow for simple and easy replacement by the

user. Ramps **116***a*, **116***b* facilitate installation within fluid cartridge **20** by engaging pre-loaded side seals **88***a*, **88***b* and widening the gap between the pre-loaded side seals **88***a*, **88***b* to allow the side seals **88***a*, **88***b* to engage lateral sides **114***a*, **114***b*. Ramps **116***a*, **116***b* are sloped such that ramps **116***a*, **116***b* do not damage the sealing surfaces of side seals **88***a*, **88***b*.

FIG. **7**A is an isometric view of mix chamber **64'**. FIG. **7**B is a bottom plan view of mix chamber **64'**. FIGS. **7**A and **7**B will be discussed together. Mix chamber **64'** includes body **68**, head **70**, spray orifice **72**, and tail **104**. Body **68** includes first body end **110**, second body end **112**, lateral sides **114***a*, **114***b*; ramps **116***a*, **116***b*; groove **144'**; top side **168**; and bottom side **170**. Lateral sides **114***a*, **114***b* respectively include inlet ports **172***a*, **172***b* (only inlet port **172***b* is shown). Tail **104** includes pin bore **118**. Mix chamber **64'** is elongate along chamber axis A_M-A_M.

Mix chamber **64'** is substantially similar to mix chamber **64** (best seen in FIGS. **6**A-**6**E). Groove **144'** extends axially along mix chamber **64'** and is formed on head **70**, body **68**, and tail **104**. More specifically, groove **144'** extends further into bottom side **170** of mix chamber **64'** than groove **144** (FIGS. **3**B, **6**A, and **6**E). As such, groove **144'** forms a "deep groove." Groove **144'** is configured to receive a projection, such as a pin, a fin, a rail, or other such projection, formed in central bore **34** (best seen in FIGS. **2**B and **3**B) of mounting head **18** (best seen in FIGS. **4**A-**4**C) and/or formed in cartridge bore **54** (best seen in FIGS. **2**B and **3**B) of fluid cartridge **20** (best seen in FIGS. **2**B, **3**B, **5**A, and **5**B). Groove **144'** receiving the projection provides mistake-proofing by preventing a user from inadvertently installing mix chamber **64'** in an inverted position. In addition, groove **144'** provides a keying feature to prevent installation of an incorrect mix chamber in plural component sprayer **10** (best seen in FIGS. **1**A and **1**B). While groove **144'** is described as formed on bottom side **170**, it is understood that groove **144'** can be formed on top side **168**.

FIG. **8**A is an isometric view of mix chamber **64"**. FIG. **8**B is a front elevation view of mix chamber **64"**. FIGS. **8**A and **8**B will be discussed together. Mix chamber **64"** includes body **68**, head **70**, tail **104**, and spray orifice **72**. Body **68** includes first body end **110**, second body end **112**, lateral sides **114***a*, **114***b*; ramps **116***a*, **116***b*; top side **168**; and bottom side **170'**. Lateral sides **114***a*, **114***b* respectively include inlet ports **172***a*, **172***b* (only inlet port **172***b* is shown). Tail **104** includes pin bore **118**. Mix chamber **64"** is elongate along chamber axis A_M-A_M.

Mix chamber **64"** is substantially similar to mix chamber **64** (best seen in FIGS. **6**A-**6**D) and mix chamber **64'** (FIGS. **7**A and **7**B). Bottom side **170'** of mix chamber **64"** is flat and extends between lateral sides **114***a*, **114***b* and between first body end **110** and second body end **112**. As best seen in FIG. **8**B, bottom side **170'** is disposed transverse to lateral sides **114***a*, **114***b*. In the example shown, bottom side **170'** is disposed orthogonal to lateral sides **114***a*, **114***b*, but it is understood that bottom side **170'** can be disposed at other orientations transverse to lateral sides **114***a*, **114***b*.

Bottom side **170'** is formed as a flat side to mate with a correspondingly flat portion central bore **34** (best seen in FIGS. **2**B and **3**B) of mounting head **18** (best seen in FIGS. **4**A-**4**C) and/or formed in cartridge bore **54** (best seen in FIGS. **2**B and **3**B) of fluid cartridge **20** (best seen in FIGS. **2**B. **3**B, **5**A, and **5**B). Bottom side **170'** being flat while top side **168** is rounded provides mistake-proofing by preventing a user from inadvertently installing mix chamber **64"** in an inverted position. In addition, mix chamber **64"** including three flat sides (lateral sides **114***a*, **114***b* and bottom side **170'**) provides a keying feature to prevent installation of an incorrect mix chamber in plural component sprayer **10** (best seen in FIGS. **1**A and **1**B). While bottom side **170'** is described as flat, it is understood that top side **168** can be flat and bottom side **170'** can be rounded. In another example, both bottom side **170'** and top side **168** can be flat such that body **68** has a substantially square cross-section orthogonal to axis A_M-A_M. The substantially square cross-section can be formed with or without contoured/shaped edges.

FIG. **9**A is a first isometric view of mix chamber **64'"**. FIG. **9**B is a second isometric view of mix chamber **64'"**. FIGS. **9**A and **9**B will be discussed together. Mix chamber **64'** includes body **68**, head **70**, tail **104**, and spray orifice **72**. Body **68** includes first body end **110**, second body end **112**, lateral sides **114***a*, **114***b*; ramps **116***a*, **116***b*; top side **168**; and bottom side **170**. Lateral sides **114***a*, **114***b* respectively include inlet ports **172***a*, **172***b*. Tail **104** includes pin bore **118**. Mix chamber **64'"** is substantially similar to mix chamber **64** (best seen in FIGS. **6**A-**6**D), mix chamber **64'** (FIG. **7**), and mix chamber **64"** (FIG. **8**).

FIG. **10**A is an isometric view of mix chamber assembly **22'**. FIG. **10**B is a cross-sectional view of mix chamber assembly **22'** taken along line B-B in FIG. **10**A. FIGS. **10**A and **10**B will be discussed together. Mix chamber assembly **22'** includes mix chamber **64""** and chamber connector **66**. Mix chamber **64""** includes body **68'**; head **70'**; spray orifice **72**; tail **104**; inlet bores **106***a*, **106***b*; mix bore **108**; and ramp **116'**. Body **68'** includes first body end **110**, second body end **112**, lateral sides **114***a*, **114***b*; top side **168**; and bottom side **170**. Lateral sides **114***a*, **114***b* respectively include inlet ports **172***a*, **172***b*. Tail **104** includes pin bore **118**. Ramp **116'** includes contoured end **174**. Chamber connector **66** includes locking tab **74**, attachment portion **176**, and shaft **178**. Attachment portion **176** includes openings **180**.

Mix chamber assembly **22'** is substantially similar to mix chamber assembly **22** (FIGS. **1**B-**3**B). Mix chamber **64""** is substantially similar to mix chamber **64** (best seen in FIGS. **6**A-**6**E), mix chamber **64'** (FIG. **7**), mix chamber **64"** (FIG. **8**), and mix chamber **64'"** (FIG. **9**). Ramp **116'** is disposed on head **70'**. Ramp **116'** forms a ramping feature of mix chamber **64""**, similar to the ramping feature formed by ramps **116***a*, **116***b* (best seen in FIGS. **6**B-**6**D).

Chamber connector **66** is attached to mix chamber **64""** to form mix chamber assembly **22'**. While chamber connector **66** is shown as separately formed and attached to mix chamber **64""**, it is understood that, in some examples, chamber connector **66** and mix chamber **64""** can be integrally formed to provide a unitary mix chamber assembly **22'**. Chamber connector **66** can be removably or permanently mounted to mix chamber **64""**. In the example shown, attachment portion **176** receives tail **104** and a locking device, such as a pin, dowel, other similar device, is inserted through pin bore **118** and openings **180** to secure chamber connector **66** to mix chamber **64""**. While chamber connector **66** and mix chamber **64""** are described as attached by a pin connection, it is understood that any suitable connecting interface can be used, such as threading, press-fitting, or a bayonet connection, among other options

Shaft **178** extends from attachment portion **176** to locking tab **74**. Locking tab **74** projects radially from the end of shaft **178**. Locking tab **74** secures mix chamber assembly **22'** to actuator **16** (best seen in FIGS. **2**A and **3**A) such that actuator **16** can drive mix chamber assembly **22'** between states.

Head **70'** extends from first body end **110**. Ramp **116'** is mounted on head **70'**. In some examples, ramp **116'** is removable from head **70'** such that ramp **116'** can be

removed and replaced. Body **68'** and head **70'** can be formed from a durable material, such as hardened steel or other similar metals, or suitably rigid plastics or polymers. Such durable material can damage seal members **102***a*, **102***b* (best seen in FIG. **2**B) as mix chamber assembly **22'** passes under the pre-loaded seal members **102***a*, **102***b* during installation.

Ramp **116'** includes contoured end **174** and can be composed of a plastic or other suitably compliant material. Ramp **116'** does not include any sharp edges and is suitably compliant such that ramp **116'** does not score or otherwise damage seal members **102***a*, **102***b*. Ramp **116'** is the first part of mix chamber **64''''** to engage side seals **88***a*, **88***b* (best seen in FIG. **2**B) during installation. Contoured end **174** engages seal members **102***a*, **102***b* and pushes the seal members **102***a*, **102***b* away from axis A-A (best seen in FIG. **2**B) such that the gap between side seals **88***a*, **88***b* widens to width W**1**, which is the widest portion of ramp **116'**. Lateral sides **114***a*, **114***b* are spaced by width W**2**. In some examples, width W**1** is larger than width W**2** such that seal members **102***a*, **102***b* are spaced further apart than lateral sides **114***a*, **114***b* to facilitate lateral sides **114***a*, **114***b* passing under and being engaged by seal members **102***a*, **102***b*. Width W**2** being wider than width W**1** also prevents seal members **102***a*, **102***b* from inadvertently contacting the corners between first body end **110** and lateral sides **114***a*, **114***b*. In some examples, width W**1** is the same as width W**2**.

Mix chamber assembly **22'** provides significant advantages. Chamber connector **66** facilitates mounting of various mix chambers **64**, **64'**, **64''**, **64'''**, **64''''** using a single chamber connector **66**. The mix chambers can be changed to provide optimal spraying. The mounting capabilities provided by chamber connector **66** provides a modular plural component sprayer **10** (best seen in FIGS. **1**A and **1**B). Chamber connector **66** also provides quick-change capabilities by providing a tool-less connection with actuator **16**. Ramp **116'** allows mix chamber assembly **22'** to be inserted past pre-loaded side seals **88***a*, **88***b*. Ramp **116'** lifts seal members **102***a*, **102***b* away from lateral sides **114***a*, **114***b* to seat seal members **102***a*, **102***b* on lateral sides **114***a*, **114***b* rather than a ground corner of body **68'**. Ramp **116'** can be formed from a polymer or other soft material, relative to body **68'**, lengthening the life of side seals **88***a*, **88***b*.

FIG. **11** is an isometric, partially exploded view of plural component sprayer **10'**. Plural component sprayer **10'** includes handle **12**, trigger **14**, mounting head **18'**, fluid cartridge **20'**, retaining cap **24'**, air cap **28'**, mix chamber **64''''**, and valve **182**. Cartridge bore **54'** and purge ports **136***a*. **136***b* or fluid cartridge **20'** are shown. Needles **184***a*, **184***b* of valve **182** are shown. Mix chamber **64''''** includes body **68''** and head **70''**.

Fluid cartridge **20'** is substantially similar to fluid cartridge **20** (best seen in FIGS. **5**A and **5**B). Fluid and air seals are disposed in fluid cartridge **20'**. Purge ports **136***a*, **136***b* extend into fluid cartridge **20'** to provide purge air to mix chamber **64''''**. Mix chamber **64''''** is substantially similar to mix chamber **64** (best seen in FIGS. **6**A-**6**E), mix chamber **64'** (FIGS. **7**A and **7**B), mix chamber **64''** (FIGS. **8**A and **8**B), mix chamber **64'''** (FIGS. **9**A and **9**B), and mix chamber **64''''** (FIGS. **10**A and **10**B), except mix chamber **64''''** remains stationary throughout operation. Cartridge bore **54'** extends partway into fluid cartridge **20'** and is open only through the end of fluid cartridge **20'**. Body **68''** is received by cartridge bore **54'**. Body **68''** and cartridge bore **54'** can be contoured to form a tight-fit interface between body **68''** and cartridge bore **54'** to facilitate sealing.

Needles **184***a*, **184***b* are formed as part of valve **182** and extend from actuator **16** (best seen in FIGS. **2**A and **3**A). Each needle **184***a*, **184***b* extends into a material bore, similar to material passages **80***a*, **80***b* (FIG. **2**B), formed in fluid cartridge **20'**. Seals are disposed in the material bores and needles **184***a*, **184***b* interface with the seals to control flow of the first and second component materials through fluid cartridge **20'** to mix chamber **64''''**.

Retaining cap **24'** attaches to plural component sprayer **10'** to secure fluid cartridge **20'** within plural component sprayer **10'**. For example, retaining cap **24'** can include threading configured to interface with threading on plural component sprayer **10'**. In the example shown, fluid cartridge **20'** is disposed within mounting head **18'** that is integrally formed as part of the body of plural component sprayer **10'**. Air cap **28'** mounts to retaining cap **24'**. One of air cap **28'** and retaining cap **24'** can contact a shoulder of mix chamber **64''''** to push mix chamber **64''''** further into cartridge bore **54'**, enhancing sealing between mix chamber **64''''** and cartridge bore **54'**.

During operation, needles **184***a*, **184***b* translate axially to control the flow of the first and second component materials to mix chamber **64''''** and to control the flow of purge air through purge ports **136***a*, **136***b* to mix chamber **64''''**.

Fluid head **20'** incorporates various sealing components into one cartridge, which results in quicker head changes compared to the prior plural component heads used to apply binary compounds, like epoxy, which required that the point where the two components combine be cleaned or replaced regularly in order to operate. Fluid cartridge **20'** may be disposable to minimize servicing time and for easy preventive maintenance.

During assembly, fluid cartridge **20'** is inserted into plural component sprayer **10'** such that needles **136***a*, **136***b* extend into fluid cartridge **20'**. Mix chamber **64''''** is inserted into cartridge bore **54'**. Retaining cap **24'** is attached to plural component sprayer **10** and air cap **28'** is attached to retaining cap **24'**. Plural component sprayer **10'** is thus assembled for operation. Plural component sprayer **10'** can be easily disassembled by a reverse process. Air cap **28'** is removed. With air cap **28'** removed, mix chamber **64''''** can be pulled through the opening in retaining cap **24'**, in some examples. To remove fluid cartridge **20'**, retaining cap **24'** is removed. Fluid cartridge **20'** can then be pulled out of plural component sprayer **10'** and off of needles **184***a*, **184***b*. Plural component sprayer **10'** can be reassembled with a new fluid cartridge **20'** and/or mix chamber **64''''** to resume spraying.

While the invention has been described with reference to an exemplary embodiment(s), it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment(s) disclosed, but that the invention will include all embodiments falling within the scope of the appended claims.

The invention claimed is:

1. A fluid cartridge for use with a plural component sprayer, the plural component sprayer configured to receive a first component material from a first fluid line and a second component material from a second fluid line, respectively, the plural component sprayer comprising a mix chamber that is configured to be received within the fluid cartridge and is further configured to receive the first component material and the second component material and combine the first component material and the second component material to

form a plural component material for spraying, the plural component sprayer further comprising a receiving chamber, a handle, and a trigger, the fluid cartridge configured to be mounted to the plural component sprayer and configured to receive the first and second component materials and provide the first and second component materials to the mix chamber, the fluid cartridge comprising:

a cartridge body extending along an axis, the cartridge body including a first opening at a first end of the cartridge body open to a cartridge bore within the cartridge body, wherein the cartridge bore is configured to at least partially receive the mix chamber and the cartridge bore extends along the axis from the first opening;

a first material flowpath extending within the cartridge body from a first material inlet to a first material outlet open to the cartridge bore;

a second material flowpath extending within the cartridge body from a second material inlet to a second material outlet open to the cartridge bore;

a purge air flowpath extending within the cartridge body from a purge inlet on an exterior of the cartridge body to a purge outlet, the purge air flowpath configured to direct purge air through the cartridge body;

a first post extending from the cartridge body, wherein the first material inlet is formed through the first post, and the first post supports a first seal on an exterior of the first post, the first seal disposed in a groove on the first post and spaced along the first post from the cartridge body and from the first material inlet; and

a second post extending from the cartridge body, wherein the second material inlet is formed through the second post, and the second post supports a second seal on an exterior of the second post, the second seal disposed in a groove on the second post and spaced along the second post from the cartridge body and from the second material inlet;

wherein the cartridge body is configured to shift along the axis to enter into a portion of the receiving chamber of the plural component sprayer through which the axis extends to interface with the plural component sprayer during mounting of the fluid cartridge to the plural component sprayer.

2. The fluid cartridge of claim **1**, wherein the first material flowpath routes the first component material axially and then radially inward to the first material outlet.

3. The fluid cartridge of claim **2**, wherein the second material flowpath routes the second component material axially and then radially inward to the second material outlet.

4. The fluid cartridge of claim **1**, further comprising:

a first fluid check disposed in the first material flowpath between the first material inlet and the first material outlet, the first fluid check preventing flow from the first material outlet to the first material inlet.

5. The fluid cartridge of claim **4**, wherein the first fluid check is normally closed.

6. The fluid cartridge of claim **4**, further comprising:

a first side seal disposed in the first material flowpath, the first side seal including a first seal member and a first side spring biasing the first seal member at least partially into the cartridge bore through the first material outlet such that the first side seal is pre-loaded.

7. The fluid cartridge of claim **1**, wherein the purge air flowpath outputs the purge air at a location disposed axially between the first material outlet and the first end.

8. The fluid cartridge of claim **1**, wherein the purge air flowpath outputs the purge air at a location disposed axially between the first material outlet and the first opening.

9. The fluid cartridge of claim **1**, wherein the first post extends axially and is radially offset from the axis.

10. The fluid cartridge of claim **9**, wherein the second post extends axially and is radially offset from the axis.

11. The fluid cartridge of claim **1**, wherein the cartridge bore extends fully axially through the cartridge body between the first opening and a second opening formed on a second end of the cartridge body.

12. The fluid cartridge of claim **11**, wherein the mix chamber is configured to extend into the cartridge bore through the second opening.

13. The fluid cartridge of claim **1**, wherein the fluid cartridge includes at least one exterior projection that extends outward away from the axis.

14. The fluid cartridge of claim **1**, wherein the first post extends parallel to the second post.

15. A fluid cartridge for use with a plural component sprayer, the plural component sprayer configured to receive a first component material from a first fluid line and a second component material from a second fluid line, respectively, the plural component sprayer comprising a mix chamber that is configured to be received within the fluid cartridge and is further configured to receive the first component material and the second component material and combine the first component material and the second component material to form a plural component material for spraying, the plural component sprayer further comprising a receiving chamber, a handle, and a trigger, the fluid cartridge configured to be mounted to the plural component sprayer and configured to receive the first and second component materials and provide the first and second component materials to the mix chamber, the fluid cartridge comprising:

a cartridge body extending along an axis, the cartridge body including a first opening at a first end of the cartridge body open to a cartridge bore within the cartridge body, wherein the cartridge bore is configured to at least partially receive the mix chamber and the cartridge bore extends along the axis from the first opening;

a first material flowpath extending through the cartridge body from a first material inlet to a first material outlet open to the cartridge bore;

a second material flowpath extending through the cartridge body from a second material inlet to a second material outlet open to the cartridge bore;

a purge air flowpath extending through the cartridge body from a purge inlet on an exterior of the cartridge body to a purge outlet, the purge air flowpath configured to direct purge air through the cartridge body;

a first post cantilevered from the cartridge body, the first post extending along a first post axis between a first base connected to the cartridge body and a first distal end, wherein the first material inlet is formed through the first post, wherein the first post supports a first seal on an exterior of the first post, the first seal disposed in a seal groove on the first post;

a first fluid check disposed in the first post and between the first material inlet and the first material outlet, the first fluid check preventing flow from the first material outlet to the first material inlet, wherein the first fluid check is biased closed;

a second post cantilevered from the cartridge body, the second post extending along a second post axis between a second base connected to the cartridge body

and a second distal end, wherein the second material inlet is formed through the second post; and

a second fluid check disposed in the second post and between the second material inlet and the second material outlet, the second fluid check preventing flow from the second material outlet to the second material inlet, wherein the second fluid check is biased closed;

wherein the cartridge body is configured to shift along the axis such that the cartridge body enters into a portion of the receiving chamber of the plural component sprayer aligned with the axis and such that the cartridge body interfaces with the plural component sprayer during mounting of the fluid cartridge to the plural component sprayer.

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