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(54) Title: MODULAR MANIFOLD ADHESIVE GUN

(57) Abstract: An applicator gun (10) for a two-part material includes a hand grip (14) and a barrel (16). The barrel (16) extends generally transverse to the hand grip (14) and has a free end (32). A feed valve set (20) is positioned at about a juncture of the barrel (16) and the hand grip (14), and includes first and second feed valves (20), each having an inlet (26). An actuator (22) is operably connected to one or both of the feed valves (20) for opening and closing the valves (20). A mixing nozzle (34) is disposed at the barrel free end (32) and has first and second inlets (46) and discharge openings (56). The discharge openings (56) are formed at a discharge end of the nozzle (34). Feed tubes (30) provide flow communication between the feed valves (20) and the mixing nozzle inlets (46). The actuator (22) opens the feed valves (20) to feed the two part material through the applicator gun (10) and the two-part material is maintained separated through discharge at the mixing nozzle (34).

TITLE

MODULAR MANIFOLD ADHESIVE GUN

CROSS-REFERENCE TO RELATED APPLICATION DATA

[0001] This application claims the benefit of priority of US Provisional Patent Application Serial No. 61/488,051, filed May 19, 2011, the disclosure of which is incorporated herein in its entirety.

BACKGROUND

[0002] Many known adhesives are applied in two-part form. For example, epoxy adhesives are provided in a two-part form as a resin and an accelerator. When mixed, the accelerator facilitates the setting (or hardening or curing) of the resin.

[0003] In large scale applications, such as those for installing roofing materials and the like, the two parts, the resin and the accelerator, are carried in containers on a cart. A pump conveys the materials to an applicator gun. Known applicator guns include a frame with a barrel and handle. A manifold block, such as a steel or aluminum block is mounted at the end of the barrel.

[0004] Tubes or hoses are used as the conduit to convey material from the pumps to the manifold block. Valves are mounted to the block (typically ball valves) that are used to permit and shut-off flow of material into the manifold block. The two valves are separately actuated.

[0005] A mixing nozzle is bolted to the end of the manifold block and an applicator tube is mounted, as by threading, onto the end of the mixing nozzle. As such, mixing of the resin and accelerator occurs, in part, at the end of the manifold block and in the mixing nozzle.

[0006] There are a number of drawbacks with the present applicator system. First, the equipment is heavy and unwieldy. In particular, the manifold block is, as the name describes, a block. It is typically a block of steel or aluminum and is positioned at the end of the barrel, with the valves (also steel or aluminum) mounted to the block. Thus the majority of the weight of the gun is located at a distance from the user's hand that is holding the gun, creating a fairly substantial moment at the hand and wrist.

[0007] Moreover, in that mixing occurs at the end or exit of the manifold and in the mixing nozzle, if delivery of either or both of the components of the two-part adhesive is upset, the mixed adhesive can set up in the manifold block and/or the mixing nozzle. When this happens, it is necessary to take the applicator gun out of service, remove the mixing nozzle and clean and/or replace the manifold block and mixing nozzle. This can be a time consuming and costly situation in the cleaning and or replacement service and lost applicator operating time.

[0008] Accordingly, there is a need for an applicator gun and system that is light-weight and readily maneuvered. Desirably, such an applicator gun uses a single or double valve actuator to open and close both the resin and the accelerator valves. More desirably still, the actuator is located at or near the juncture of the gun barrel and handle, near the user's hand, to provide better ergonomics and ease of use. Still more desirably, the applicator gun includes a modular mixing nozzle and carriage to facilitate quick change-out as needed.

SUMMARY

[0009] An applicator gun applies a two-part material. The gun includes a hand grip and a barrel extending from an end of the hand grip, generally transverse to the hand grip. The barrel has a free end.

[0010] A feed valve set is positioned at about a juncture of the barrel and the hand grip. The feed valve set includes first and second feed valves, each of which has an inlet. An actuator is operably connected to the feed valves for opening and closing the feed valves.

[0011] A mixing nozzle is disposed at about the free end of the barrel. The mixing nozzle has first and second inlets and first and second discharge openings. The discharge openings are formed at a discharge end of the nozzle. First and second feed tubes provide flow communication between the second feed valves and the mixing nozzle inlets.

[0012] The actuator opens the feed valves contemporaneously to feed the two part material through the applicator gun. The two-part material is maintained

separated through discharge at the mixing nozzle. A separator can be positioned between the first and second discharge openings.

[0013] The barrel can include channels formed therein for receipt of the first and second feed tubes.

[0014] The mixing nozzle is secured in the barrel by a biased detent. The detent can be located in the mixing nozzle and the barrel can include a recess for cooperating with the biased detent. Alternately, the detent can be located in the barrel and the mixing nozzle can includes a recess for cooperating with the detent.

[0015] The mixing nozzle can include a cooperating member, such as a thread or a bayonet mount for mounting a mixing tip to the nozzle.

[0016] In an embodiment, the hand grip and barrel are formed as a unitary member. They can be formed from polymeric materials or the like and can be a molded component or components. Preferably, the mixing nozzle is also formed from a polymeric material.

[0017] These and other features and advantages of the present invention will be readily apparent from the following detailed description, in conjunction with the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] FIG. 1 is a perspective illustration of an embodiment of an applicator gun, in which the feed hoses are shown disconnected from the feed valves for clarity of illustration;

[0019] FIG. 2 is a side view of the applicator gun of FIG. 1;

[0020] FIG. 3 is a top view of the applicator gun;

[0021] FIG. 4 is a rear view of the applicator gun, as viewed looking into the feed valves;

[0022] FIG. 5 is a front view of the applicator gun, as viewed looking into the mixing nozzle;

[0023] FIG. 6 is a perspective view of the applicator gun frame;

[0024] FIG. 7 is a perspective view of the applicator gun frame assembled, with the feed hoses shown disconnected from the feed valves;

[0025] FIG. 8 is a perspective view of the mixing nozzle;

[0026] FIG. 9 is a top view of the mixing nozzle;

[0027] FIG. 10 is a front view of the mixing nozzle; and

[0028] FIG. 11 is a partial view of the applicator gun shown exploded, illustrating a mixing tip and Y adaptor in position for mounting to the mixing nozzle.

DETAILED DESCRIPTION

[0029] While the present device is susceptible of embodiments in various forms, there is shown in the drawings and will hereinafter be described exemplary and non-limiting embodiments, with the understanding that the present disclosure is to be considered an exemplification of the device and is not intended to be limited to the specific embodiments illustrated.

[0030] With reference now to the figures and in particular to FIGS. 1-5, an applicator gun 10 is shown. The applicator gun 10 includes a frame 12 having a handle 14 and a barrel 16. The handle 14 is formed transverse to the barrel 16. The barrel 16 has a first end 18, at about the handle, that is configured to accommodate and secure first and second feed valves 20 to the frame 12. An actuator handle 22 is mounted to each valve 20 to open and close the valve 20. The valves can be opened in tandem or independently. A hand grip 24, such as the tubular handle can be mounted to each actuator handle 22 to facilitate ease of opening and closing the valves 20. Although two hand grips 24 are shown, it will be appreciated that a single hand grip can be used to actuate the valves concurrently. The valves 20 each include an inlet 26, to which delivery hoses (not shown) are affixed to feed the resin and accelerator to the applicator gun 10. The valves 20 can be mounted to the frame 12 by methods that will be recognized by those skilled in the art.

[0031] The frame 12 includes a longitudinal channel 28 formed in each side. The channels 28 are configured to accommodate feed tubes 30 that extend from the feed valves 20 to the end 32 of the barrel 16. A mixing nozzle 34 is positioned in and secured to a recess or opening 36 in the end of the barrel.

[0032] The mixing nozzle 34 is mounted to the barrel 16 and is captured by the walls 38 that define the opening 36. As best seen in FIGS. 8 and 11, a biased

bearing 40 (ball or plug) serves as a detent to maintain the mixing nozzle 34 in the opening 36. As illustrated, the bearing 40 and a spring (not shown) are located within the bottom wall 38a of the opening 36, such that the ball 40 (which is urged upward, into the opening 36 by the spring), engages a recess or dimple 42 in the top of the mixing nozzle 34. It will be appreciated be those skilled in the art that the bearing 40 detent can be located in the top wall of the opening 36, or can be positioned in the mixing nozzle (described below) and that the recess or dimple can be located in the frame 12. This arrangement provides a tool-less arrangement by which the mixing nozzle 34 can be installed in and removed from the frame 12 (opening 36) while still maintaining the nozzle 34 sufficiently secure within the frame 12 for proper functioning of the applicator gun 10.

[0033] Referring to FIGS. 8-11, the mixing nozzle 34 includes a body 44 having a pair of inlet tubes 46 extending from one end 48 of the body 44 to a discharge nozzle 50 at an opposite end 52 of the body 44. In a present mixing nozzle 34, the inlet tubes 46 have a friction fit (such as the raised ring 54), so that the feed tubes 30 (which are inserted onto the inlet tubes 46), remain secured to the inlet tubes 46. Other arrangements for securing the feed tubes 30 to the inlet tubes 46, such as barbed fittings and the like, are contemplated and are within the scope and spirit of the present disclosure.

[0034] As discussed above, the body 44 includes the recess or dimple 42 for receiving the bearing detent 40 (in the frame 12) to secure the mixing nozzle 34 within the frame end opening 36. Also as discussed above, the bearing detent 40 can be positioned in the mixing nozzle body 44 to cooperate with a recess or dimple in the frame 12.

[0035] Within the body 44 of the mixing nozzle 34, two flow chambers 56 are formed. Each flow chamber 56 extends from a respective inlet tube 46, through the body 44, toward and into the discharge nozzle 50. The chambers 56 converge at the (discharge) end of the discharge nozzle 50. A separator 58 is positioned on the end of the discharge nozzle 50, between the flow chamber 56 ends (exit ends) to prevent contamination at the respective flow chamber 56 ends. That is, the separator 58 prevents resin from entering or coming into contact with the accelerator flow chamber end, and

likewise, the separator 58 prevents accelerator from coming into contact with resin at the resin flow chamber end. This configuration reduces or eliminates premature mixing of the resin and accelerator at the mixing nozzle by maintaining the two parts separate from one another. In a present mixing nozzle 34, the separator 58 is formed as a wall between the two flow chamber 56 ends.

[0036] Referring to FIG. 11, the discharge end 50 of the mixing nozzle 34 can include a thread 60 or like formation to permit the use (e.g., connection) of a mixing tip 62. A Y-adapter 64 can be fitted onto the mixing tip 62 to permit applying two beads of adhesive simultaneous. The mixing tip 62 can include an internal element (not shown), such as a screw thread or the like, to enhance intimate mixing of the resin and accelerator as they flow though the tip 62. It is contemplated that the mixing tip 62 can be readily replaced in the event that the adhesive sets up in the tip 62.

[0037] A present applicator gun 10 is formed from common, relatively light-weight materials. For example, the frame 12 can be formed from a polymeric material such as high density polyethylene (HDPE). HDPE is ideal due to its strength, stability and workability/formability. The valves 20 and handle/actuator 22 can be formed from steel, aluminum or like metals. However, because the valves 20 and handle/actuator 22 are located near the hand grip 24, the weight of these components is readily managed. The feed tubes 30 can be formed from any polymeric material that is suitable or compatible with the resin and accelerator. The tubes 30 can be transparent or translucent so that material in the tubes 30 can be readily, visibly inspected. The tubes 30 may also be color coded, as by striping, so that the resin and accelerator are fed through the same tubes 30 (for example when changing over supplies) to prevent contamination of the tubes 30. The mixing nozzle 34 is also preferably formed from a molded, polymeric material. Other suitable materials for the various components of the applicator gun 10 will be recognized by those skilled in the art.

[0038] In the disclosure, the use of the disjunctive is intended to include the conjunctive. The use of the definite article or indefinite article is not intended to indicate cardinality. In particular, a reference to “the” object or “a” or “an” object is intended to denote also one of a possible plurality of such objects.

[0039] All patents referred to herein, are hereby incorporated herein by reference, whether or not specifically done so within the text of this disclosure.

[0040] From the foregoing it will be observed that numerous modification and variations can be effectuated without departing from the true spirit and scope of the novel concepts of the present disclosure. It is to be understood that no limitation with respect to the specific embodiments illustrated is intended or should be inferred. The disclosure is intended to cover by the appended claims all such modifications as fall within the scope of the claims.

CLAIMS

What is claimed is:

1. An applicator gun for applying a two-part material, comprising:

a hand grip;

a barrel extending from an end of the hand grip, the barrel extending generally transverse to the hand grip, the barrel having a free end;

a feed valve set positioned at about a juncture of the barrel and the hand grip, the feed valve set including first and second feed valves, each of the first and second feed valves having an inlet;

an actuator operably connected to at least one of the first and second feed valves for opening and closing the feed valves;

a mixing nozzle disposed at about the free end of the barrel, the mixing nozzle having first and second inlets and first and second discharge openings, the discharge openings formed at a discharge end of the mixing nozzle; and

first and second feed tubes for providing flow communication between the first and second feed valves and the mixing nozzle first and second inlets, respectively,

wherein the actuator opens at least one of the first and second feed valves to feed the two part material through the applicator gun, the two-part material being maintained separated through discharge at the discharge openings of the mixing nozzle.

2. The applicator gun of claim 1 wherein the mixing nozzle includes a separator positioned between the first and second discharge openings.

3. The applicator gun of claim 1 wherein the barrel includes channels formed therein for receipt of the first and second feed tubes.

4. The application gun of claim 1 wherein the mixing nozzle is secured in the barrel by a biased detent.

5. The applicator gun of claim 4 wherein the biased detent is located in the mixing nozzle and wherein the barrel includes a recess for cooperating with the biased detent.

6. The applicator gun of claim 4 wherein the biased detent is located in the barrel and wherein the mixing nozzle includes a recess for cooperating with the biased detent.

7. The applicator gun of claim 1 wherein the mixing nozzle includes a cooperating member for mounting a mixing tip

8. The applicator gun of claim 1 wherein the hand grip and barrel are formed as a unitary member.

9. The applicator gun of claim 1 wherein the hand grip and barrel are formed from a polymeric material.

10. The applicator gun of claim 1 wherein the mixing nozzle is formed from a polymeric material.

11. The applicator gun of claim 1 wherein the actuator is a first actuator connected to the first feed valve and including a second actuator connected to the second feed valve.

12. The applicator gun of claim 1 wherein the first and second actuators operate the first and second feed valves independently.

13. A mixing nozzle for an applicator gun for applying a two-part material, the applicator gun including a barrel having a free end, the mixing nozzle comprising:

a body having first and second inlets and first and second discharge openings, the discharge openings formed at a discharge end of the mixing nozzle,

one of a biased detent and a detent cooperating member for securing the mixing nozzle at the free end of the barrel without the use of tools.

14. The mixing nozzle of claim 13 wherein the mixing nozzle is a molded part formed from polymeric materials.

15. The mixing nozzle of claim 13 including a separator at about the discharge end of the mixing nozzle to maintain the first and second discharge openings isolated from one another.

16. The mixing nozzle of claim 15 wherein the separator is a separator wall.

17. The mixing nozzle of claim 13 including a thread formation at the discharge end.

18. The mixing nozzle of claim 13 wherein the biased detent is positioned in the mixing nozzle.

19. The mixing nozzle of claim 13 wherein the detent cooperating member is positioned in the mixing nozzle.

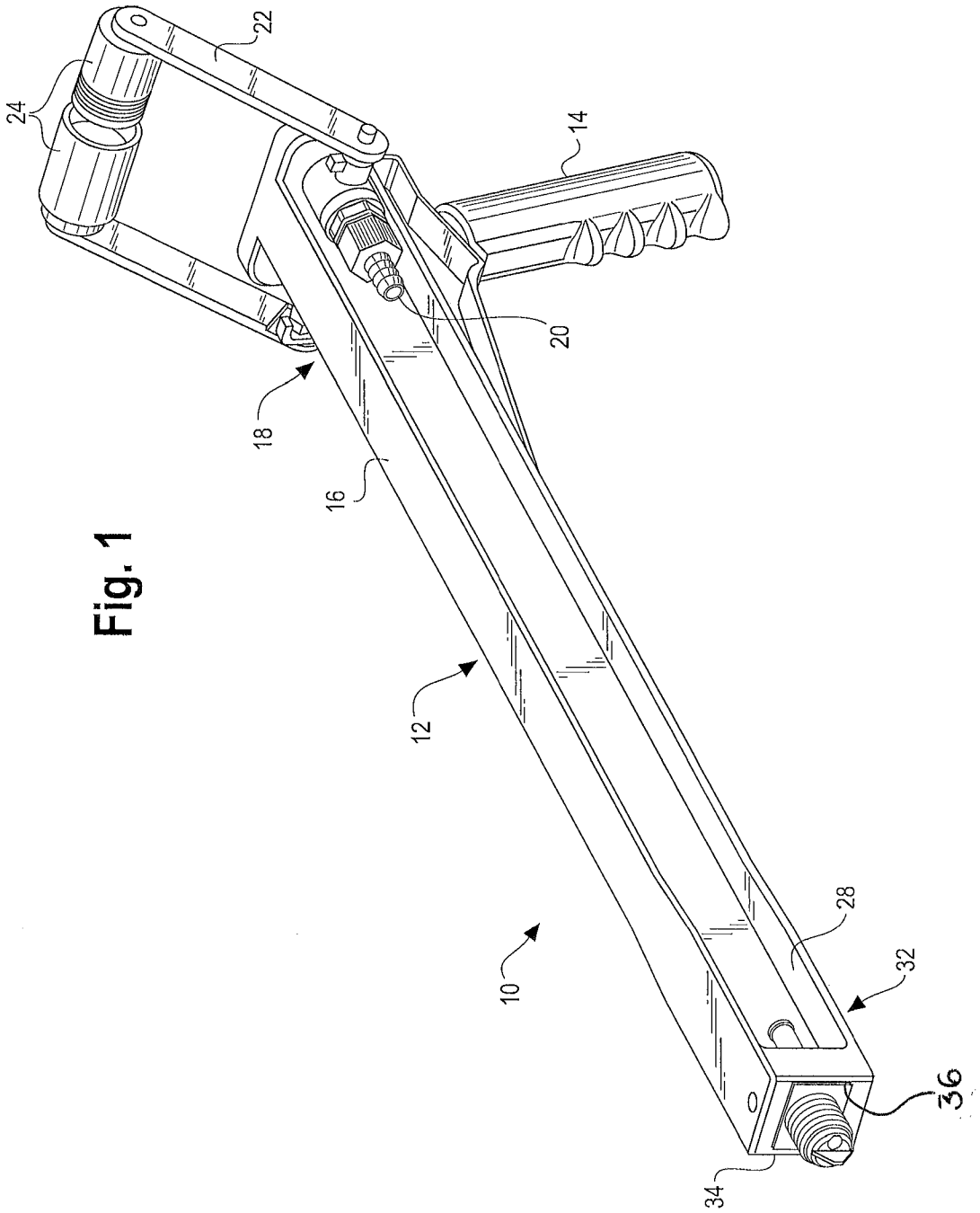


Fig. 1

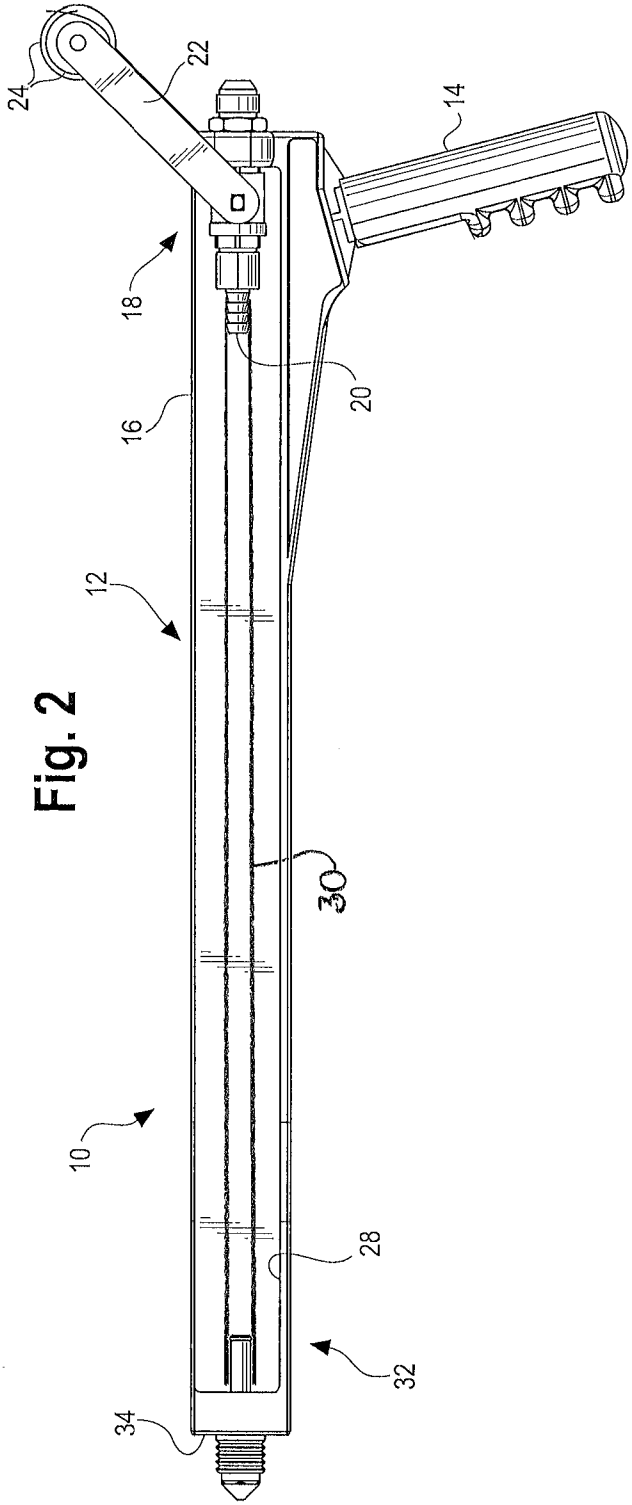


Fig. 2

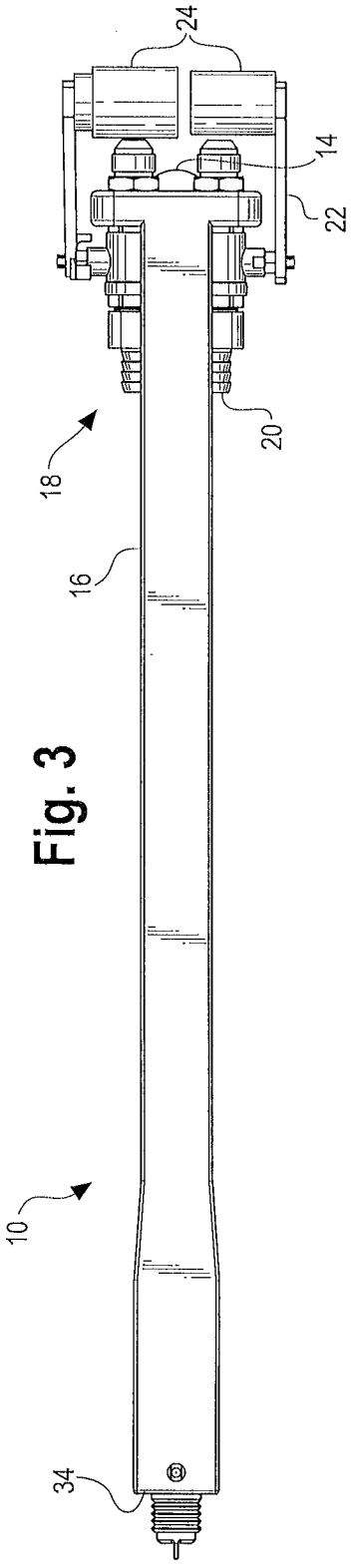


Fig. 3

Fig. 4

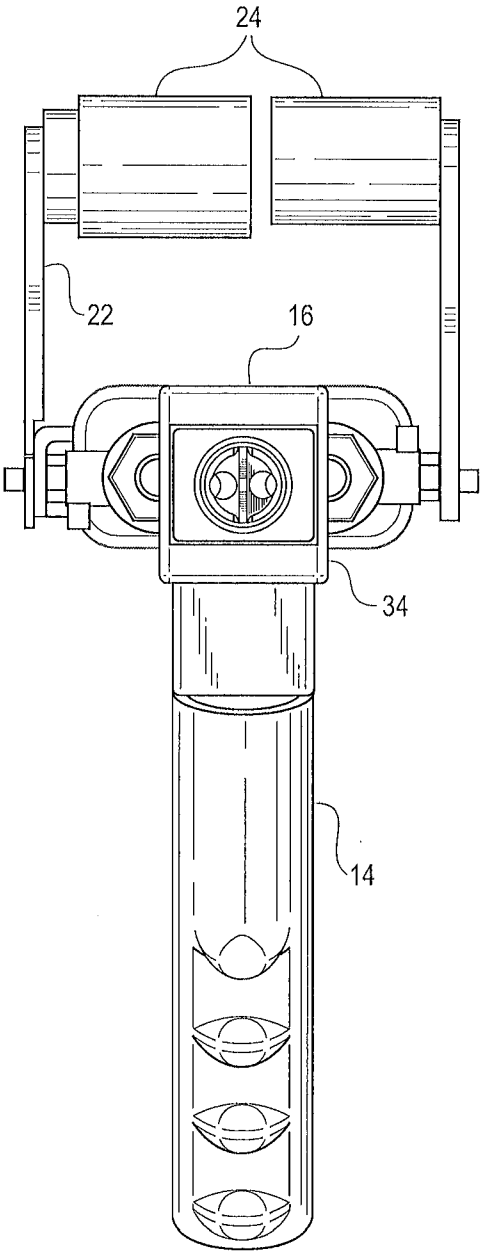
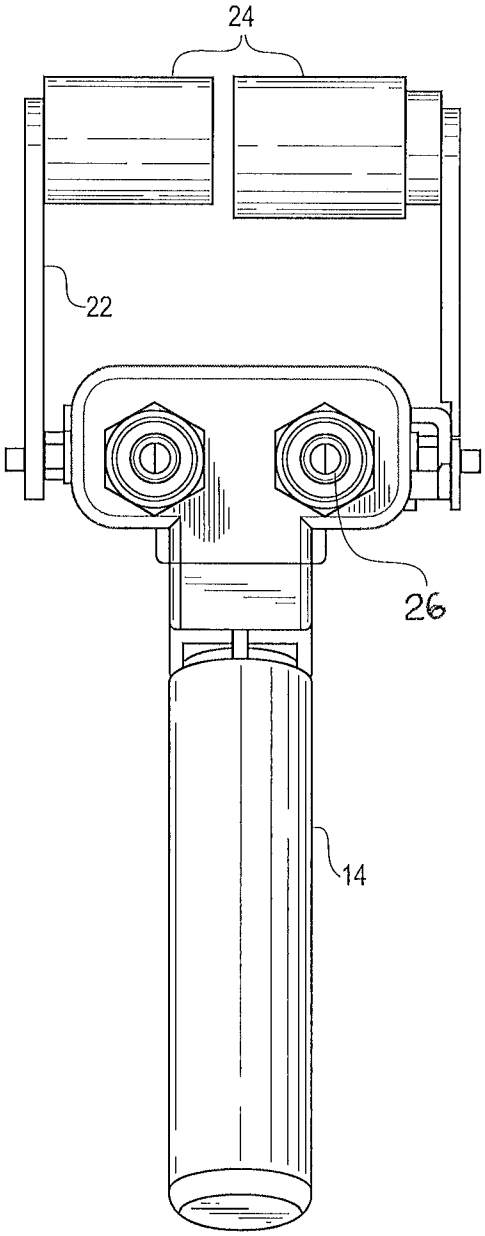


Fig. 5



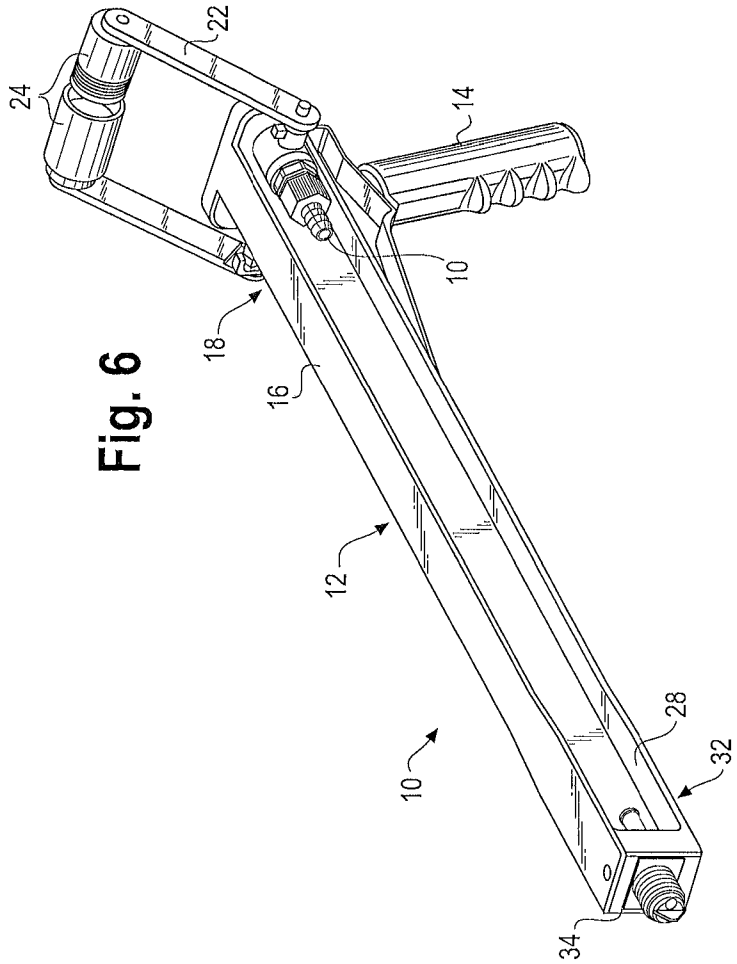


Fig. 6

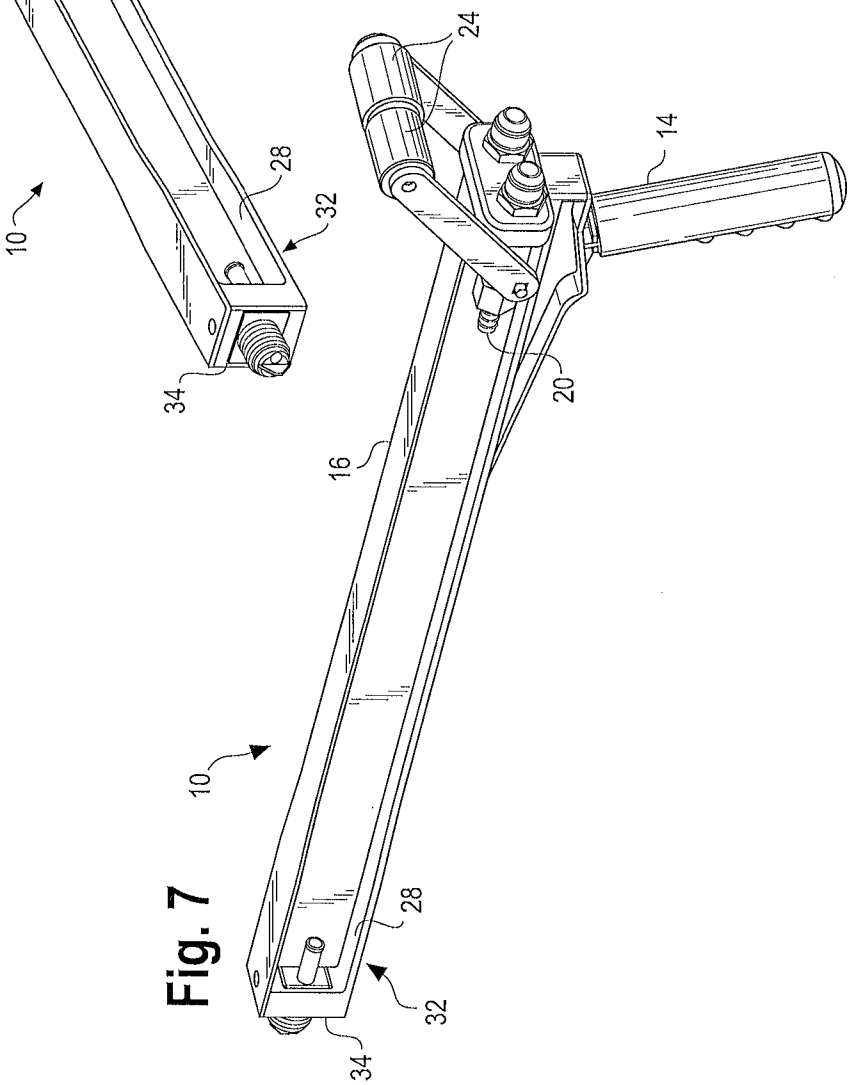


Fig. 7

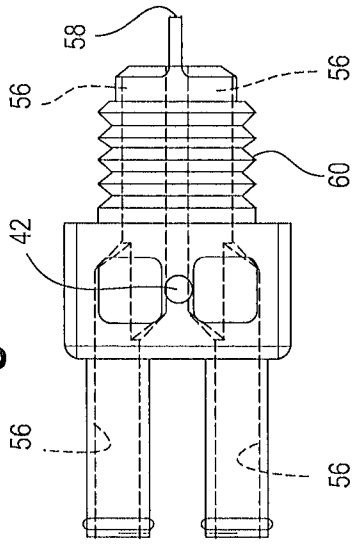


Fig. 9

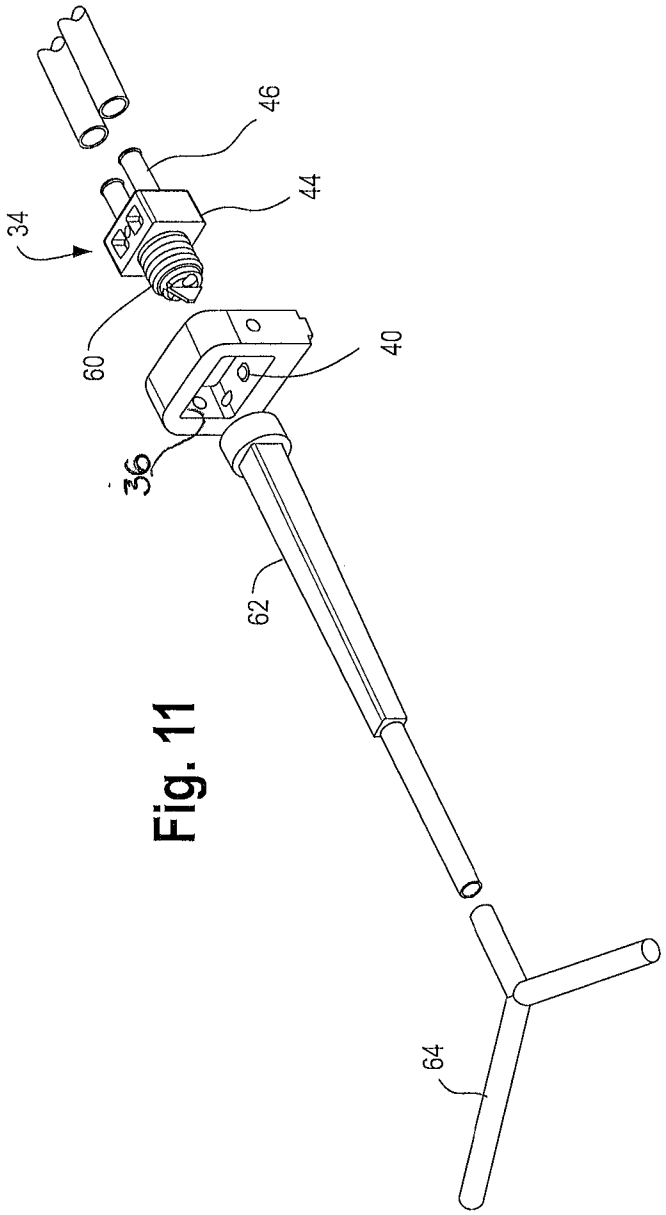


Fig. 11

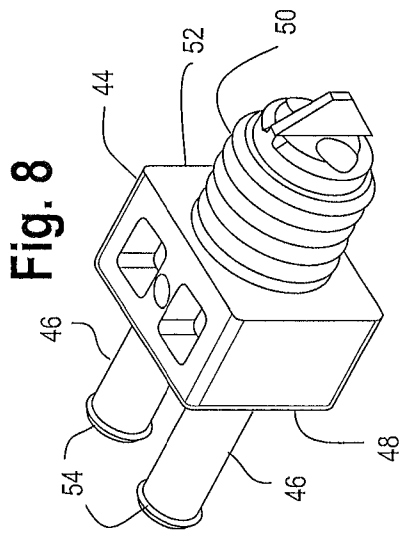


Fig. 8

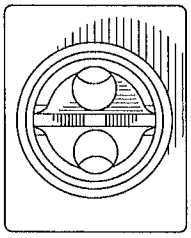


Fig. 10

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/038545

A. CLASSIFICATION OF SUBJECT MATTER
INV. B05B7/04 B05B7/12 B29B7/74 B05B12/00 B05C17/005
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B05B B29B B05C B01F

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/270400 A1 (EVAR SCOTT D [US] ET AL) 28 October 2010 (2010-10-28) paragraph [0084] - paragraph [0109]; figures 1-23 paragraph [0114] - paragraph [0131]; figures 26-39 -----	1-11, 13-19
X	US 4 117 551 A (BROOKS WILLIAM R ET AL) 26 September 1978 (1978-09-26) column 6, line 64 - column 8, line 40; figures 7-9 column 5, line 1 - line 20; figures 1-6 column 5, line 47 - line 62 ----- -/--	1,2,4-8, 10-13, 15,18,19

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 October 2012	23/10/2012

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

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/038545

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/031270 A1 (CHOINIERE STANLEY W [US] ET AL) 10 February 2011 (2011-02-10) paragraph [0056]; figure 14 figures 9-14	13-19
A	WO 03/066227 A1 (URECOATS MFG INC [US]) 14 August 2003 (2003-08-14) figures	1,13

2

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2012/038545

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010270400 A1	28-10-2010	NONE	
US 4117551 A	26-09-1978	BE 859130 A1	16-01-1978
		DE 2742791 A1	05-04-1979
		FR 2403881 A1	20-04-1979
		NL 7710233 A	21-03-1979
		US 4117551 A	26-09-1978
US 2011031270 A1	10-02-2011	NONE	
WO 03066227 A1	14-08-2003	AU 2003217348 A1	02-09-2003
		CA 2380044 A1	07-08-2003
		CN 1436603 A	20-08-2003
		US 6705539 B1	16-03-2004
		US 2004217185 A1	04-11-2004
		WO 03066227 A1	14-08-2003