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(71) Applicant: GRACO MINNESOTA INC. [US/US]; 88

11th Avenue NE, Minneapolis, Minnesota 55413-1829 (US).

(72) Inventors: SPIESS, Andrew, M.; 4659 Stoddart Lane, White Bear Lake, Minnesota 55127 (US). MCKELLIPS,

Kyle, J.; 13225 Brockton Lane North, Rogers, Minnesota 55374 (US). INGEBRAND, John, R.; 24871 W. Cedar Lake Drive, New Prague, Minnesota 56071 (US). ROSS, Daniel, P.; 4231 Bluebell Ct., Vadnais Heights, Minnesota

55127 (US). LINDAHL, Austin, H.; 20500 David Koch Avenue, Rogers, Minnesota 55374 (US).

(74) Agent: SWANSON, Andrew, R. et al.; Kinney & Lange, P. A., 312 South Third Street, Minneapolis, Minnesota 55415 (US).

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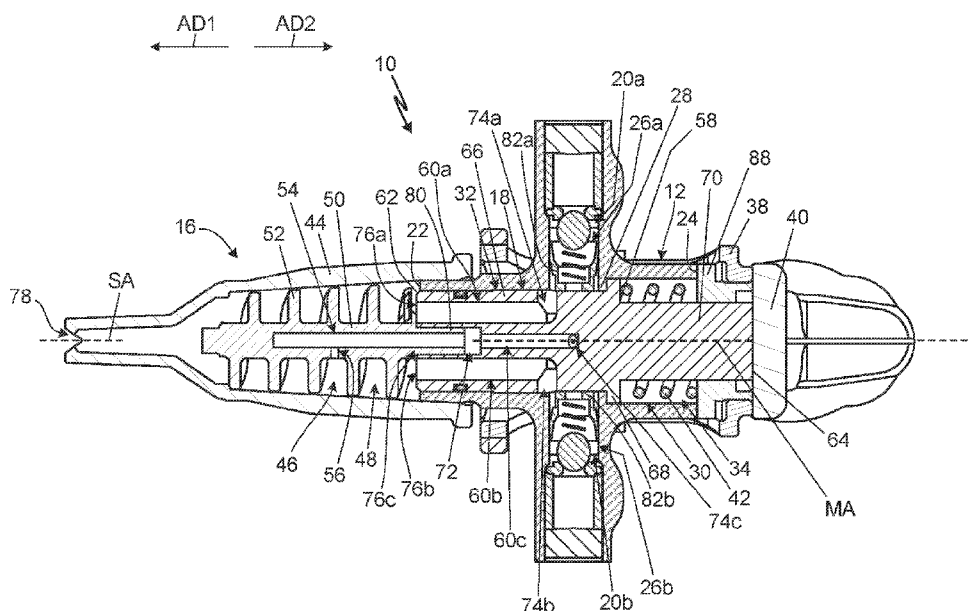


Fig. 1B

(57) Abstract: A plural component spray gun includes a manifold that is configured to receive flows of individual constituent materials. The manifold routes the constituent materials to a mix chamber within which the individual constituent materials mix to form the plural component material. The manifold shifts relative to the mix chamber to permit and shut off flows of the individual constituent materials into the manifold.



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PLURAL COMPONENT SPRAY GUN

CROSS-REFERENCE TO RELATED APPLICATION(S)

This application claims the benefit of U.S. Provisional Application No. 63/340,406 filed
5 May 10, 2022 and entitled "SPRAY FOAM GUN," the disclosure of which is hereby
incorporated by reference in its entirety.

BACKGROUND

The present disclosure relates generally to spray guns. More specifically, this
disclosure relates to spray guns for spraying plural component materials.

10 Plural component spray systems are configured to mix individual constituent materials
together to form a resultant plural component material that is applied to a substrate. For
example, the plural component spray system can be a foam spray system that can spray various
foams such as polyurea and other multi-part foam fluids that cure or otherwise set in place.
Typical foam spray system includes a first pump and a second pump. The first pump supplies
15 a first constituent material and the second pump supplies a second constituent material.

Compressed gas can also be supplied. The first constituent material, the second
constituent material, and the compressed gas can be mixed in the spray gun to react the
constituent materials to cure as a foam. The compressed gas can be used to facilitate mixing
as well as to propel the mixed material out from a nozzle of the spray gun onto a target surface.
20 The foam can be used for insulation and/or sealing, amongst other potential uses. In many
cases, the foam expands shortly after mixing, and can be used to mechanically expand confined
areas. In some cases, the foam can be used structurally after setting. The compressed gas can
be compressed ambient air or concentrated gas such as nitrogen. The present disclosure
concerns a gun in which the first and the second components and gas are mixed.

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SUMMARY

According to an aspect of the disclosure, a plural component spray gun includes a
housing; a manifold at least partially disposed within the housing; and a mixing assembly
supported by the housing. The manifold includes a manifold body; a first channel extending
through the manifold body between a first channel inlet and a first channel outlet; and a second
30 channel extending through the manifold body between a second channel inlet and a second
channel outlet. The manifold is movable along an axis between a first position, in which the
first channel is fluidly connected to a first material pathway of the housing to receive a first
constituent material from the first material pathway and the second channel is fluidly connected
to a second material pathway of the housing to receive a second constituent material from the

second material pathway; and a second position, in which the first channel is fluidly disconnected from the first material pathway and the second channel is fluidly disconnected from the second material pathway. The manifold routes the first constituent material and the second constituent material to a mixing chamber within the mixing assembly with the manifold
5 in the second position.

According to an additional or alternative aspect of the disclosure, a plural component spray gun includes a housing; a manifold at least partially disposed within the housing, the manifold movable along an axis between a first position, in which the manifold is fluidly connected to material flowpaths through the housing to receive a first constituent material and a second constituent material from the material flowpaths, and a second position, in which the
10 manifold is fluidly disconnected from the material flowpaths; and a mixing assembly supported by the housing, wherein the manifold routes the first constituent material and the second constituent material to a mixing chamber within the mixing assembly with the manifold in the second position. The manifold is shifts relative to the mixing chamber as the manifold moves
15 between the first position and the second position.

According to another additional or alternative aspect of the disclosure, a method of spraying a plural component material with a spray gun including a housing defining a first material flowpath and a second material flowpath and a mixing assembly having a cover connected to the housing and a mixer disposed within the cover, the mixing assembly
20 configured to mix a first constituent material and a second constituent material to form a plural component material. The method includes displacing a manifold disposed at least partially within the housing in a first direction along an axis and relative to the mixer to fluidly connect a first channel extending through the manifold with the first material flowpath and fluidly connect a second channel extending through the manifold with the second material flowpath;
25 flowing the first constituent material through the first channel and outputting the first constituent material into the mixing assembly from the first channel, and flowing the second constituent material through the second channel and outputting the second constituent material into the mixing assembly from the second channel; mixing the first constituent material and the second constituent material within the mixing assembly to form the plural component
30 material; and spraying the plural component material through a nozzle of the spray gun.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1A is an isometric view of a spray gun.

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

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

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

DETAILED DESCRIPTION

The present disclosure concerns spray guns for plural component materials. The spray gun includes a manifold that is slidably disposed within a gun body of the spray gun. The manifold includes material flowpaths formed therethrough that are configured to route constituent materials to a mixer disposed downstream of the manifold. The manifold further includes air pathways that are configured to route compressed gas to the mixer. The manifold is slidable relative to valving components to allow and stop flow of the constituent components into the material flowpaths. The manifold can move relative to the mixer to allow and stop the flow of the constituent materials into the material flowpaths.

Components can be considered to radially overlap when those components are disposed at common axial locations along an axis. A radial line extending from the axis will extend through each of the radially overlapping components. Components can be considered to axially overlap when those components are disposed at common radial and circumferential locations such that an axial line parallel to the axis extends through the axially overlapping components. Components can be considered to circumferentially overlap when aligned about the axis, such that a circle centered on the axis passes through the circumferentially overlapping components.

FIG. 1A is an isometric view of spray gun 10. FIG. 1B is a cross-sectional view taken along line B-B in FIG. 1A. FIGS. 1A and 1B will be discussed together. Spray gun 10 includes housing 12, handle 14, mixing assembly 16, manifold 18, check valves 20a, 20b, trigger 36, sleeve 38, cap 40, and spring 42. Housing 12 includes first housing end 22, second housing end 24, material flowpath 26a, material flowpath 26b, shoulder 28, and housing bore 30. Purge chamber 32 and spring chamber 34 are formed within housing bore 30. Mixing assembly 16 includes cover 44 and mixer 46 that define a mixing chamber 48. Mixer 46 includes mixer body 50, projections 52, mixer bore 54 and gas outlet 56. Manifold 18 includes manifold body 58, channel 60a, channel 60b, and channel 60c. Manifold body 58 includes first manifold end 62 and second manifold end 64, flow block 66, flange 66, and tail 70.

Spray gun 10 is configured to receive individual flows of constituent materials, such as two or more constituent materials, to combine the constituent materials to form a plural component material, and to emit a spray of the resultant plural component material. For example, spray gun 10 can be configured as a foam spray gun that can spray various foams such as polyurea and other multi-part foam fluids that cure or otherwise set in place. Typical foam spray system includes a first pump and a second pump (not shown). The first pump supplies a first constituent material and the second pump supplies a second constituent material.

The plural component spray foam is typically created by mixing the first constituent material (e.g., isocyanate) and the second constituent material (e.g., polyol resin) to form the resultant foam. While spray gun 10 is described as a foam spray gun, it is understood that foam is one broad type of sprayable plural component materials. Plural component materials can also be
5 glues, adhesives, coatings, and other materials. While spray foam will be used as an example, the constituent materials can be any type of component liquids that can be mixed and sprayed. The mixtures are combined in the spray gun 10 and sprayed as a single solution.

Housing 12 encloses and supports at least some other components of spray gun 10. Housing 12 is configured to receive flows of the constituent materials that combine to form the
10 plural component material. In the example shown, component line 84a is connected to housing 12 to provide the first constituent material to the spray gun 10 and component line 84b is connected to housing 12 to provide the second constituent material to the spray gun 10. In the example shown, housing 12 is further configured to receive flows of compressed gas. Gas line 86 is connected to housing 12 to provide the compressed gas to spray gun 10. The supply lines
15 connected to housing 12 to provide the constituent materials and compressed gas can be tubes, bores, and/or channels, for example.

Handle 14 is connected to housing 12. Handle 14 can be directly connected to housing 12, such as by fasteners, a threaded interface, etc. Handle 14 is configured to be grasped by a single hand of a user such that the user can aim spray gun 10 and cause spraying by spray gun
20 10 with that single hand. In some examples, the housing 12 and handle 14 can be detachably connected such that the housing 12 can be removed from the handle 14.

Housing bore 30 is formed through housing 12 between first housing end 22 and second housing end 24. Housing bore 30 extends fully through housing 12 in the example shown. Housing bore 30 extends along spray axis SA in the example shown. The spray gun 10 is
25 configured to output the plural component material along the spray axis SA. Nozzle 78 of spray gun 10, from which the plural component material is output, is disposed on spray axis SA.

In the example shown, housing bore 30 defines multiple chambers. Purge chamber 32 is disposed within housing bore 30. The purge chamber 32 extends about the exterior of the manifold 18 and within the interior of housing bore 30. The purge chamber 32 can extend fully
30 about the spray axis SA. In the example shown, purge chamber 32 is formed in a first diameter portion of the housing bore 30 that extends from first housing end 22 and in second axial direction AD2. Purge chamber 32 is fluidly connected to gas line 86. The gas line 86 provides

the compressed gas to purge chamber 32 and the compressed gas can flow into manifold 18 from purge chamber 32.

Spring chamber 34 is disposed within housing bore 30. Spring chamber 34 is formed in a portion of housing bore 30 disposed in second axial direction AD2 from purge chamber 32. In the example shown, the spring chamber 34 is formed in a second diameter portion of housing bore 30 that extends from second housing end 24 and in first axial direction AD1. Spring 42 is disposed in spring chamber 34.

Shoulder 28 is a portion of housing 12 disposed between the first diameter portion and the second diameter portion. Shoulder 28 projects radially to enlarge the diameter of the housing bore 30 between the first diameter portion and the second diameter portion. The first diameter portion extends in first axial direction AD1 from shoulder 28. The second diameter portion extends in second axial direction AD2 from shoulder 28.

Spring brace 88 is mounted to housing 12. Spring brace 88 is mounted at second housing end 24 of housing 12. Spring brace 88 defines an axial end of spring chamber 34.

Material flowpath 26a is configured to route the first constituent material to the housing bore 30. Check valve 20a is disposed in material flowpath upstream of the outlet of material flowpath 26a into the housing bore 30. Material flowpath 26b is configured to route the second constituent material to the housing bore 30. Check valve 20b is disposed in material flowpath upstream of the outlet of material flowpath 26b into the housing bore 30. Check valves 20a, 20b are configured to prevent retrograde flow through the material flowpaths 26a, 26b. Check valve 20a prevents retrograde flow to component line 84a. Check valve 20b prevents retrograde flow to component line 84b.

The check valves 20a, 20b prevent retrograde flow back into the first component line 84a and the second component line 84b. For example, such retrograde flow could be otherwise be inadvertently powered by the compressed gas supplied by the compressed gas line 86. It is understood that the check valves 20a, 20b can be located in other locations, and may not be within the particular structure of the housing 12. In the example shown, the check valves 20a, 20b are located immediately upstream of the side channel inlets 74a, 74b for the channels 60a, 60b of the sliding manifold 18.

Side seals 82a, 82b engage with an exterior of the manifold 18. Side seals 82a, 82b seal against manifold body 58. In the example shown, a spring of the check valve 20a biases the side seal 82a into engagement with manifold 18 and a spring of check valve 20b biases the side seal 82b into engagement with manifold 18. The outlets of the material flowpaths 26a, 26b are formed through the side seals 82a, 82b.

Manifold 18 is disposed at least partially within housing 12. Manifold 18 is at least partially disposed within housing bore 30. In the example shown, the manifold 18 is configured to slide within the housing bore 30. The manifold is elongate along a manifold axis MA. The manifold 18 is configured to slide axially along spray axis SA in the example shown. In the
5 example shown, the manifold axis MA is disposed coaxially with the spray axis SA.

Manifold body 58 is at least partially disposed within housing 12. Manifold body 58 extends along manifold axis MA between first manifold end 62 and second manifold end 64. Flow block 66 is a portion of manifold body 58 through which flowpaths for constituent materials and compressed gas are formed. In the example shown, each of channels 60a–60c
10 are formed in flow block 66.

Flange 66 projects radially outward relative to flow block 66. Flange 66 is disposed at an opposite axial end of flow block 66 from channel outlets 76a, 76b. Flange 66 is configured to interface with shoulder 28 of housing 12 to inhibit further movement of manifold 18 in first axial direction AD1.

Tail 70 extends axially from flow block 66. Tail 70 is disposed on an opposite axial side of flow block 66 from flange 66. Tail 70 extends in second axial direction AD2. The tail 70 extends to and connects with cap 40. In the example shown, no flowpaths for the constituent materials or the compressed gas are formed in tail 70, though it is understood that not all examples are so limited. Tail 70 extends through spring brace 88 to interface with cap 40, in
15 the example shown. Tail 70 of manifold body 58 extends fully axially through spring 42 in the example shown.

The manifold 18 includes channel 60a, channel 60b, and channel 60c that extend through manifold 18. Channel 60a extends between channel inlet 74a formed on an exterior of manifold body 58 and channel outlet 76a formed on an axial end face of manifold body 58.
25 Channel outlet 76a is formed through first manifold end 62. Channel 60b extends between channel inlet 74b formed on an exterior of manifold body 58 and channel outlet 76b formed on an axial end face of manifold body 58. Channel outlet 76b is formed through first manifold end 62. Channel 60c extends between channel inlet 74c formed on an exterior of manifold body 58 and channel outlet 76c formed on an axial end face of manifold body 58. Channel
30 outlet 76c is formed through first manifold end 62. Channel 60a includes a single channel inlet 74a. Channel 60b includes a single channel inlet 74b. Channel 60c can include multiple channel inlets 74c.

Each of the channel outlet 76a and channel outlet 76b are forward facing outlets into the mixing chamber 48. The channel outlet 76a and the channel outlet 76b are oriented in first

axial direction AD1. Channel outlet 76a is radially offset from manifold axis MA. Channel outlet 76a is radially offset from spray axis SA. Channel outlet 76b is radially offset from manifold axis MA. Channel outlet 76b is radially offset from spray axis SA. In the example shown, neither channel 60a nor channel 60b extends to or through either of the manifold axis
5 MA and the spray axis SA.

Channel 60a is configured to output the first constituent material into mixing assembly 16. Channel 60a is configured to output the first constituent material directly into mixing chamber 48. Channel 60a is configured to output the first constituent material from manifold 18 at a location upstream of projections 52. Channel 60a includes a bend that changes the
10 direction of the flow through channel 60a. In the example shown, channel 60a is configured to reroute the flow of the first constituent material from a radial flow through channel inlet 74a to an axial flow through channel outlet 76a.

Channel 60b is configured to output the second constituent material into mixing assembly 16. Channel 60b is configured to output the second constituent material directly into
15 mixing chamber 48. Channel 60b is configured to output the second constituent material from manifold 18 at a location upstream of projections 52. Channel 60b includes a bend that changes the direction of the flow through channel 60b. In the example shown, channel 60b is configured to reroute the flow of the second constituent material from a radial flow through channel inlet 74b to an axial flow through channel outlet 76b.

20 Channel 60c is configured to route compressed gas to mixing assembly 16. Channel 60c can also be referred to as a compressed gas channel. An axial portion of channel 60c is formed by manifold bore 72 that extends into manifold body 58. Channel 60c is configured to output the compressed gas to the mixer bore 54 that extends within mixer body 50.

Manifold bore 72 extends into manifold body 58 through the axial end face of manifold
25 body 58 that is oriented in first axial direction AD1. Manifold bore 72 forms a portion of channel 60c. In the example shown, manifold bore 72 has a larger diameter other portions of channel 60c upstream of manifold bore 72. A portion of mixer 46 extends into and is disposed within manifold bore 72. Mixer 46 and manifold 18 radially overlap with each other by stem 80 of mixer 46 extending into manifold bore 72. Mixer 46 and manifold 18 interface by mixer
30 46 extending into manifold bore 72. Mixer 46 extends into manifold 18 through channel outlet 76c of channel 60c. In the example shown, compressed gas enters into mixer 46 from channel 60c at a location upstream of the channel outlet 76c. The compressed gas still flows out of manifold through the channel outlet 76c even through the compressed gas is disposed within

the mixer 46 which is within the manifold 18 when the compressed gas flows out of the manifold 18.

Manifold 18 is movable along spray axis SA to place the spray gun 10 in a spray state, in which the plural component material is emitted from nozzle 78, and a non-spray state, in which flows of the constituent materials to manifold 18 are blocked and spray gun 10 does not emit the plural component material. Spray gun 10 is shown in the non-spray state in FIG. 1B.

With spray gun 10 in the non-spray state, the channel inlet 74a is misaligned from material flowpath 26a and channel inlet 74b is misaligned from material flowpath 26b. Side seal 82a engages with the exterior surface of manifold body 58 and seals against manifold body 58, preventing flow of the first constituent material out of material flowpath 26a. Side seal 82b engages with the exterior surface of manifold body 58 and seals against manifold body 58, preventing flow of the first constituent material out of material flowpath 26b.

With spray gun 10 in the spray state, the channel inlet 74a is aligned with the material flowpath 26a and the channel inlet 74b is aligned with the material flowpath 26b. In the example shown, the channel inlet 74a is aligned with the passage through side seal 82a and the channel inlet 74b is aligned with the passage through side seal 82b to receive the constituent materials through the passages in the side seals 82a, 82b. The channels 60a, 60b are fluidly connected to the material flowpaths 26a, 26b, respectively, such that the constituent materials can flow through the channels 60a, 60b to be output to the mixing assembly 16 for mixing and forming the plural component material.

Mixing assembly 16 is mounted to housing 12. Mixing assembly 16 is mounted to first housing end 22 of housing 12. Cover 44 of mixing chamber 48 can mount to housing 12 to mount mixing assembly 16 to housing 12. In the example shown, the cover 44 mounts directly around the housing 12, however the mounting may be indirect in various other examples. The cover 44 can mount on the housing 12 via a threaded or bayonet connection, amongst other connection options.

Nozzle 78 is formed at an axial end of cover 44 opposite housing 12. Nozzle 78 is formed at an opposite end of cover 44 from the mount portion that connects to housing 12. Nozzle 78 is configured to output spray from spray gun 10. The nozzle 78 can output the plural component material and/or compressed gas. The nozzle 78 is oriented to output the plural component material in first axial direction AD1.

Mixer 46 is disposed within cover 44. Mixer 46 includes a plurality of radial projections 52 that extend radially outward from mixer body 50. The projections 52 interrupt the flow of the constituent materials to facilitate mixing of the first and the second constituent materials.

In this case, the radial projections form a helical spiral. Mixing chamber 48 is formed by cover 44 and mixer 46. Mixing chamber 48 is a chamber that extends within mixing assembly 16 and within which the individual constituent materials mix to form the resultant plural component material.

5 Mixer 46 includes a mixer bore 54 that extends axially within mixer body 50. The mixer bore 54 does not extend fully axially through the mixer body 50. The mixer bore 54 is open in second axial direction AD2 to receive compressed gas from manifold 18. Gas outlet 56 extends radially through mixer body 50. Gas outlet 56 extends from the exterior of mixer body 50 to the mixer bore 54. Gas outlet 56 is configured to emit compressed gas from inside
10 of mixer body 50 and into the mixing chamber 48.

The gas outlet 56 is located along the mixing assembly 16 downstream of the outlets of channel 60a and channel 60b. In this way, the first and second constituent materials can be partially mixed before being further mixed with the compressed gas further downstream along mixing chamber 48.

15 Stem 80 is formed by a portion of mixer body 50. Stem 80 does not radially overlap with projections 52. Stem 80 is configured to extend into manifold bore 72. Stem 80 is axially elongate. Mixer bore 54 is open through a distal end of stem 80. The mixer bore 54 extends fully through stem 80 and into portions of mixer body 50 from which projections 52 extend.

The manifold 18 is configured to shift axially along manifold axis MA to actuate the
20 spray gun 10 between the spray and non-spray states. Trigger 36 is connected to sleeve 38. Sleeve 38 is disposed exterior to housing 12 in the example shown. Sleeve 38 extends at least partially around housing 12. Sleeve 38 is configured to shift axially relative to housing 12. Cap 40 is mounted to sleeve 38. Cap 40 is connected to sleeve 38 for simultaneous movement along the spray axis SA. The cap 40 can be connected to sleeve 38 in any desired manner, such
25 as by a threaded interface, a bayonet connection, among other connection types.

The cap 40 extends radially inward to overlap with the axis SA. Cap 40 is connected to manifold 18. In the example shown, cap 40 is connected to second manifold end 64 of manifold 18. Cap 40 is connected to an opposite axial end of manifold 18 from channel outlets 76a, 76b. In the example shown, cap 40 is connected to tail 70 of manifold 18.

30 Cap 40 can be connected to manifold 18 in any desired manner, such as by interfaced threading, a pinned connection, a bayonet connection, among other options. Cap 40 is connected to manifold 18 such that cap 40 can exert an axial driving force on manifold 18 in second axial direction AD2. In the example shown, cap 40 is connected to manifold 18 for simultaneous movement in both first axial direction AD1 and second axial direction AD2. In

the example shown, the connection between cap 40 and manifold 18 allows manifold 18 to pull cap 40 in first axial direction AD1 when the spray gun 10 is detriggered.

Spring 42 interfaces with manifold 18. Spring 42 is configured to bias manifold 18 in first axial direction AD1. Spring 42 is at least partially disposed within housing 12. In the example shown, spring 42 is disposed in spring chamber 34 formed within housing bore 30. Spring 42 extends between and interfaces with flange 66 and spring brace 88 in the example show. Spring 42 is configured to bias the manifold 18 to place spray gun 10 in the non-spray state. In the example shown, manifold body 58 extends fully axially through spring 42.

During operation, manifold 18 is shifted axially to place the spray gun 10 in the spray and non-spray states. Manifold 18 is in a forward position (shown) with the spray gun 10 in the non-spray state. Manifold 18 is in a rearward position with the spray gun 10 in the spray state. Manifold 18 can be considered to slide axially within housing 12. Manifold 18 is configured to shift axially relative to housing 12. Manifold 18 is configured to shift axially relative to mixer 46. Manifold 18 is configured to shift axially relative to cover 44. Manifold 18 is configured to shift axially relative to nozzle 78.

Spray gun 10 is initially in the non-spray state shown in FIG. 1B. With spray gun 10 in the non-spray state, the channels 60a, 60b are fluidly disconnected from the material flowpaths 26a, 26b, respectively. However, the compressed gas line 86 can continue to provide compressed gas to spray gun 10 with the spray gun 10 in the non-spray state. The compressed gas enters into purge chamber 32 within housing bore 30. A portion of the compressed gas flows into channel 60c and is provided downstream to mixer bore 54 within mixer 46. That portion of compressed gas is output through gas outlet 56 and flows through mixing chamber 48 and downstream to be output from nozzle 78. That portion of compressed gas can assist in cleaning out plural component material from within mixing assembly 16, preventing undesirable curing within mixing chamber 48.

In the example shown, the channels 60a, 60b are fluidly connected to purge chamber 32 with spray gun 10 in the non-spray state. Compressed gas from within purge chamber 32 enters into channel 60a through channel inlet 74a and flows downstream through channel 60a to channel outlet 76a. The compressed gas flows from channel 60a and into mixing assembly 16. Compressed gas from within purge chamber 32 enters into channel 60b through channel inlet 74b and flows downstream through channel 60b to channel outlet 76b. The compressed gas flows from channel 60b and into mixing assembly 16.

The compressed gas flowing through channels 60a, 60b assists in clearing out constituent materials from within channels 60a, 60b and assists in purging plural component

material and residue that remains within mixing assembly 16, preventing undesirable curing within mixing chamber 48. While channels 60a, 60b are described as fluidly connected to purge chamber 32 with spray gun 10 in the non-spray state, it is understood that not all examples are so limited. For example, the channel inlets 74a, 74b can be blocked, such as by the interior surface of housing 12, to prevent gas flow into channels 60a, 60b.

The user pulls trigger 36 to actuate spray gun 10 to the spray state. Pulling on trigger 36 shifts manifold 18 rearward in second axial direction AD2. In the example shown, trigger 36 does not pivot but instead shifts axially to cause sleeve 38 to shift axially. Sleeve 38 displaces cap 40 in second axial direction AD2. Cap 40 pulls manifold 18 in second axial direction AD2. Spring 42 is compressed between flange 66 and spring brace 88.

Manifold 18 shifts in second axial direction AD2 to align channel inlet 74a with material flowpath 26a and align channel inlet 74b with material flowpath 26b. The channel inlet 74a aligns with the material flowpath 26a to fluidly connect channel 60a with material flowpath 26a. The first constituent material flows through channel 60a and is output from channel outlet 76a into mixing chamber 48. The channel inlet 74b aligns with the material flowpath 26b to fluidly connect channel 60b with material flowpath 26b. The second constituent material flows through channel 60b and is output from channel outlet 76b into mixing chamber 48.

Compressed gas enters into channel 60c through the one or more channel inlets 74c. The compressed gas flows through channel 60c and enters into mixer bore 54. The compressed gas flows through mixer bore 54 and is output from mixer 46 through gas outlet 56.

With manifold 18 in the rearward position and channels 60a, 60b fluidly connected to material flowpaths 26a, 26b, respectively, the flows of the first and second constituent materials overcome the spring force maintaining the check valves 20a, 20b in the normally closed states. The first and second constituent materials flow past the check valves 20a, 20b, through the openings in the side seals 82a, 82b, and enter into the channels 60a, 60b through channel inlets 74a, 74b.

The first constituent material is output from the manifold 18 through channel outlet 76a and the second constituent material is output from the manifold 18 through channel outlet 76b. The constituent materials do not combine within the manifold 18. Instead, the constituent materials combine within mixing assembly 16. In the example shown, the projections 52 route the constituent materials helically to mix the constituent materials, though it is understood that not all examples are so limited.

Compressed gas is emitted from gas outlet 56 in mixer 46. The compressed gas assists in mixing the constituent materials and can accelerate the plural component material out of nozzle 78 for spraying.

The trigger 36 is released to stop spraying. Releasing the trigger 36 allows the spring 42 to bias the manifold 18 in first axial direction AD1 and back to the forward position. In the example shown, the spring 42 displaces the manifold 18 until flange 66 engages with shoulder 28. Spring 42 displacing manifold 18 in first axial direction AD1 fluidly disconnects the channel 60a from material flowpath 26a and fluidly disconnect the channel 60b from material flowpath 26b. Fluidly disconnecting the channels 60a, 60b from the material flowpaths 26a, 26b stops the flows of the constituent materials to the mixing chamber 48, thereby stopping formation and spraying of the plural component material from spray gun 10. Spray gun 10 is thus placed back in the non-spray state. Spray gun 10 remains in the non-spray state until retriggering.

In some examples, the sliding action of the manifold 18 can cut off the flow of compressed gas from the compressed gas line 86 with manifold 18 in the forward position, while allowing flow from the compressed gas line 86 into the channel 60c of the manifold 18 and into the mixing chamber 48 when the manifold 18 is in the rearward position during triggering. As such, triggering and dettriggering can start and stop delivery of the compressed gas into the mixing chamber 48. In the example shown, however, the compressed gas is continuously provided to purge chamber 32 and the sliding action of the manifold 18 does not start or stop the supply of compressed gas to the mixer bore 54 and to mixing chamber 48 through gas outlet 56. In the example shown, the compressed gas can be provided to mixing chamber 48 through channel 60a, channel 60b, and channel 60c, as discussed above. For example, the compressed gas can be provided through each of channel 60a, channel 60b, and channel 60c with spray gun 10 in the non-spray state, while compressed gas does not flow within channel 60a and channel 60b with spray gun 10 in the spray state.

It is noted that no mixing of the first constituent material, the second constituent material, and the compressed gas occur within the sliding manifold 18 with spray gun 10 in the spray state. The channels 60a, 60b, 60c are separate from each other and not fluidly connected at locations within manifold 18. Rather, the components (first and second constituent materials and compressed gas) are only mixed in the mixing chamber 48, or at least downstream of the manifold 18.

In the example shown, the mixer 46 is fixed in position relative to the cover 44. The mixer 46 and cover 44 are fixed axially during operation of spray gun 10. In the example

shown, mixer 46 and manifold 18 interface at a telescoping interface. The telescoping interface is formed between stem 80 of mixer 46 and manifold bore 72. Mixer 46 and manifold 18 radially overlap each other at the telescoping interface. The manifold 18 moves relative to the mixer 46 as manifold 18 moves between the forward and rearward positions. The compressed gas is transmitted from the manifold 18 to the mixer 46 at the telescoping interface.

It is understood that, in some examples, the compressed gas is not routed through the mixer 46. For example, the compressed gas can be output into the mixing chamber 48 from a distal end of the manifold 18, similar to channels 60a, 60b outputting the constituent materials. In such an example, mixer 46 may not include stem 80 such that the compressed gas is output into mixing chamber 48 directly from the channel outlet 76c.

In various examples, most or all of the components of the spray gun 10 can be formed from polymer. Exceptions can be springs, such spring 42 and the springs of check valves 20. The seats of the check valve 20a, 20b, on which the ball seals, may also not be polymer. General polymer construction allows various parts of the spray gun 10 to be disposable.

Spray gun 10 provides significant advantages. Manifold 18 is movable along spray axis SA to fluidly connect with and fluidly disconnect from material flowpaths 26a, 26b. Manifold 18 is a movable component that routes separate, discrete flows of the first and second component materials for output to mixing assembly 16 within which the constituent materials mix to form the plural component material. The mixing assembly 16 is static and does not shift along spray axis SA during spraying. The manifold 18 moves to turn on and shut off flow of the constituent materials. The telescoping interface between manifold 18 and mixer 46 facilitates coaxial alignment of manifold 18 and mixer 46 on spray axis SA and facilitates provision of compressed gas to gas outlet 56 to assist in mixing of the constituent materials.

The manifold 18 routes, but does not mix, the constituent materials. The channels 60a, 60b do not intersect and are not fluidly connected within manifold 18. Not mixing the constituent materials within manifold 18 prevents curing of the plural component material within channels 60a, 60b, maintaining the operability of manifold 18. The constituent materials mix at a location downstream of the manifold 18, within mixing assembly 16. In some examples, the user can disconnect mixing assembly 16 and mount a new mixing assembly 16 to spray gun 10, such as if plural component material does cure in mixing assembly 16 thereby blocking flow, without having to replace manifold 18, as the channels 60a, 60b are fluidly separated at locations within manifold. In the example shown, the channel 60c is also fluidly separated from both channel 60a and channel 60b.

FIG. 2A is a cross-sectional view of spray gun 110 taken along line A-A in FIG. 2B. FIG. 2B is a cross-sectional view of spray gun 110 taken along line B-B in FIG. 2A. FIGS. 2A and 2B will be discussed together. Spray gun 110 is substantively similar to spray gun 10, except manifold 118 of spray gun 110 is pneumatically displaced in at least one axial direction along the axis SA. Components of spray gun 110 that are similar to or the same as components of spray gun 10 are referred to with the same reference number except increased by “100”.

Housing 112, handle 114, mixing assembly 116, manifold 118, side seals 182a, 182b, trigger 136, spring 142, piston 202, and shuttle valve 198 of spray gun 110 are shown. Housing 112 includes first housing end 122, second housing end 124, material flowpath 126a, material flowpath 126b, shoulder 128, and housing bore 130. Mixing assembly 116 includes cover 144 and mixer 146 that together define a mixing chamber 148. Mixer 146 includes mixer body 150, projections 152, mixer bore 154 and gas outlet 156. Manifold 118 includes manifold body 158, channel 160a, channel 160b, and channel 160c. Manifold body 158 extends between first manifold end 162 and second manifold end 164.

Spray gun 110 is configured to receive individual flows of constituent materials, combine the constituent materials to form a plural component material, and emit a spray of a resultant plural component material.

Handle 114 is configured to be grasped by a hand of a user. In the example shown, gun body 190 is formed monolithically with handle 114, though it is understood that not all examples are so limited. Gun body 190 is vertically above handle 114. Housing 112 is supported by handle 114.

Housing 112 is configured to receive flows of the constituent materials for combination into the plural component material. Component line 184a is connected to housing 112 to provide the first constituent material to the spray gun 110 and component line 184b is connected to housing 112 to provide the second constituent material to the spray gun 110. Gas line 186 is connected to handle 114 to provide the compressed gas to spray gun 110.

Housing bore 130 is formed through housing 112 between first housing end 122 and second housing end 124. Housing bore 130 extends fully through housing 112 in the example shown. Housing bore 130 extends along spray axis SA in the example shown.

Purge chamber 132 is formed within housing bore 130. The purge chamber 132 extends about the exterior of the manifold 118 and within the interior of housing bore 130. Purge chamber 132 is fluidly connected to gas line 186. The gas line 186 provides the compressed gas to purge chamber 132 and the compressed gas flows into manifold 118 from purge chamber 132.

Shoulder 128 is a portion of housing 112 that projects radially to enlarge the diameter of the housing bore 130.

Material flowpath 126a is configured to route the first constituent material to the housing bore 130. Material flowpath 126b is configured to route the second constituent
5 material to the housing bore 130.

Side seals 182a, 182b engage with an exterior of the manifold 118. Side seals 182a, 182b seal against manifold body 158. In the example shown, springs bias the side seals 182a, 182b into engagement with manifold 118. The outlets of the material flowpaths 126a, 126b are formed through the side seals 182a, 182b.

10 Manifold 118 is disposed at least partially within housing 112. Manifold body 158 extends along a manifold axis MA between first manifold end 162 and second manifold end 164. In the example shown, the manifold axis MA is disposed coaxially with the spray axis SA. Manifold 118 is at least partially disposed within housing bore 130. In the example shown, the manifold 118 is configured to slide axially within the housing bore 130. The manifold 118
15 is configured to slide axially along spray axis SA in the example shown.

Connector 196 extends between and connects manifold 118 and piston 202. Connector 196 extends in second axial direction AD2. Connector 196 is mounted to an axial end of the manifold 118 that is opposite the axial end that channel outlets 176a, 176b are formed through.

The manifold 118 includes channel 160a, channel 160b, and channel 160c that extend
20 through manifold body 158. Channel 160a extends between channel inlet 174a formed on an exterior of manifold body 158 and channel outlet 176a formed on an axial end face of manifold body 158. Channel 160b extends between channel inlet 174b formed on an exterior of manifold body 158 and channel outlet 176b formed on an axial end face of manifold body 158. Channel 160c extends between channel inlets 174c formed on an exterior of manifold body 158 and
25 channel outlet 176c. Channel 160c can include multiple channel inlets 174c. Channel 160a includes a single channel inlet 174a. Channel 160b includes a single channel inlet 174b.

Each of the channel outlet 176a and channel outlet 176b are forward facing outlets into the mixing chamber 148. The channel outlet 176a and the channel outlet 176b are oriented in first axial direction AD1. Channel outlet 176a is radially offset from spray axis SA. Channel
30 outlet 176b is radially offset from spray axis SA. In the example shown, neither channel 160a nor channel 160b extends to or through the spray axis SA.

Channel 160a is configured to output the first constituent material into mixing assembly 116. Channel 160a is configured to output the first constituent material directly into mixing chamber 148. Channel 160a is configured to output the first constituent material from manifold

118 at a location upstream of projections 152. Channel 160a includes a bend that changes the direction of the flow through channel 160a. In the example shown, channel 160a is configured to reroute the flow of the first constituent material from a radial flow through channel inlet 174a to an axial flow through channel outlet 176a.

5 Channel 160b is configured to output the second constituent material into mixing assembly 116. Channel 160b is configured to output the second constituent material directly into mixing chamber 148. Channel 160b is configured to output the second constituent material from manifold 118 at a location upstream of projections 152. Channel 160b includes a bend that changes the direction of the flow through channel 160b. In the example shown, channel
10 160b is configured to reroute the flow of the second constituent material from a radial flow through channel inlet 174b to an axial flow through channel outlet 176b.

Channel 160c is configured to route compressed gas to mixing assembly 116. Channel 160c can also be referred to as a compressed gas channel. Channel 160c is configured to output the compressed gas to the mixer bore 154 that extends within mixer body 150. In the example
15 shown, channel 160c extends axially beyond first manifold end 162. Stem 180 projects from manifold body 158. Stem 180 extends in first axial direction AD1 from first manifold end 162 of manifold body 158. The channel outlet 176c of channel 160c is formed at a distal end of stem 180. The channel outlet 176c through which compressed gas is output from channel 160c is spaced in first axial direction AD1 from channel outlets 176a, 176b. Stem 180 extends into
20 mixer bore 154 in the example shown. Stem 180 is disposed in mixer bore 154 such that manifold 118 and mixer 146 radially overlap with each other.

Manifold 118 is movable along manifold axis MA to place the spray gun 110 in a spray state, in which the plural component material is emitted from nozzle 178, and a non-spray state, in which flows of the constituent materials to manifold 118 are blocked and spray gun 110 does
25 not emit the plural component material. Spray gun 110 is shown in the non-spray state in FIGS. 2A and 2B, though trigger 136 is actuated and shuttle valve 198 is positioned to direct compressed gas to actuate spray gun 110 to the spray state in FIG. 2B.

With spray gun 110 in the non-spray state, the channel inlet 174a is misaligned from material flowpath 126a and channel inlet 174b is misaligned from material flowpath 126b.
30 Side seal 182a engages with the exterior surface of manifold body 158 and seals against manifold body 158, preventing flow of the first constituent material out of material flowpath 126a. Side seal 182b engages with the exterior surface of manifold body 158 and seals against manifold body 158, preventing flow of the first constituent material out of material flowpath 126b.

With spray gun 110 in the spray state, the channel inlet 174a is aligned with the material flowpath 126a and the channel inlet 174b is aligned with the material flowpath 126b. In the example shown, the channel inlet 174a is aligned with the passage through side seal 182a and the channel inlet 174b is aligned with the passage through side seal 182b. The channels 160a
5 160b are fluidly connected to the material flowpaths 126a, 126b, respectively, such that the constituent materials can flow through the channels 160a 160b to be output to the mixing assembly 116 for mixing and forming the plural component material.

Mixing assembly 116 is mounted to housing 112. Mixing assembly 116 is mounted to first housing end 122 of housing 112. Cover 144 of mixing chamber 148 can mount to housing
10 112 to mount mixing assembly 116 to housing 112. In the example shown, the cover 144 mounts directly around the housing 112, however the mounting may be indirect in various other examples. The cover 144 may mount on the housing 112 via a threaded or bayonet connection, amongst other options.

Nozzle 178 is formed at an axial end of cover 144 opposite housing 112. Nozzle 178
15 is configured to output spray from spray gun 110.

Mixer 146 is disposed within cover 144. Mixer 146 includes a plurality of radial projections 152 that extend radially outward from mixer body 150 and interrupt the flow of the constituent materials to facilitate mixing of the first and the second constituent materials. Mixing chamber 148 is formed by cover 144 and mixer 146. Mixing chamber 148 is a chamber
20 that extends within mixing assembly 116 and within which the individual constituent materials mix to form the resultant plural component material.

Mixer 146 includes a mixer bore 154 that extends axially within mixer body 150. The mixer bore 154 does not extend fully axially through the mixer body 150. The mixer bore 154 is open in second axial direction AD2 to receive compressed gas from manifold 118. Gas outlet
25 156 extends radially through mixer body 150 and provides a flowpath for compressed gas to flow from mixer bore 154 to mixing chamber 148.

Trigger 136 is mounted to gun body 190 in the example shown. Shuttle valve 198 is disposed within gun body 190. The trigger 136 is configured to actuate the shuttle valve 198 to direct compressed gas to piston chamber 200 to displace piston 202 axially. The shuttle
30 valve 198 is configured to direct compressed gas to passage 194a to displace piston 202 in second axial direction AD2 and place spray gun 110 in the spray state. The shuttle valve 198 is configured to direct compressed gas to passage 194b to displace piston 202 in first axial direction AD1 and place the spray gun 110 in the non-spray state. The trigger 136 displaces the shuttle of shuttle valve 198 to direct the compressed air to piston chamber 200 to displace

piston 202 in second axial direction AD2. A spring can displace the shuttle of the shuttle valve 198 in first axial direction AD1 when trigger 136 is released.

Piston 202 is disposed in piston chamber 200. The piston 202 is connected to the manifold 118 to displace the manifold axially. In the example shown, connector 196 is
5 connected to piston 202 and to manifold 118. Connector 196 extends between and connects piston 202 and manifold 118. The body of connector 196 can interface with shoulder 128 to limit displacement of manifold 118 in first axial direction AD1.

Spring 142 interfaces with piston 202. Spring 142 is configured to bias piston 202, and thus manifold 118, in first axial direction AD1. Spring 142 is configured to bias piston 202
10 and manifold 118 in the first axial direction AD1 to maintain the manifold 118 in the forward position when the spray gun 110 is not triggered. The spring 142 further assists the driving gas (provided to piston chamber 200 by shuttle valve 198) in displacing piston 202 in first axial direction AD1 to place spray gun 110 in the non-spray state. The spring 142 assisting the driving gas in displacing piston 202 in first axial direction AD1 provides quick responsiveness
15 when trigger 136 is released, quickly shutting off the spray of the plural component material.

During operation, manifold 118 is shifted axially to place the spray gun 110 in the spray and non-spray states. Manifold 118 is in a forward position (shown in FIGS. 2A and 2B) with the spray gun 110 in the non-spray state. Manifold 118 is in a rearward position with the spray gun 110 in the spray state. Manifold 118 can be considered to slide axially within housing 112.
20 Manifold 118 is configured to shift axially relative to housing 112. Manifold 118 is configured to shift axially relative to mixer 146. Manifold 118 is configured to shift axially relative to cover 144. Manifold 118 is configured to shift axially relative to nozzle 178.

Spray gun 110 is initially in the non-spray state. With spray gun 110 in the non-spray state, the channels 160a 160b are fluidly disconnected from the material flowpaths 126a, 126b,
25 respectively. However, the compressed gas line can continue to provide compressed gas to spray gun 110 with the spray gun 110 in the non-spray state. In the example shown, the shuttle of shuttle valve 198 is configured such that the compressed gas can flow through the shuttle of shuttle valve 198 and downstream to purge chamber 132 with spray gun 110 in both the spray state and the non-spray state. A portion of the compressed gas flows into channel 160c through
30 channel inlets 174c and is provided downstream to mixer bore 154 within mixer 146. That portion of compressed gas is output through gas outlet 156 and into mixing chamber 148 and downstream to be output from nozzle 178. That portion of compressed gas can assist in cleaning out plural component material from within mixing assembly 116, preventing undesirable curing within mixing chamber 148.

In the example shown, with spray gun 110 in the non-spray state, the channels 160a 160b are fluidly connected to purge chamber 132. Compressed gas from within purge chamber 132 enters into channel 160a through channel inlet 174a and flows downstream through channel 160a to channel outlet 176a. Compressed gas from within purge chamber 132 enters
5 into channel 160b through channel inlet 174b and flows downstream through channel 160b to channel outlet 176b. The compressed gas flowing through channels 160a 160b assists in clearing out constituent materials from within channels 160a 160b and assists in purging plural component material and residue that remains within mixing assembly 116, preventing undesirable curing within mixing chamber 148. While channels 160a 160b are described as
10 fluidly connected to purge chamber 132 with spray gun 110 in the non-spray state, it is understood that not all examples are so limited. For example, the channel inlets 174a, 174b can be blocked, such as by the interior surface of housing 112, to prevent flow into channels 160a 160b.

The user pulls trigger 136 to actuate spray gun 110 to the spray state. Pulling on trigger
15 136 shifts shuttle valve 198 to direct compressed gas through passage 194a and to piston chamber 200. The compressed gas displaces piston 202 in second axial direction AD2. The piston 202 pulls the connector 196 and manifold 118 rearward in second axial direction AD2.

Manifold 118 shifts in second axial direction AD2 to align channel inlet 174a with material flowpath 126a and align channel inlet 174b with material flowpath 126b. The first
20 constituent material flows through channel 160a and is output from channel outlet 176a into mixing chamber 148. The second constituent material flows through channel 160b and is output from channel outlet 176b into mixing chamber 148.

Compressed gas enters into channel 160c through the one or more channel inlets 174c. The compressed gas flows through channel 160c and enters into mixer bore 154. The
25 compressed gas flows through mixer bore 154 and is output from mixer 146 through gas outlet 156.

With manifold 118 in the rearward position and channels 160a 160b fluidly connected to material flowpaths 126a, 126b, respectively, the first and second constituent materials flow through the openings in the side seals 182a, 182b, and enter into the channels 160a 160b
30 through channel inlets 174a, 174b.

The first constituent material is output from the manifold 118 through channel outlet 176a and the second constituent material is output from the manifold 118 through channel outlet 176b. The constituent materials do not combine within the manifold 118. Instead, the

constituent materials combine within mixing assembly 116. In the example shown, the projections 152 route the constituent materials helically to mix the constituent materials.

Compressed gas is emitted from gas outlet 156 in mixer 146. The compressed gas assists in mixing the constituent materials and can accelerate the plural component material out of nozzle 178 for spraying.

To stop spraying the trigger 136 is released. Releasing the trigger 136 allows the shuttle valve 198 to shift back to the position associated with the non-spray state. The shuttle valve 198 directs compressed gas through passage 194b and to an opposite side of piston 202 to displace piston 202 in first axial direction AD1. The compressed gas provided to actuate piston 202 in second axial direction AD1 can be exhausted through passage 194a and through exhaust passage 192 in handle 114. The compressed gas and spring 142 displace the piston 202, and thus the manifold 118, in first axial direction AD1 and back to the forward position. Channel 160a is fluidly disconnected from material flowpath 126a and channel 160b is fluidly disconnected from material flowpath 126b. Fluidly disconnecting the channels 160a 160b from the material flowpaths 126a, 126b stops the flows of the constituent materials to the mixing chamber 148, thereby stopping spraying of the plural component material from spray gun 110. Spray gun 110 is thus placed back in the non-spray state. Spray gun 110 remains in the non-spray state until retriggering.

In some examples, the sliding action of the manifold 118 can cut off the flow of compressed gas from the compressed gas line 186 with manifold 118 in the forward position, while allowing flow from the compressed gas line 186 into the channel 160c of the manifold 118 and into the mixing chamber 148 when the manifold 118 is in the rearward position during triggering. As such, triggering and detripping can start and stop delivery of the compressed gas into the mixing chamber 148. In the example shown, however, the compressed gas is continuously provided to purge chamber 132 and the sliding action of the manifold 118 does not start or stop the supply of compressed gas to the mixing chamber 148. In the example shown, the compressed gas can be provided to mixing chamber 148 through channel 160a, channel 160b, and channel 160c with the spray gun 110 in the non-spray state, as discussed above. Channel 160a and channel 160b do not route compressed gas with the spray gun 110 in the spray state.

It is noted that no mixing of the first constituent material, the second constituent material, and the compressed gas occur within the sliding manifold 118 with spray gun 110 in the spray state. The channels 160a, 160b, 160c are separate from each other and not fluidly

connected at locations within manifold 118. Rather, these components are only mixed in the mixing chamber 148, or at least downstream of the manifold 118.

In the example shown, the mixer 146 is fixed in position relative to the cover 144. The mixer 146 and cover 144 are fixed axially during operation of spray gun 110. In the example
5 shown, mixer 146 and manifold 118 interface at a telescoping interface. The telescoping interface is formed between stem 180 of manifold 118 and mixer bore 154 of mixer 146. The stem 180 extends into the mixer 146 such that manifold 118 and mixer 146 radially overlap. The manifold 118 moves relative to the mixer 146 as manifold 118 moves between the forward and rearward positions. The compressed gas is transmitted from the manifold 118 to the mixer
10 146 at the telescoping interface.

It is understood that, in some examples, the compressed gas is not routed through the mixer 146. For example, the compressed gas can be outlet into the mixing chamber 148 from a distal end of the manifold 118, similar to channels 160a 160b outputting the constituent materials. Such an example may not include a stem 180.

15 In various examples, most or all of the components of the spray gun 110 can be formed from polymer. Exceptions can be springs, such spring 142 and the springs of side seals 182a, 182b. General polymer construction allows various parts of the gun 110 to be disposable.

Spray gun 110 provides significant advantages. Manifold 118 is movable along spray axis SA to fluidly connect with and fluidly disconnect from material flowpaths 126a, 126b.
20 Manifold 118 is a movable component and that routes separate, discrete flows of the first and second component materials for output to mixing assembly 116 within which the constituent materials mix to form the plural component material. The mixing assembly 116 is static and does not shift along spray axis SA during spraying. The manifold 118 moves to turn on and shut off flow of the constituent materials. The telescoping interface between manifold 118 and
25 mixer 146 facilitates coaxial alignment of manifold 118 and mixer 146 on spray axis SA.

The manifold 118 routes, but does not mix, the constituent materials. The channels 160a 160b do not intersect and are not fluidly connected within manifold 118. Not mixing the constituent materials within manifold 118 prevents curing of the plural component material within channels 160a 160b, maintaining the operability of manifold 118. The constituent
30 materials mix at a location downstream of the manifold 118, within mixing assembly 116.

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.

CLAIMS:

1. A plural component spray gun comprising:
a housing;
a manifold at least partially disposed within the housing, the manifold
5 comprising:
a manifold body;
a first channel extending through the manifold body between a first
channel inlet and a first channel outlet; and
a second channel extending through the manifold body between a
10 second channel inlet and a second channel outlet;
wherein the manifold is movable along an axis between:
a first position, in which the first channel is fluidly connected to
a first material pathway of the housing to receive a first
constituent material from the first material pathway and
15 the second channel is fluidly connected to a second
material pathway of the housing to receive a second
constituent material from the second material pathway;
and
a second position, in which the first channel is fluidly
20 disconnected from the first material pathway and the
second channel is fluidly disconnected from the second
material pathway;
a mixing assembly supported by the housing, wherein the manifold routes the
first constituent material and the second constituent material to a mixing
25 chamber within the mixing assembly with the manifold in the second
position.
2. The spray gun of claim 1, wherein the first channel and the second channel are
fluidly separated within the manifold.
3. The spray gun of any preceding claim, wherein the first channel inlet is oriented
30 radially and the second channel inlet is oriented radially.
4. The spray gun of any preceding claim, wherein the first channel outlet is
oriented axially and the second channel outlet is oriented axially.

5. The spray gun of any preceding claim, wherein the manifold shifts axially relative to the mixing assembly as the manifold moves between the first position and the second position.
6. The spray gun of any preceding claim, wherein the first channel includes a bend
5 that redirects a flow of the first constituent material between the channel inlet and the channel outlet.
7. The spray gun of any preceding claim, wherein:
the first channel outlet is radially offset from the axis;
the second channel outlet is radially offset from the axis; and
10 a nozzle through which a plural component material is emitted from the spray gun is disposed on the axis.
8. The spray gun of any one of claims 1–6, wherein the mixing assembly comprises:
a cover connected to the housing;
15 a nozzle formed through the cover, the nozzle configured to emit a spray of a plural component material from the spray gun, the plural component material formed by a mixture of the first constituent material and the second constituent material; and
a mixer disposed within the cover, wherein the mixing chamber is formed
20 between the mixer and the cover.
9. The spray gun of claim 8, wherein a telescoping interface is formed between the manifold and the mixer.
10. The spray gun of claim 9, wherein a stem of the mixer extends into a bore of the manifold at the telescoping interface.
- 25 11. The spray gun of claim 9, wherein a stem of the manifold extends into a bore of the mixer at the telescoping interface.
12. The spray gun of any one of claims 9–11, wherein the manifold further includes a third channel that extends between a third channel inlet and a third channel outlet, the third channel configured to route compressed gas to an interior of the mixer.
- 30 13. The spray gun of any one of claims 1–8, further comprising:
a third channel that extends between a third channel inlet and a third channel outlet, the third channel configured to route compressed gas from the third channel inlet to the third channel outlet.

14. The spray gun of claim 13, wherein the third channel inlet is oriented radially and the third channel outlet is oriented axially.
15. The spray gun of any one of claims 13 and 14, wherein the third channel outlet is disposed radially inward of the first channel outlet and the second channel outlet.
- 5 16. The spray gun of any one of claims 13–15, wherein the third channel includes a plurality of the third channel inlets.
17. The spray gun of any one of claims 13–16, wherein the third channel inlet is fluidly connected to a supply of compressed gas with the manifold in the first position and with the manifold in the second position.
- 10 18. The spray gun of any preceding claim, wherein:
the manifold is disposed in a housing bore of the housing;
a gas chamber is formed within the housing bore between an exterior of the
manifold and a surface of the housing bore, the gas chamber fluidly
connected to a gas line such that the gas chamber contains compressed
15 gas from the gas line; and
the first channel inlet and the second channel inlet are fluidly connected to the
gas chamber with the manifold in the second position.
19. The spray gun of claim 18, wherein the housing bore extends fully axially through the housing.
- 20 20. The spray gun of any preceding claim, further comprising:
a spring biasing the manifold towards the second position.
21. The spray gun of any preceding claim, further comprising:
a piston connected to the manifold and configured to displace the manifold
along the axis.
- 25 22. The spray gun of claim 20, wherein the piston is pneumatically displaced.
23. The spray gun of any preceding claim, further comprising a handle extending away from the housing.
24. A plural component spray gun comprising:
a housing;
30 a manifold at least partially disposed within the housing, the manifold movable
along an axis between a first position, in which the manifold is fluidly
connected to material flowpaths through the housing to receive a first
constituent material and a second constituent material from the material

- flowpaths, and a second position, in which the manifold is fluidly disconnected from the material flowpaths; and
- a mixing assembly supported by the housing, wherein the manifold routes the first constituent material and the second constituent material to a mixing chamber within the mixing assembly with the manifold in the second position;
- wherein the manifold is shifts relative to the mixing chamber as the manifold moves between the first position and the second position.
25. The spray gun of claim 24, wherein a telescoping interface is formed between the manifold and the mixing assembly.
26. The spray gun of claim 25, wherein the manifold extends into a mixer of the mixing assembly at the telescoping interface.
27. The spray gun of claim 25, wherein a mixer of the mixing assembly extends into the manifold at the telescoping interface.
28. The spray gun of any one of claims 24 and 25, wherein the mixing assembly comprises:
- a cover connected to the housing;
- a nozzle formed through the cover, the nozzle configured to emit a spray of a plural component material from the spray gun, the plural component material formed by a mixture of the first constituent material and the second constituent material; and
- a mixer disposed within the cover, wherein the mixing chamber is formed between the mixer and the cover.
29. The spray gun of claim 28, wherein the manifold outputs the first constituent material at a location radially offset from the nozzle.
30. The spray gun of claim 29, wherein the manifold outputs the second constituent material at a location radially offset from the nozzle.
31. A manifold for use in a plural component spray gun, the manifold comprising:
- a manifold body extending along an axis between a first manifold end and a second manifold end;
- a first channel extending within the manifold body between a first channel inlet formed on an exterior of the manifold body and a first channel outlet formed through the first manifold end; and

a second channel extending within the manifold body between a second channel inlet formed on the exterior of the manifold body and a second channel outlet formed through the first manifold end;

wherein the first channel is fluidly separated from the second channel and does not intersect with the second channel.

32. The manifold of claim 31, further comprising:

a third channel extending within the manifold body between a third channel inlet formed on the exterior of the manifold body and a third channel outlet oriented axially, wherein the third channel is fluidly separated from the first channel and the separate channel.

33. The manifold of claim 32, wherein the third channel outlet is disposed on the axis.

34. The manifold of any one of claims 32 and 33, further comprising:
a stem projecting from the first manifold end, wherein the third channel extends through the stem.

35. The manifold of any one of claims 31–34 wherein the first channel outlet is radially offset from the axis and the second channel outlet is radially offset from the axis.

36. A method of spraying a plural component material with a spray gun including a housing defining a first material flowpath and a second material flowpath and a mixing assembly having a cover connected to the housing and a mixer disposed within the cover, the mixing assembly configured to mix a first constituent material and a second constituent material to form a plural component material, the method comprising:

displacing a manifold disposed at least partially within the housing in a first direction along an axis and relative to the mixer to fluidly connect a first channel extending through the manifold with the first material flowpath and fluidly connect a second channel extending through the manifold with the second material flowpath;

flowing the first constituent material through the first channel and outputting the first constituent material into the mixing assembly from the first channel, and flowing the second constituent material through the second channel and outputting the second constituent material into the mixing assembly from the second channel;

mixing the first constituent material and the second constituent material within the mixing assembly to form the plural component material; and

spraying the plural component material through a nozzle of the spray gun.

37. The method of claim 36, further comprising:

displacing the manifold in a second direction along the axis and relative to the mixer to fluidly disconnect the first channel from the first material flowpath and fluidly disconnect the second channel from the second material flowpath.

38. The method of claim 37, further comprising:

flowing compressed gas into the first channel and the second channel from a purge chamber formed within the housing and between the housing and the manifold.

39. The method of any one of claims 36 and 37, further comprising:

flowing compressed gas into a third channel formed within the manifold and outputting the compressed gas from the third channel and into a bore formed within the mixer.

40. The method of any one of claims 36–39, wherein flowing the first constituent material through the first channel and outputting the first constituent material into the mixing assembly from the first channel, and flowing the second constituent material through the second channel and outputting the second constituent material into the mixing assembly from the second channel includes:

outputting the first constituent material through an outlet of the first channel that is formed on an axial end face of the manifold; and
outputting the second constituent material through an outlet of the second channel that is formed on the axial end face of the manifold.

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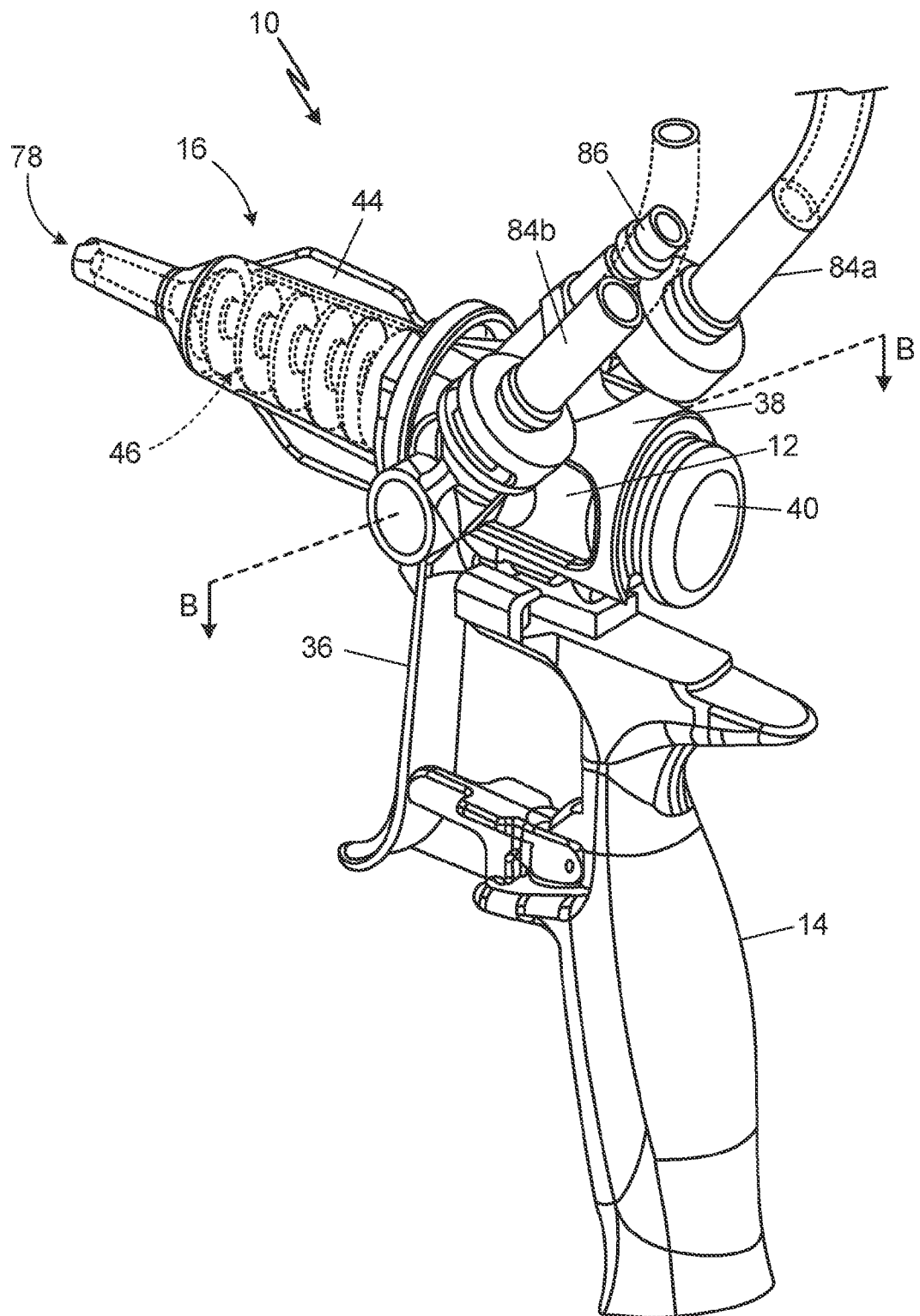
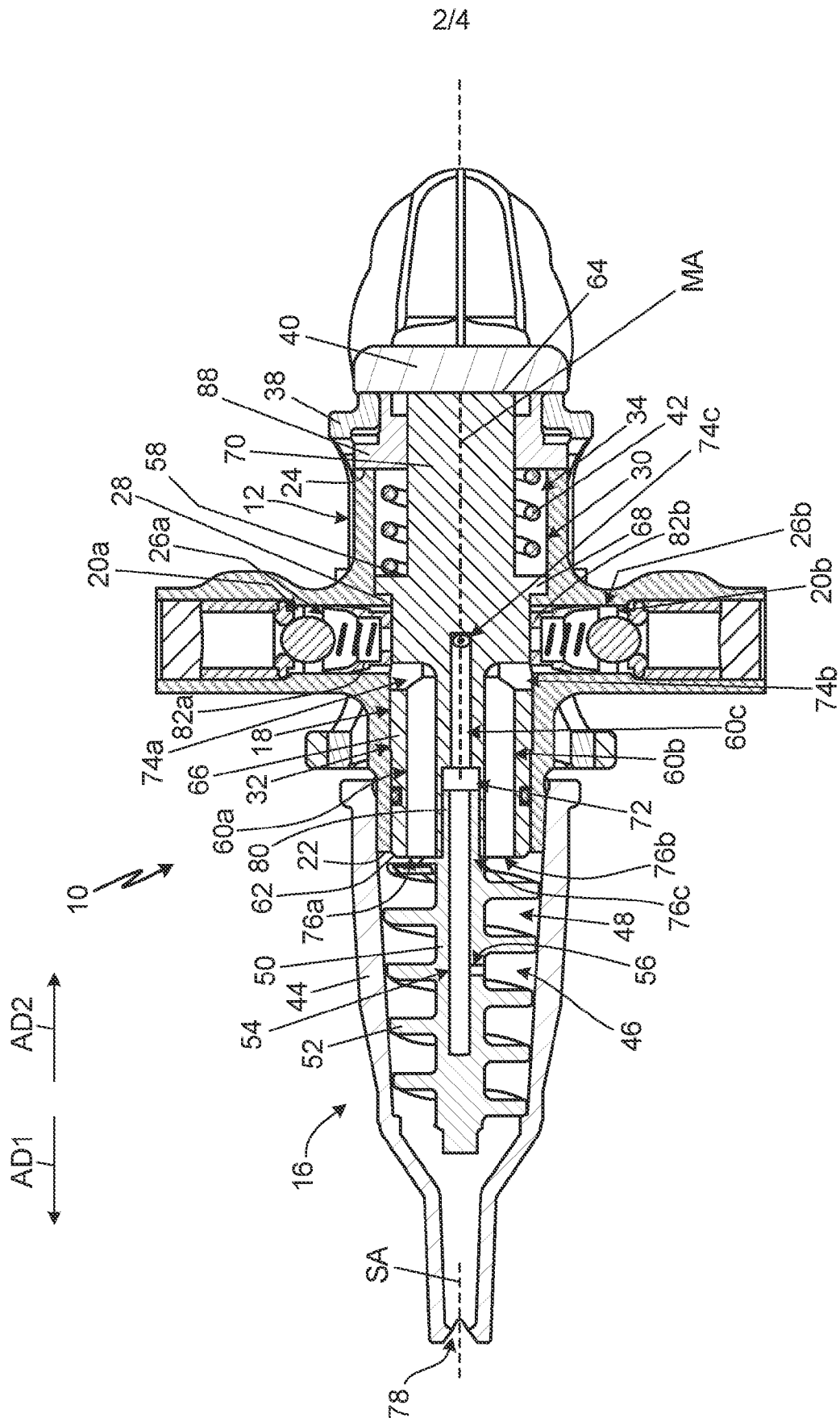


Fig. 1A



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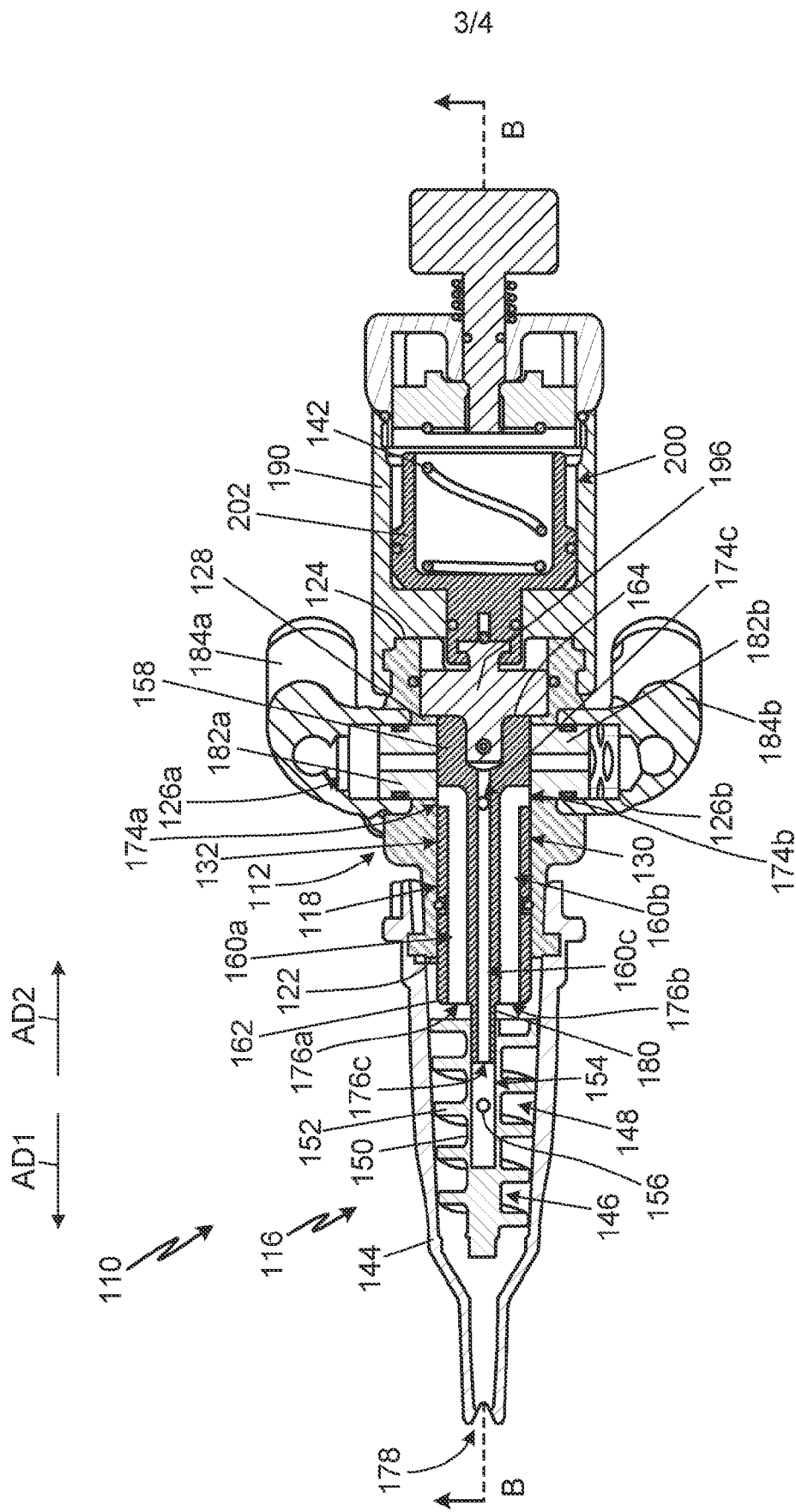


Fig. 2A

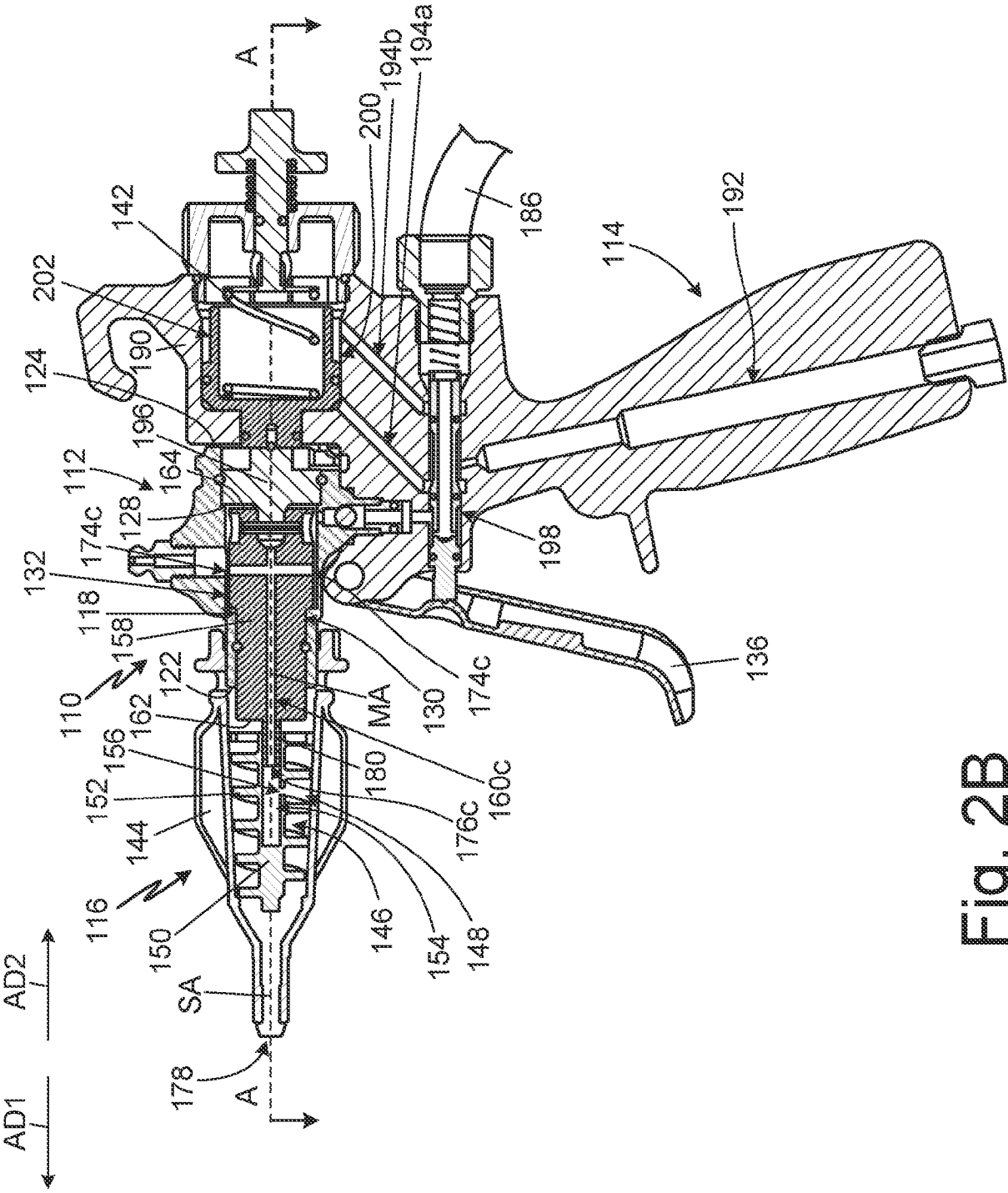


Fig. 2B

International application No
PCT/US2023/021359

According to International Patent Classification (IPC) or to both national classification and IPC

Minimum documentation searched (classification system followed by classification symbols)
B05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2022/015610 A2 (KRONZ MICHAEL [US])	1-3, 5, 6,
Y	20 January 2022 (2022-01-20)	36-40
A	figures	4, 7, 8,
		13-23
		9-12

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A	figures	4, 7, 8

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		25-27

Y	US 4 458 831 A (HOLLERAN PETER M [US] ET AL) 10 July 1984 (1984-07-10)	28-30
	figures	

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☒ Further documents are listed in the continuation of Box C.

x See patent family annex.

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Date of the actual completion of the international search

16 August 2023

Date of mailing of the international search report

28/08/2023

Name and mailing address of the ISA/
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

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Lindner, Volker

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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