



(51) International Patent Classification:
B05B 5/03 (2006.01) *B05B 5/053* (2006.01)
B05B 15/06 (2006.01)

(21) International Application Number:
PCT/US2009/035439

(22) International Filing Date:
27 February 2009 (27.02.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
12/045,354 10 March 2008 (10.03.2008) US

(71) Applicant (for all designated States except US): **ILLINOIS TOOL WORKS INC.** [US/US]; 3600 West Lake Avenue, Glenview, IL 60026 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **BALTZ, James, P.** [US/US]; 3600 West Lake Avenue, Glenview, IL 60026 (US).

(74) Agent: **HAUPTMAN, Benjamin, J.**; Lowe Hauptman Ham & Berner, LLP, 1700 Diagonal Road, Suite 300, Alexandria, VA 22314 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR),

[Continued on next page]

(54) Title: METHOD AND APPARATUS FOR RETAINING HIGHLY TORQUED FITTINGS IN MOLDED RESIN OR POLYMER HOUSING

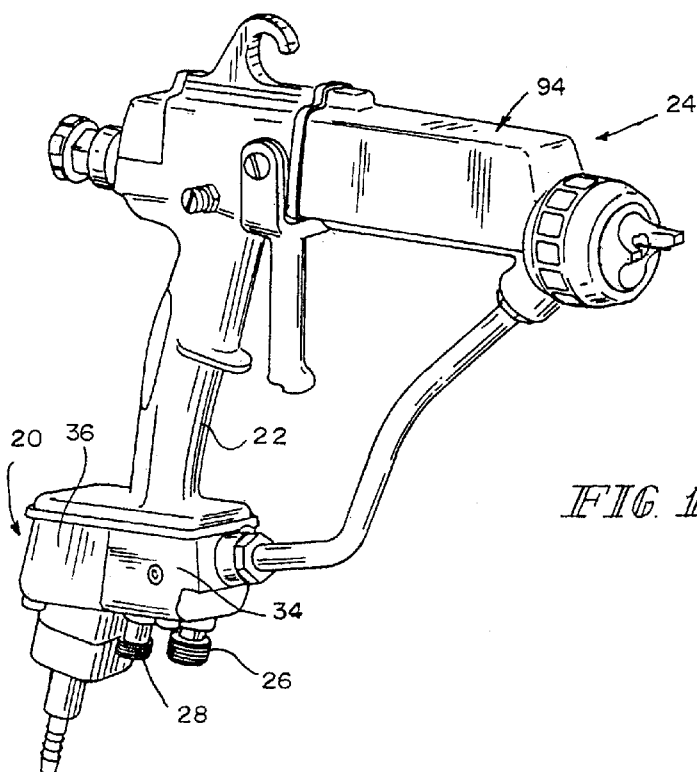


FIG. 1

(57) Abstract: A module (20) for mounting on the end of a handle (22) of a coating material (24) dispensing device comprises at least a coating material fitting (26) for coupling to a source of coating material. The module further includes a first fractional module component (36) and a second fractional module component (34). The coating material fitting is captured between the first fractional module component and the second fractional module component when the first a second fractional module components are assembled together.



OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG). **Published:**

— *with international search report (Art. 21(3))*

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

METHOD AND APPARATUS FOR RETAINING HIGHLY TORQUED FITTINGS IN MOLDED RESIN OR POLYMER HOUSING

CROSS-REFERENCE TO RELATED APPLICATIONS

5 This application is related to U. S. S. N. 12/045,155, titled Sealed
Electrical Source For Air-Powered Electrostatic Atomizing And Dispensing Device,
U. S. S. N. 12/045,175, titled Circuit Board Configuration For Air-Powered
Electrostatically Aided Coating Material Atomizer, U. S. S. N. 12/045,173, titled
Controlling Temperature In Air-Powered Electrostatically Aided Coating Material
10 Atomizer, U. S. S. N. 12/045,169, titled Circuit For Displaying The Relative Voltage
At The Output Electrode Of An Electrostatically Aided Coating Material Atomizer, U.
S. S. N. 12/045,178, titled Generator For Air-Powered Electrostatically Aided Coating
Dispensing Device, and U. S. S. N. 12/045,354, titled Method And Apparatus For
Retaining Highly Torqued Fittings In Molded Resin Or Polymer Housing, all filed on
15 the same day as this application, the disclosures of all of which are hereby
incorporated herein by reference.

FIELD OF THE INVENTION

20 This invention relates to methods for constructing molded filled or
unfilled resin and polymer housings which are provided with fittings subject to
relatively high torque during assembly and/or use. The invention is disclosed in the
context of electrostatically aided coating material atomization and dispensing devices,
hereinafter sometimes called spray guns or guns; and particularly in the context of a
spray gun powered by compressed gas, typically compressed air. Hereinafter, such
25 guns are sometimes called cordless spray guns or cordless guns.

BACKGROUND

Various types of manual and automatic spray guns are known. There
are the cordless electrostatic handguns illustrated and described in U. S. Patents:
30 4,219,865; 4,290,091; 4,377,838; and, 4,491,276. There are also, for example, the
automatic and manual spray guns illustrated and described in the following listed U.S.

patents and published applications: 2006/0283386; 2006/0219824; 2006/0081729; 2004/0195405; 2003/0006322; U.S. Pat. Nos. 7,296,760; 7,296,759; 7,292,322; 7,247,205; 7,217,442; 7,166,164; 7,143,963; 7,128,277; 6,955,724; 6,951,309; 6,929,698; 6,916,023; 6,877,681; 6,854,672; 6,817,553; 6,796,519; 6,790,285; 5 6,776,362; 6,758,425; RE38,526; 6,712,292; 6,698,670; 6,679,193; 6,669,112; 6,572,029; 6,488,264; 6,460,787; 6,402,058; RE36,378; 6,276,616; 6,189,809; 6,179,223; 5,836,517; 5,829,679; 5,803,313; RE35,769; 5,647,543; 5,639,027; 5,618,001; 5,582,350; 5,553,788; 5,400,971; 5,395,054; D350,387; D349,559; 5,351,887; 5,332,159; 5,332,156; 5,330,108; 5,303,865; 5,299,740; 5,289,977; 10 5,289,974; 5,284,301; 5,284,299; 5,236,425; 5,236,129; 5,218,305; 5,209,405; 5,209,365; 5,178,330; 5,119,992; 5,118,080; 5,180,104; D325,241; 5,093,625; 5,090,623; 5,080,289; 5,074,466; 5,073,709; 5,064,119; 5,063,350; 5,054,687; 5,039,019; D318,712; 5,022,590; 4,993,645; 4,978,075; 4,934,607; 4,934,603; D313,064; 4,927,079; 4,921,172; 4,911,367; D305,453; D305,452; D305,057; 15 D303,139; 4,890,190; 4,844,342; 4,828,218; 4,819,879; 4,770,117; 4,760,962; 4,759,502; 4,747,546; 4,702,420; 4,613,082; 4,606,501; 4,572,438; 4,567,911; D287,266; 4,537,357; 4,529,131; 4,513,913; 4,483,483; 4,453,670; 4,437,614; 4,433,812; 4,401,268; 4,361,283; D270,368; D270,367; D270,180; D270,179; RE30,968; 4,331,298; 4,289,278; 4,285,446; 4,266,721; 4,248,386; 4,216,915; 20 4,214,709; 4,174,071; 4,174,070; 4,171,100; 4,169,545; 4,165,022; D252,097; 4,133,483; 4,122,327; 4,116,364; 4,114,564; 4,105,164; 4,081,904; 4,066,041; 4,037,561; 4,030,857; 4,020,393; 4,002,777; 4,001,935; 3,990,609; 3,964,683; 3,949,266; 3,940,061; 3,932,071; 3,557,821; 3,169,883; and, 3,169,882. There are also the disclosures of WO 2005/014177 and WO 01/85353. There are also the 25 disclosures of EP 0 734 777 and GB 2 153 260. There are also the Ransburg model REA 3, REA 4, REA 70, REA 90, REM and M-90 guns, all available from ITW Ransburg, 320 Phillips Avenue, Toledo, Ohio, 43612-1493.

The disclosures of these references are hereby incorporated herein by reference. The above listing is not intended to be a representation that a complete 30 search of all relevant art has been made, or that no more pertinent art than that listed exists, or that the listed art is material to patentability. Nor should any such representation be inferred.

DISCLOSURE OF THE INVENTION

According to an aspect of the invention, a module for attachment to a tool comprising a first fractional module component and a second fractional module component, at least one fitting captured between the first and second fractional module components when the first and second fractional module components are assembled together.

Illustratively according to this aspect of the invention, each of the first and second fractional module components includes a feature complementarily configured to receive the at least one at least one fitting in the assembled module.

Illustratively according to this aspect of the invention, the tool comprises a coating material dispensing device. The at least one at least one fitting includes both a coating material fitting and a compressed gas fitting. Each of the first and second fractional module components includes a feature complementarily configured to receive the coating material fitting and the compressed gas fitting in the assembled module.

Illustratively according to this aspect of the invention, both the coating material fitting and the compressed gas fitting comprise metallic fittings. The first and second fractional module components are assembled together with metallic fasteners. The module further includes a feature provided in at least one of the first and second fractional module components to accommodate an electrically conductive device for connecting to the metallic fittings and metallic fasteners by at least one of: pressing of the electrically conductive device into intimate contact with the metallic fittings; pressing of the electrically conductive device into intimate contact with the metallic fasteners; electrical conductors extending between the electrically conductive device and the metallic fittings; and, electrical conductors extending between the electrically conductive device and the metallic fasteners.

Further illustratively according to this aspect of the invention, the module includes a length of grounded conduit coupled to the compressed gas fitting and to ground to ground the electrically conductive device and the metallic fittings and metallic fasteners coupled to the electrically conductive device.

Further illustratively according to this aspect of the invention, the

module includes a generator having a shaft. A compressed gas driven turbine wheel is mounted on the shaft for driving the generator.

Further illustratively according to this aspect of the invention, the module includes a passageway provided in at least one of the first and second fractional module components to supply compressed gas to the turbine wheel to drive the generator to produce electricity for the coating material dispensing device.

Illustratively according to this aspect of the invention, each of the first and second fractional module components includes a first feature and a second feature configured to receive the first feature in the assembled module.

Illustratively according to this aspect of the invention, the module is adapted to mount on a free end of a handle of a somewhat pistol-shaped coating material dispensing device. Each of the first and second fractional module components includes a feature which cooperates with the feature on the other of the first and second fractional module components to receive a second feature provided on the free end of the handle to aid in orienting the assembled module relative to the handle.

Illustratively according to this aspect of the invention, the first and second fractional module components are joined together in the assembled module by threaded fasteners received in cooperating passageways provided in the first and second fractional module components.

Illustratively according to this aspect of the invention, a space is provided between the cooperating passageways for a module-to-handle threaded fastener.

Further illustratively according to this aspect of the invention, the module includes a generator having a shaft. A compressed gas driven turbine wheel is mounted on the shaft for driving the generator.

Further illustratively according to this aspect of the invention, the module includes a passageway provided in at least one of the first and second fractional module components to supply compressed gas to the turbine wheel to drive the generator to produce electricity for the tool.

According to another aspect of the invention, a module for mounting on the end of a handle of a coating material dispensing device comprises at least a coating material fitting for coupling to a source of coating material. The module further includes a first fractional module component and a second fractional module component. The coating material fitting is captured between the first fractional module component and the second fractional module component when the first and second fractional module components are assembled together.

Illustratively according to this aspect of the invention, the source of coating material comprises a source of liquid coating material. The module further includes a compressed gas fitting. A source of compressed air is coupled to the compressed gas fitting.

Illustratively according to this aspect of the invention, each of the first and second fractional module components includes a feature complementarily configured to receive the coating material fitting and the compressed gas fitting in the assembled module.

Illustratively according to this aspect of the invention, both the coating material fitting and the compressed gas fitting comprise metallic fittings. The first and second fractional module components are assembled together with metallic fasteners. The module further includes a feature provided in at least one of the first and second fractional module components to accommodate an electrically conductive device for connecting to the metallic fittings and metallic fasteners by at least one of: pressing of the electrically conductive device into intimate contact with the metallic fittings; pressing of the electrically conductive device into intimate contact with the metallic fasteners; electrical conductors extending between the electrically conductive device and the metallic fittings; and, electrical conductors extending between the electrically conductive device and the metallic fasteners.

Further illustratively according to this aspect of the invention, the module includes a length of grounded conduit coupled to the compressed gas fitting and to ground to ground the electrically conductive device and the metallic fittings and metallic fasteners coupled to the electrically conductive device.

Illustratively according to this aspect of the invention, each of the first

and second fractional module components includes a first feature and a second feature configured to receive the first feature in the assembled module.

Illustratively according to this aspect of the invention, the first and second fractional module components are joined together in the assembled module by threaded fasteners received in cooperating passageways provided in the first and second fractional module components.

Illustratively according to this aspect of the invention, a space is provided between the cooperating passageways for a module-to-handle threaded fastener.

Further illustratively according to this aspect of the invention, the module includes a generator having a shaft. A compressed gas driven turbine wheel is mounted on the shaft for driving the generator.

Further illustratively according to this aspect of the invention, the module includes a passageway provided in at least one of the first and second fractional module components to supply compressed gas to the turbine wheel to drive the generator to produce electricity for the coating material dispensing device.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 illustrates a perspective view, generally from the right front, of a gun constructed according to the invention;

Fig. 2 illustrates a partly longitudinally sectional fragmentary side elevational view of certain details of the gun illustrated in Fig. 1;

Fig. 3 illustrates an exploded perspective view of certain details of the gun illustrated in Fig. 1; and,

Fig. 4 illustrates a perspective view of a detail of the gun illustrated in Fig. 1.

DETAILED DESCRIPTIONS OF ILLUSTRATIVE EMBODIMENTS

In many prior art guns, the air and fluid fittings necessary for gun operation are molded in place in a single molded component. The complexity

resulting from the modular design of the illustrated gun reduced the likelihood that a mold could be made that would produce the module as designed. Further, if the compressed gas and coating material fittings were integral, non-removable components of the module, the entire module would have to be discarded if, for example, coating material hardened in the coating material fitting and could not be removed. Also, if both fittings were incorporated into a single composite fitting, the weight of an all stainless steel coating material/compressed gas fitting was a concern from the operator fatigue standpoint.

The coating material and compressed gas fittings on a typical gun are subject to installation and removal torques as delivery conduits are attached and detached. Two metallic fittings must be held in place, transport their respective coating material and compressed gas, and not rotate in the gun body or module, or fail catastrophically as delivery conduits are attached and detached. This system also must be able to withstand the stress the delivery conduits, typically flexible hoses, place on the fittings and the gun where the fittings enter the gun.

The module was split into fractional components, and the coating material and compressed gas fittings are installed after molding by capturing them between the fractional components.

Referring now particularly to Fig. 1, a power module assembly 20 mounts on the lower end of a handle 22 of a spray gun 24. Module 20 is coupled through coating material and compressed gas fittings 26, 28, respectively, to sources of coating material and compressed gas (not shown). In the illustrated embodiment, the coating material source is a source of liquid paint and the compressed gas source is a source of compressed air. Coating material fitting 26 illustratively is constructed from stainless steel which is relatively inert to the coating material being dispensed through it. Compressed gas fitting 28 illustratively is fabricated from aluminum.

Module 20 is comprised of a fractional (hereinafter sometimes one-quarter or $\frac{1}{4}$) power module component 34 and a fractional (hereinafter sometimes three-quarter or $\frac{3}{4}$) power module component 36. Each of fractional power module components 34, 36 illustratively is constructed from a filled or unfilled molded resin or polymer such as, for example, PolyOne GMF 60640 UV black 28, black, UV

stabilized, glass-reinforced, mineral-filled, type 6 Nylon. Coating material fitting 26 and compressed gas fitting 28 are captured between fractional power module component 34 and fractional power module component 36 when components 34, 36 are assembled together, as will be discussed in more detail. Module 20 also includes a voltage control switch (not shown), a printed circuit board assembly 40, a three-phase, fractional horsepower motor 42 operated as a generator and powered by a compressed air driven turbine wheel (not shown), all for the purposes set forth in related U. S. S. N. 12/045,155, titled Sealed Electrical Source For Air-Powered Electrostatic Atomizing And Dispensing Device, U. S. S. N. 12/045,175, titled Circuit Board Configuration For Air-Powered Electrostatically Aided Coating Material Atomizer, U. S. S. N. 12/045,173, titled Controlling Temperature In Air-Powered Electrostatically Aided Coating Material Atomizer, U. S. S. N. 12/045,169, titled Circuit For Displaying The Relative Voltage At The Output Electrode Of An Electrostatically Aided Coating Material Atomizer, and U. S. S. N. 12/045,178, titled Generator For Air-Powered Electrostatically Aided Coating Dispensing Device.

Each of fractional power module component 34 and fractional power module component 36 includes a contoured pocket 50, 52, respectively, complementarily configured to receive the compressed gas fitting 28 in the assembled power module 20. Each of fractional power module component 34 and fractional power module component 36 also includes a contoured pocket 54, 56, respectively, complementarily configured to receive the coating material fitting 26 in the assembled power module 20.

Each of fractional power module component 34 and fractional power module component 36 includes a tongue 58, 60, respectively, and, adjacent the tongue 58, 60, a groove 62, 64 configured to receive the tongue 60, 58 of the other of fractional power module component 36 and fractional power module component 34, respectively, in the assembled power module 20.

Each of fractional power module component 34 and fractional power module component 36 includes a contoured pocket 66, 68, respectively, which cooperates with the contoured pocket 68, 66 on the other of fractional power module component 36, 34, respectively, to receive a boss 70 provided on the bottom end 72 of

the gun 24 handle 22 and aid in properly orienting the assembled module 20 relative to the handle 22. Cross holes 74, 76 provided with screw threads by, for example, Heli-Coil® screw thread inserts, are provided for receiving threaded fasteners 78, 80, respectively, such as Allen head cap screws, to hold the assembled fractional power
5 module components 34, 36 together in the assembled power module 20. Between the cross holes 74, 76 is a clearance diameter 82 for module 20-to-handle 22 bolt 84, which again may be an Allen head cap screw.

A pocket 88 is provided in fractional power module component 36 to accommodate an electrically conductive, illustratively, stainless steel, grounding clip
10 90 for connecting to all of the metallic fittings, such as fittings 26, 28, and metallic fasteners, such as fasteners 78, 80, 84, either by pressing into intimate contact with these components or by electrical conductors extending between these components and clip 90. The ground may then be achieved, for example, by providing a length of grounded hose to the compressed gas fitting 28. (A) passageway(s) 92 is (are) also
15 molded into one or both of fractional power module components 34, 36 to supply compressed gas to turbine wheel (not shown) to drive motor/generator 42 to produce electricity which is regulated by circuitry on PC board assembly 40 and supplied through (a) suitable conductor(s) up handle 22 to a high voltage cascade assembly of any suitable configuration housed in the barrel 94 of gun 24.

What is claimed is:

1. A module for attachment to a tool comprising a first fractional module component and a second fractional module component, at least one fitting captured between the first and second fractional module components when the first and second fractional module components are assembled together.
2. The module of claim 1 wherein each of the first and second fractional module components includes a feature complementarily configured to receive the at least one at least one fitting in the assembled module.
3. The module of claim 2 wherein the tool comprises a coating material dispensing device, the at least one at least one fitting includes both a coating material fitting and a compressed gas fitting, each of the first and second fractional module components including a feature complementarily configured to receive the coating material fitting and the compressed gas fitting in the assembled module.
4. The module of claim 3 wherein both the coating material fitting and the compressed gas fitting comprise metallic fittings, the first and second fractional module components are assembled together with metallic fasteners, the module further including a feature provided in at least one of the first and second fractional module components to accommodate an electrically conductive device for connecting to the metallic fittings and metallic fasteners by at least one of pressing of the electrically conductive device into intimate contact with the metallic fittings and metallic fasteners and electrical conductors extending between the electrically conductive device and the metallic fittings and metallic fasteners.
5. The module of claim 4 further including a length of grounded conduit coupled to the compressed gas fitting and to ground to ground the electrically conductive device and the metallic fittings and metallic fasteners coupled to the electrically conductive device.

6. The module of claim 3 further including a generator having a shaft, and a compressed gas driven turbine wheel mounted on the shaft for driving the generator.

7. The module of claim 6 further including a passageway provided in at least one of the first and second fractional module components to supply compressed gas to the turbine wheel to drive the generator to produce electricity for the coating material dispensing device.

8. The module of claim 1 wherein each of the first and second fractional module components includes a first feature and a second feature configured to receive the first feature in the assembled module.

9. The module of claim 1 adapted to mount on a free end of a handle of a somewhat pistol-shaped coating material dispensing device, each of the first and second fractional module components including a feature which cooperates with the feature on the other of the first and second fractional module components to receive a second feature provided on the free end of the handle to aid in orienting the assembled module relative to the handle.

10. The module of claim 1 wherein the first and second fractional module components are joined together in the assembled module by threaded fasteners received in cooperating passageways provided in the first and second fractional module components.

11. The module of claim 10 wherein a space is provided between the cooperating passageways for a module-to-handle threaded fastener.

12. The module of claim 1 further including a generator having a shaft, and a compressed gas driven turbine wheel mounted on the shaft for driving the generator.

13. The module of claim 10 further including a passageway provided in at least one of the first and second fractional module components to supply compressed gas to the turbine wheel to drive the generator to produce electricity for the tool.

14. A module for mounting on the end of a handle of a coating material dispensing device comprising at least a coating material fitting for coupling to a source of coating material, a first fractional module component and a second fractional module component, the coating material fitting captured between the first fractional module component and the second fractional module component when the first and second fractional module components are assembled together.

15. The module of claim 14 wherein the source of coating material comprises a source of liquid coating material, the module further including a compressed gas fitting, and a source of compressed air for coupling to the compressed gas fitting.

1/2

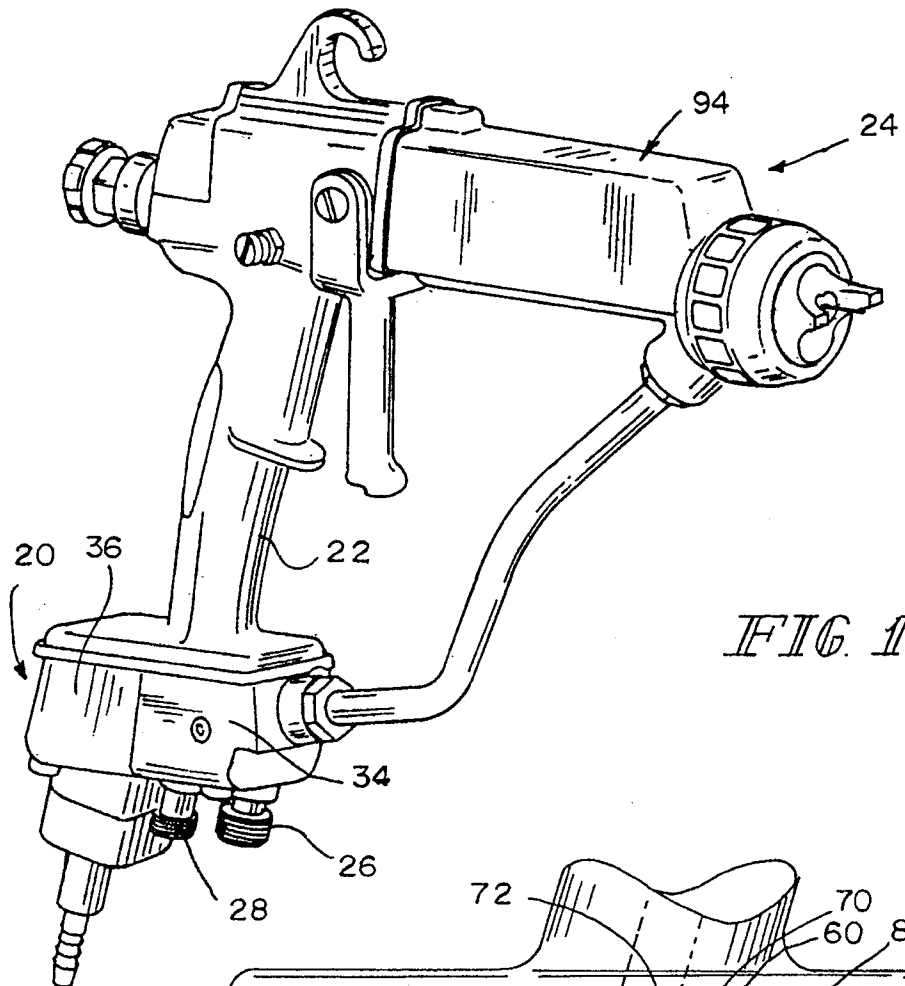


FIG. 1

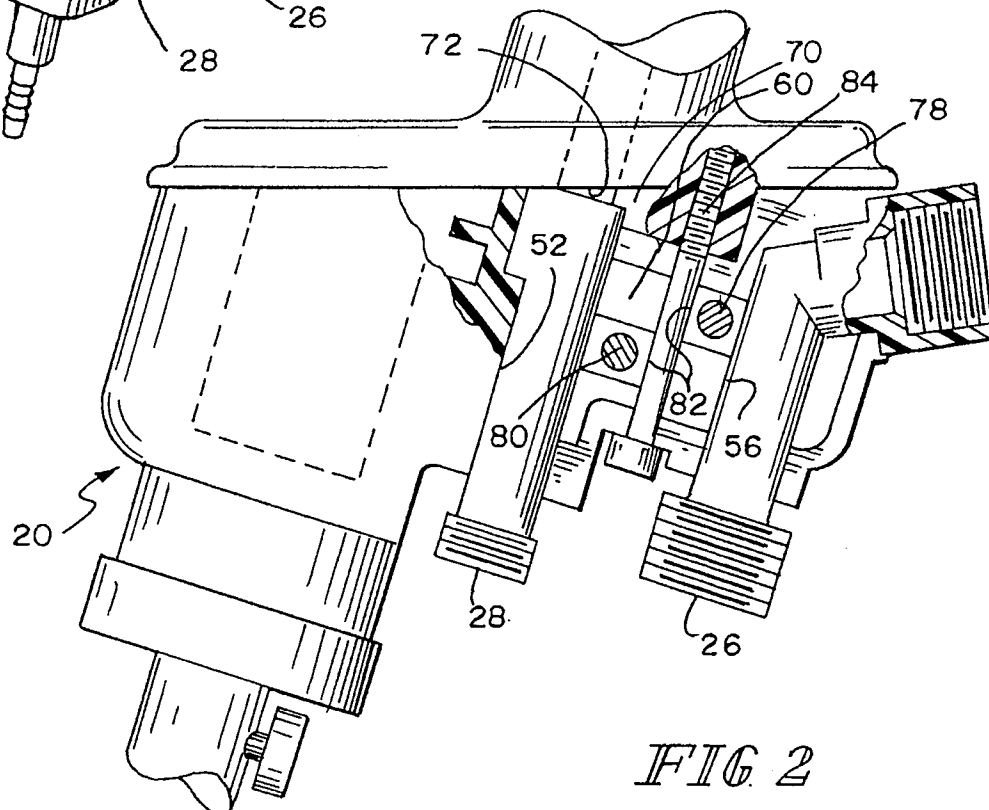
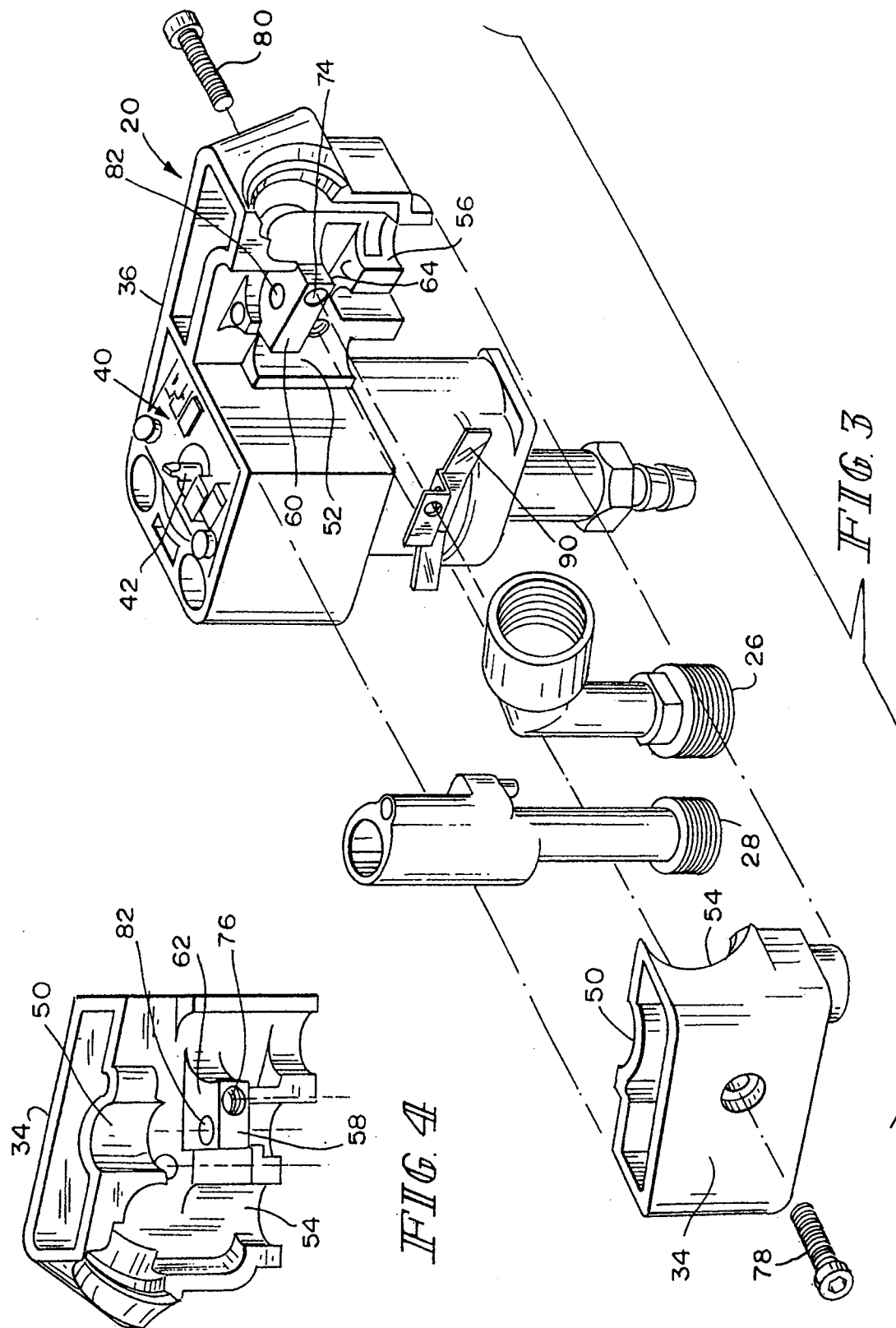


FIG. 2

2/2



INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/035439

A. CLASSIFICATION OF SUBJECT MATTER

INV. B05B5/03 B05B15/06 B05B5/053

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

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 practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2 057 434 A (JADEN FRED I ET AL) 13 October 1936 (1936-10-13) page 2, right-hand column, line 29 - line 40	1-3, 8-11, 14-15
X	GB 2 053 029 A (NORDSON CORP) 4 February 1981 (1981-02-04) page 3, line 6 - line 17 page 3, line 74 - line 85	1-3, 8-11, 14-15 4-7, 12-13



Further documents are listed in the continuation of Box C.



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 document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

28 May 2009

Date of mailing of the international search report

05/06/2009

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

Authorized officer

Roldán Abalos, Jaime

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2009/035439

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2057434	A	13-10-1936	NONE	
GB 2053029	A	04-02-1981	CA 1150047 A1	19-07-1983
			DE 3025591 A1	22-01-1981
			FR 2460721 A1	30-01-1981
			JP 1618405 C	12-09-1991
			JP 2039312 B	05-09-1990
			JP 56015856 A	16-02-1981
			US 4294411 A	13-10-1981