

(19)



(11)

EP 3 021 975 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
23.08.2017 Bulletin 2017/34

(51) Int Cl.:
B05B 5/03 (2006.01) B05B 12/14 (2006.01)
B05B 15/02 (2006.01)

(21) Application number: **14781965.0**

(86) International application number:
PCT/TR2014/000300

(22) Date of filing: **17.07.2014**

(87) International publication number:
WO 2015/009265 (22.01.2015 Gazette 2015/03)

(54) ELECTROSTATIC POWDER PAINT GUN WITH MEANS FOR QUICK COLOR CHANGE

ELEKTROSTATISCHES PULVERFARBENSPRITZPISTOLE MIT VORRICHTUNG FÜR SCHNELLEN FARBWECHSEL

PISTOLET DE POUDRAGE ÉLECTROSTATIQUE DOTÉ DE MOYENS DE CHANGEMENT DE COULEUR RAPIDE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(72) Inventor: **CAFEROGLU, Gunay**
Bursa (TR)

(30) Priority: **17.07.2013 TR 201308664**

(74) Representative: **Dericioglu Kurt, Ekin**
Ankara Patent Bureau Limited
Bestekar Sokak No: 10
Kavaklidere
06680 Ankara (TR)

(43) Date of publication of application:
25.05.2016 Bulletin 2016/21

(73) Proprietor: **Tofas Turk Otomobil Fabrikasi Anonim Sirketi**
Bursa (TR)

(56) References cited:
US-A- 3 777 981 US-A1- 2005 229 845
US-B1- 6 375 094

EP 3 021 975 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

Field of the Invention

[0001] The present invention relates to a design developed for reducing time loss in color change in electrostatic and conventional manual paint guns.

Background of the Invention

[0002] Today, in sectors wherein the parts that are subjected to painting, paint guns which enables to apply paint by spraying are used instead of manual painting.

[0003] Especially in automotive sector, the color change times in electrostatic and conventional manual paint guns used in painting the vehicle bodies are longer than the planned time and this causes to experience delays in whole production process.

[0004] Air driven, anaerobic electrostatic spray application or the ones that can be used with other systems are preferred in applications to be performed on complex formed metal surface in which the overspray should be little and wet paint applications. In electrostatic spray applications, the air around the point where the paint is sprayed is ionized by applying 50-125 kV electric current. The electrons that are released as a result of ionizing the air hold on to the surfaces of paint particles passing by this area and charge them with negative (-) charge. Before application, the surface to be painted is grounded and charged with positive (+) charge. Therefore, electrostatic area is formed around the surface to be painted. In this case, negative charged paint particles are enabled to reach the surface with the electrical attraction force on the object. This electrical attraction significantly decreases spray losses that can occur due to spatter and splash. Especially it minimizes paint losses in painting objects such as pipe, profile and their rear surfaces causing spray loss.

[0005] Electrical conductivity of the paint should be sufficient so that the paint particles reaching the surface can transfer the charge thereon to the soil from the surface. In electrostatic applications of paints with solvent, solvents or additives with high conductivity such as alcohols are added inside the product or its thinner.

[0006] In electrostatic spray applications, spray guns in which air used as propellant are commonly used. The distribution level of the air spray is obtained in these applications and spray losses are minimized. In electrostatic spray applications, application devices with rotating head in shape of a disc or bell wherein the paint is split to very small droplets with the effect of centrifugal force are used.

[0007] In the state of the art, during paint application, the trigger of the gun is pushed, the needle is pulled back and paint is sprayed from the nozzle. Gun trigger attached to the pressurized paint hose cleaning chemical circuit (solvent etc.) is pushed on during color change, it is continued to push until the previous color is emptied.

Then the pressurized paint hose is attached to the new paint color to be charged and the paint is discharged from the nozzle until the new color comes by pushing the gun trigger again.

5 [0008] United States Patent Document no US20100196616A1, an application known in the state of the art, discloses a robotic painting system. It is disclosed that the said robotic system two different paint metering devices and these paint metering devices are electrostatically isolated, color change time and a paint waste are minimized since the parallel fluid circuit performs process order swiftly. Furthermore, it is disclosed that color change time ranges between 6-15 seconds or 10-25% of the available cycle time per car by means of the robotic painting system.

15 [0009] United States Patent Document no US20020007788A1, an application known in the state of the art, discloses a coating apparatus to which a voltage is applied and which can be used in coating guns. It is disclosed that the coating material used in the coating apparatus enters the system via the hose and it is moved via the pistons located at the front of the system. Furthermore it is disclosed the said piston at the front side enables the color change time to be shortened since it has the ability to move fast.

20 [0010] US2005/229845 A1 discloses a nozzle assembly for a material application device including an expansion chamber for slowing down the velocity of powder fed to the nozzle from a dense phase pump and a nozzle insert that forms the expansion chamber and provides air assist function. No application has been found in the state of the art which prevents time loss during color change in manual electrostatic powder paint guns.

Summary of the Invention

[0011] The objective of the present invention is to provide a paint gun which enables to decrease production loss caused by time during color changing.

40 [0012] Said objective is achieved by a paint gun according to claim 1.

Detailed Description of the Invention

45 [0013] "A paint gun" developed to fulfill the objective of the present invention is illustrated in the accompanying figures wherein

Figure 1 is the perspective view of the paint gun.

50 Figure 2 is the exploded perspective view of the paint gun.

Figure 3 is the perspective view of the air valve.

Figure 4 is the exploded perspective view of the air valve.

55 Figure 5 is the perspective view of the paint valve.

Figure 6 is the exploded perspective view of the paint valve.

[0014] The components given in the figures are assigned reference numerals as follows:

1. Paint gun
2. Gun body
3. Trigger
4. Nozzle
5. Air valve assembly
 51. Air valve
 52. Elbow
 53. Triggering button
 54. Reduction member
 55. Fixing member
 56. Needle
 57. Check valve
6. Paint valve assembly
 61. Paint valve
 62. Slot
 63. Slot fixing apparatus
 64. Connection elbow
7. Air hose
8. Main circuit air hose inlet
9. Paint hose
10. Fast connection paint inlet
11. Fast connection paint discharge
12. Fast connection elbow

[0015] The inventive paint gun (1) which minimizes time loss occurring during color change comprises

- at least one gun body (2),
- at least one trigger (3) which is provided on the gun body (2) and on which pressure is applied in order to spray the paint,
- at least one nozzle (4) from which the paint comes upon the trigger (3) is pushed,
- at least one air valve assembly (5) which is preferably mounted on the gun body (2),
- at least one air valve (51) which is located in the air valve assembly (5),
- at least one paint valve assembly (6) which is preferably mounted on lower part of gun body (2),
- at least one air hose (7) which provides the air connection between the paint valve (61) and the elbow (52) located in the air valve assembly (5),
- at least one main circuit air hose inlet (8) which is located at the lower end of the gun body (2) and enables the entrance of air,
- at least one paint hose (9) which is connected to the upper end of the paint valve (6),
- at least one fast connection paint inlet (10) and at least one fast connection paint discharge (11) which are connected to the paint valve assembly (6),
- at least one fast connection elbow (12) which connects the ends of the air hose (7) enabling the connection of the paint valve assembly (6) and the air valve assembly (5) on the gun body (2).

[0016] In the inventive paint gun (1), the trigger (3) is pushed while applying the paint, the main needle located inside the gun by (2) is pulled back and the paint is sprayed from the nozzle (4).

5 **[0017]** During color change in the paint gun (1), the fast connection paint inlet (10) mounted to the paint valve assembly (6) at the lower end of the gun body (2) is attached to the place where the cleaning chemical (solvent, etc.) is present. The triggering button (53) in the air valve assembly (5) is pushed with the trigger (3). By this means, the air valve (51) comes to open position and triggers the paint valve (61). The wet paint present inside the paint valve slot (62) is discharged from the nozzle (4) and the fast connection paint discharge (11) located at the lower end of the slot (62) at the same time. By this means, the paint wanted to be discharged is discharged in much shorter time than the time in the state of the art.

15 **[0018]** After this step, the fast connection paint inlet (10) is attached to the color of the paint wanted to be charged for the new color. Again as it is during color change, the trigger (3) and the triggering button (53) in the air valve assembly (5) is pushed at the same time, and the paint is discharged from the nozzle (4) until the new color comes. The trigger (3) and the triggering button (53) are released when the new color comes.

20 **[0019]** During painting the surface wanted to be painted; only the trigger (3) is pushed on. The triggering button (53) on the air valve assembly (5) is only used during color change.

30 **[0020]** The air valve assembly (5) is fixed to the gun body (2) via the reduction member (54) and the fixing member (55). In the air valve assembly (5), there is at least one air valve (51), an elbow (52) to which the air hose (7) one end of which is connected to the fast connection elbow (12) is connected, at least one triggering button (53) which is triggered to pump air, at least one reduction member (54) and at least one fixing member (55) which enable to fix the air valve assembly (5) to the gun body (2), at least one needle (56) and at least one check valve (57).

35 **[0021]** The paint valve assembly (6) comprises a paint valve (61), at least one slot (62) in which the paint valve (61) is located, at least one slot fixing apparatus (63) for fixing the slot (62) to the gun body (2), and at least one connection elbow (64) to which the paint hose (9) is connected. Furthermore, there is an air hose (7) which enables the exchange of the paint valve assembly (6) and the air valve assembly (5) with each other and one end of which is connected to the paint valve (61) and the other end is connected to the connection elbow (12).

45 **[0022]** By means of the inventive paint gun (1), the color change time is decreased, and the production losses occurring during color change are avoided.

55 Claims

1. A paint gun (1), which minimizes time loss occurring

during color change, essentially **comprising**

- at least one gun body (2),
- at least one trigger (3) which is provided on the gun body (2) and on which pressure is applied in order to spray the paint,
- at least one nozzle (4) from which the paint comes upon the trigger (3) is pushed,
- at least one air valve assembly (5) which is mounted on the gun body (2),
- at least one air valve (51) which is located in the air valve assembly (5),
- at least one elbow (52) which is located in the air valve assembly (5),
- at least one paint valve assembly (6) which is mounted on lower part of gun body (2),
- at least one paint valve (61) which is located on the paint valve assembly (6),
- at least one air hose (7) which provides the air connection between the paint valve (61) and the elbow (52),
- at least one main circuit air hose inlet (8) which is located at the lower end of the gun body (2) and enables the entrance of air,
- at least one paint hose (9) which is connected to the upper end of the paint valve (6),
- at least one fast connection paint inlet (10) and at least one fast connection paint discharge (11) which are connected to the paint valve assembly (6),
- at least one fast connection elbow (12) which connects the ends of the air hose (7) enabling the connection of the paint valve assembly (6) and the air valve assembly (5) on the gun body (2), and **characterized by**
- air valve assembly (5) which comprises at least one air valve (51), at least one elbow (52) to which the air hose (7) one end of which is connected to the fast connection elbow (12) is connected, at least one triggering button (53) which is triggered to pump air, at least one reduction member (54) and at least one fixing member (55) which enable to fix the air valve assembly (5) to the gun body (2), at least one needle (56) and at least one check valve (57),
- fast connection paint inlet (10) which is attached to the place where the cleaning chemical (solvent, etc) is present during color change, which is mounted to the paint valve assembly (6) at the lower end of the gun body (2) and which is attached to the color of the paint to be charged for the new color after the color in the gun body (2) is discharged,
- air valve (51) which comes to the open position upon the triggering button (53) in the air valve assembly (5) is pushed together with the trigger (3) for color change, and triggers the paint valve (61).

2. A paint gun (1) according to claim 1, **characterized by** paint valve assembly (6) which comprises a paint valve (61), at least one slot (62) in which the paint valve (61) is located, at least one slot fixing apparatus (63) for fixing the slot (62) to the gun body (2), and at least one connection elbow (64) to which the paint hose (9) is connected.
3. A paint gun (1) according to claim 2, **characterized by** fast connection paint discharge (11) which operates with the nozzle (4) located in the paint valve slot (62) and from which the wt paint is discharged, and which is located at the lower end of the slot (62).
4. A paint gun (1) according to any one of the preceding claims, **characterized by** trigger (3) which is pushed in order to paint the surface wanted to be painted.
5. A paint gun (1) according to claim 1, **characterized by** trigger (3) and the triggering button (53) in the air valve assembly (5) which are pushed at the same time for receiving new color until the new color comes from the nozzle (4).
6. A paint gun (1) according to any one of the preceding claims, **characterized by** triggering button (53) in the air valve assembly (5) which is only pushed during color change.
7. A paint gun (1) according to claim 1, **characterized by** reduction member (54) and the fixing member (55) which enable the air valve assembly (5) to be fixed on the gun body (2).
8. A paint gun (1) according to any one of the preceding claims, **characterized by** air hose (7) which enables the exchange of the paint valve assembly (6) and the air valve assembly (5) with each other and one end of which is connected to the paint valve (61) and the other end is connected to the connection elbow (12).

Patentansprüche

1. Eine Farbspritzpistole (1), welche die Zeitverlust, die während der Farbveränderung auftritt, minimiert, hauptsächlich **umfassend**
 - mindestens einen Pistolenkörper (2),
 - mindestens einen Auslöser (3), welcher auf dem Pistolenkörper (2) bereitgestellt ist und auf welchem Druck ausgeübt wird, um die Farbe zu spritzen,
 - mindestens eine Düse (4), aus der die Farbe auf den Auslöser (3) gedrängt wird,
 - mindestens eine Luftventilanordnung (5), welche auf dem Pistolenkörper (2) eingebaut ist,

- mindestens ein Luftventil (51), welches in der Luftventilanordnung (5) angeordnet ist,
 - mindestens ein Winkelstück (2), welches in der Luftventilanordnung (5) angeordnet ist,
 - mindestens eine Lackventilanordnung (6), welche auf dem unteren Teil des Pistolenkörpers (2) angeordnet ist,
 - mindestens ein Lackventil (61), welches auf der Lackventilanordnung (6) angeordnet ist,
 - mindestens einen Luftschlauch (7), welcher die Luftverbindung zwischen dem Lackventil (61) und dem Winkelstück (52) bereitstellt,
 - mindestens einen Hauptkreislauf-Luftschlauch-Einlass (8), welcher an dem unteren Ende des Pistolenkörpers (2) angeordnet ist und den Lufteintritt ermöglicht,
 - mindestens einen Farbspritzschlauch (9), welcher zum oberen Ende des Lackventils (6) angeschlossen ist,
 - mindestens einen Schnellverbindung-Lackeinlass (10) und mindestens einen Schnellverbindung-Lackauslass (11), welche zur Lackventilanordnung (6) angeschlossen sind,
 - mindestens ein Schnellverbindungs-Winkelstück (12), welches die Enden des Luftschlauchs (7) verbindet, der die Verbindung von Lackventilanordnung (6) und von der Luftventilanordnung (5) auf dem Pistolenkörper (2) ermöglicht und **gekennzeichnet durch**
 - Luftventilanordnung (5), welche zumindest ein Luftventil (1), mindestens ein Winkelstück (2), zu dem der Luftschlauch (7), dessen ein Ende mit dem Schnellverbindungs-Winkelstück (12) verbunden ist, angeschlossen wird, mindestens einen Auslöseknopf (53), der zum Pumpen der Luft ausgelöst wird, mindestens ein Reduktions-Glied (54) und mindestens ein Befestigungselement (55), welches ermöglicht, die Luftventilanordnung (5) zum Pistolenkörper (2) anzuschließen, mindestens eine Nadel (56) und mindestens ein Kontrollventil (57) umfasst,
 - Schnellverbindung-Lackeinlass (10), welcher an der Stelle befestigt ist, an der die Reinigungs-Chemikalie (Lösungsmittel etc.) sich während der Farbänderung existiert, welche an der Lackventilanordnung (6) an dem unteren Ende des Pistolenkörpers (2) montiert ist und welche zur Farbe des Lacks angeschlossen ist, der für die neue Farbe aufgeladen soll, nachdem die Farbe im Pistolenkörper (2) ausgeladen wurde,
 - Luftventil (51), welches zur geöffneten Stellung kommt, nachdem der Auslöseknopf (53) in der Luftventilanordnung (5) zusammen mit dem Auslöser (3) für Farbveränderung gedrückt wird und das Lackventil (61) auslöst,
2. Eine Farbspritzpistole (1) gemäß Anspruch 1, **gekennzeichnet durch** die Lackventilanordnung (6), welche ein Lackventil (61), mindestens eine Aussparung (62), in der das Lackventil (61) angeordnet ist, mindestens einen Befestigungsapparat (63) für die Aussparung zum Befestigen der Aussparung (62) zum Pistolenkörper (2) und mindestens ein Verbindungs-Winkelstück (64), an dem der Farbspritzschlauch (9) angeschlossen ist.
3. Eine Farbspritzpistole (1) gemäß Anspruch 2, **gekennzeichnet durch** den Schnellverbindung-Lackauslass (11), welcher mit dem Stutzen (4) arbeitet, der sich in der Lackventil-Aussparung (62) befindet und aus welchem die wt Farbe abgeführt wird und welcher an dem unteren Ende der Aussparung (62) angeordnet ist.
4. Eine Farbspritzpistole (1) gemäß einem der vorangehenden Ansprüche, **gekennzeichnet durch** den Auslöser (3), welcher gedrückt wird, um die Oberfläche zu lackieren, die man lackieren möchte.
5. Eine Farbspritzpistole (1) gemäß Anspruch 1, **gekennzeichnet durch** den Auslöser (3) sowie den Auslöseknopf (3) in der Luftventilanordnung (5), welche zum Erhalten der neuen Farbe gleichzeitig gedrückt werden, bis die neue Farbe aus dem Stutzen (4) herauskommt.
6. Eine Farbspritzpistole (1) gemäß einem der vorangehenden Ansprüche, **gekennzeichnet durch** den Auslöseknopf (53) in der Luftventilanordnung (5), auf welchen nur während der Farbänderung gedrückt wird.
7. Eine Farbspritzpistole (1) gemäß Anspruch 1, **gekennzeichnet durch** das Reduktions-Glied (54) und das Befestigungselement (55), welche es ermöglichen, dass die Luftventilanordnung (5) an dem Pistolenkörper (2) befestigt wird.
8. Eine Farbspritzpistole (1) gemäß einem der vorangehenden Ansprüche, **gekennzeichnet durch den Luftschlauch (7)**, welcher die Auswechslung der Lackventilanordnung (6) und der Luftventilanordnung (5) gegeneinander ermöglicht und dessen ein Ende zum Lackventil (61) angeschlossen und das andere Ende zum Verbindungs-Winkelstück (12) angeschlossen wird.
- Revendications**
1. Un pistolet à peinture (1), qui minimise la perte de temps se produisant pendant le changement de couleur, **comprenant** essentiellement
- au moins un corps de pistolet (2),
 - au moins un déclencheur (3) qui est prévu sur

le corps de pistolet (2) et sur laquelle est appliquée la pression pour pulvériser la peinture,

- au moins une buse (4) à partir de laquelle la peinture vient sur le déclencheur (3) est poussé, au moins un ensemble de soupape d'air (5) qui est monté sur le corps de pistolet (2), au moins une soupape d'air (51) située dans l'ensemble de soupape d'air (5), au moins un coude (52) qui est situé dans l'ensemble de soupape d'air (5), au moins un ensemble de soupape de peinture (6) qui est monté sur la partie inférieure de corps de pistolet (2), au moins une soupape de peinture (61) qui est située sur l'ensemble de soupape de peinture (6),
- au moins un tuyau d'air (7) qui assure la connexion d'air entre la soupape de peinture (61) et le coude (52), au moins une entrée du tuyau d'air du circuit principal (8) qui est située à l'extrémité inférieure du corps du pistolet (2) et permet l'entrée de l'air, au moins un tuyau de peinture (9) qui est relié à l'extrémité supérieure de la soupape de peinture (6),
- au moins une entrée de peinture à connexion rapide (10) et au moins une décharge de peinture à connexion rapide (11) qui sont reliées à l'ensemble de soupape de peinture (6), au moins un coude de connexion rapide (12) qui relie les extrémités de tuyau d'air (7) permettant la connexion de l'ensemble de soupape de peinture (6) et de l'ensemble de soupape d'air (5) sur le corps de pistolet (2) et **caractérisé par**:

- un ensemble de soupape d'air (5) qui comprend au moins une soupape d'air (51), au moins un coude (52) auquel est raccordé le tuyau d'air (7) dont une extrémité est reliée au coude de connexion rapide (12), au moins un bouton de déclenchement (53) qui est déclenché pour pomper de l'air, au moins un élément de réduction (54) et au moins un élément de fixation (55) qui permettent de fixer l'ensemble de soupape d'air (5) au corps de pistolet (2), au moins une aiguille (56) et au moins un clapet anti-retour (57),
- l'entrée de peinture à connexion rapide (10) qui est fixée à l'endroit où le produit chimique de nettoyage (solvant, etc.) est présent lors du changement de couleur, qui est monté sur l'ensemble de soupape de peinture (6) à l'extrémité inférieure du corps de pistolet (2) et qui est attaché à la couleur de la peinture à charger pour la nouvelle couleur après que la couleur dans le corps du pistolet (2) est déchargée,
- la soupape d'air (51) qui vient en position ouverte lorsque le bouton de déclenchement (53) dans l'ensemble de soupape d'air (5) est

poussé avec le déclencheur (3) pour le changement de couleur et déclenche la soupape de peinture (61).

- 5 2. Pistolet de peinture (1) selon la revendication 1, **caractérisé par** un ensemble de soupape de peinture (6) qui comprend une vanne de peinture (61), au moins une fente (62) dans laquelle se trouve la vanne de peinture (61), au moins un appareil de fixation de fente (63) pour fixer la fente (62) au corps de pistolet (2), et au moins un coude de connexion (64) auquel est raccordé le tuyau de peinture (9).
- 10
- 15 3. Un pistolet de peinture (1) selon la revendication 2, **caractérisé par** une décharge de peinture à connexion rapide (11) qui fonctionne avec la buse (4) située dans la fente de soupape de peinture (62) et à partir de laquelle la peinture est déchargée et qui se trouve à l'extrémité inférieure de la fente (62).
- 20
- 25 4. Un pistolet à peinture (1) selon l'une quelconque des revendications précédentes, **caractérisé par** le déclencheur (3) qui est poussé afin de peindre la surface voulue d'être peinte.
- 30
- 35 5. Un pistolet de peinture (1) selon la revendication 1, **caractérisé par** le déclencheur (3) et le bouton de déclenchement (53) dans l'ensemble de soupape d'air (5) qui sont poussés en même temps pour recevoir une nouvelle couleur jusqu'à ce que la nouvelle couleur provienne de la buse (4).
- 40
- 45 6. Un pistolet à peinture (1) selon l'une quelconque des revendications précédentes, **caractérisé par** le bouton de déclenchement (53) dans l'ensemble de soupape d'air (5) qui n'est poussé que lors d'un changement de couleur.
- 50
- 55 7. Un pistolet à peinture (1) selon la revendication 1, **caractérisé par** un élément de réduction (54) et l'élément de fixation (55) qui permettent de fixer l'ensemble de soupape d'air (5) sur le corps de pistolet (2).
8. Un pistolet à peinture (1) selon l'une quelconque des revendications précédentes, **caractérisé par** un tuyau d'air (7) qui permet l'échange de l'ensemble de soupape de peinture (6) et de l'ensemble de soupape d'air (5) l'un avec l'autre et dont une extrémité est connectée à la vanne de peinture (61) et l'autre extrémité est reliée au coude de connexion (12).

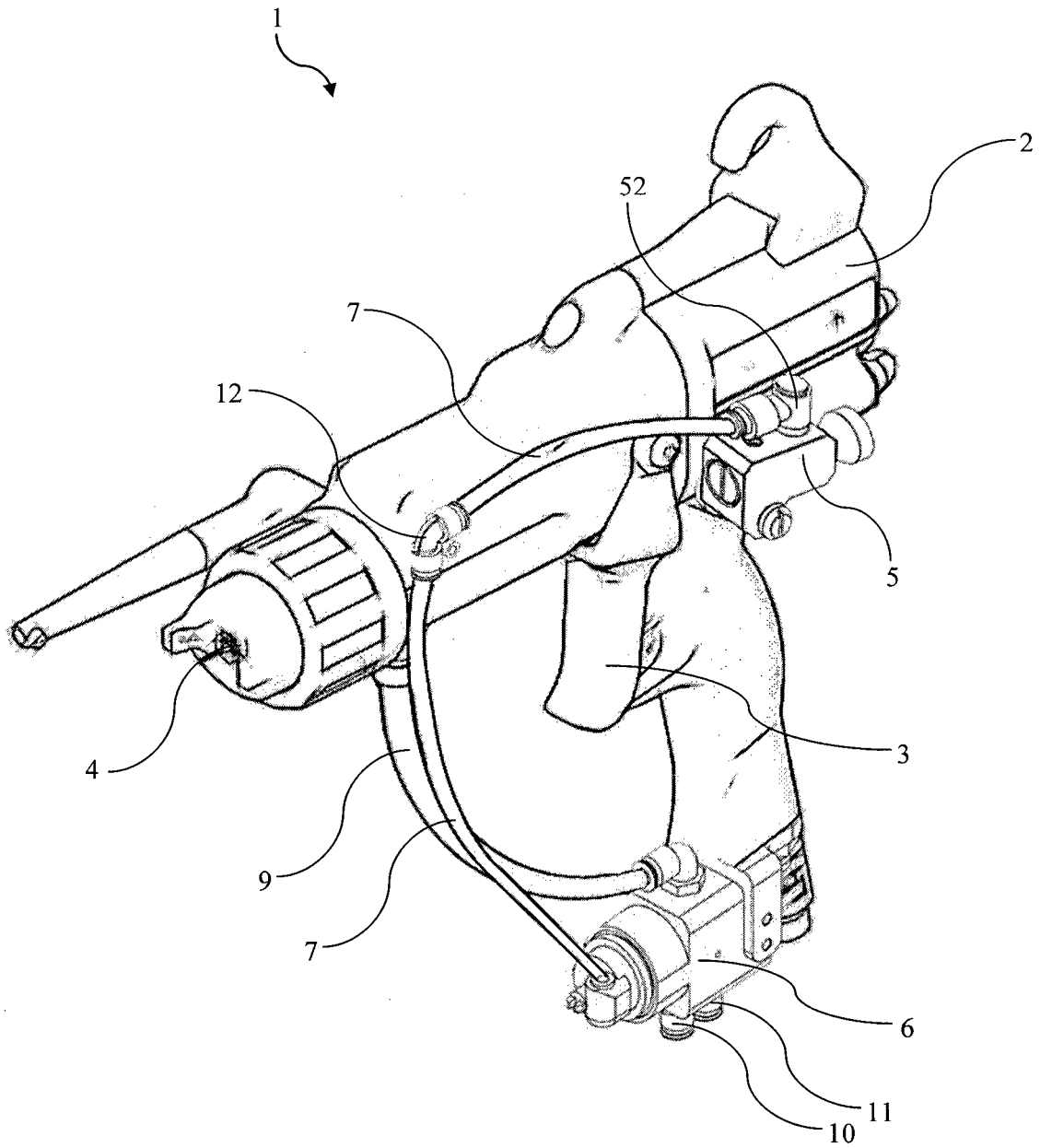


Figure 1

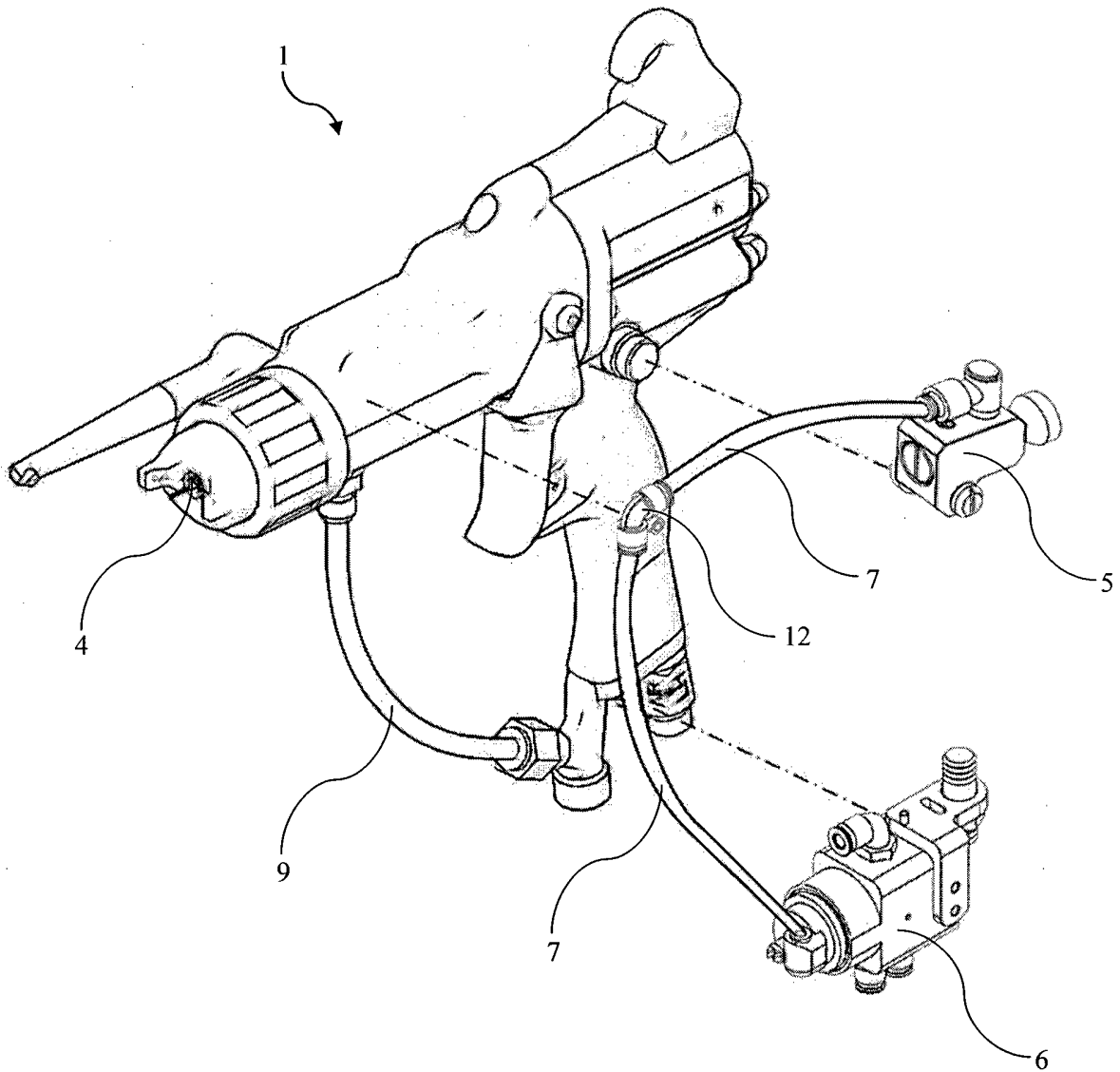


Figure 2

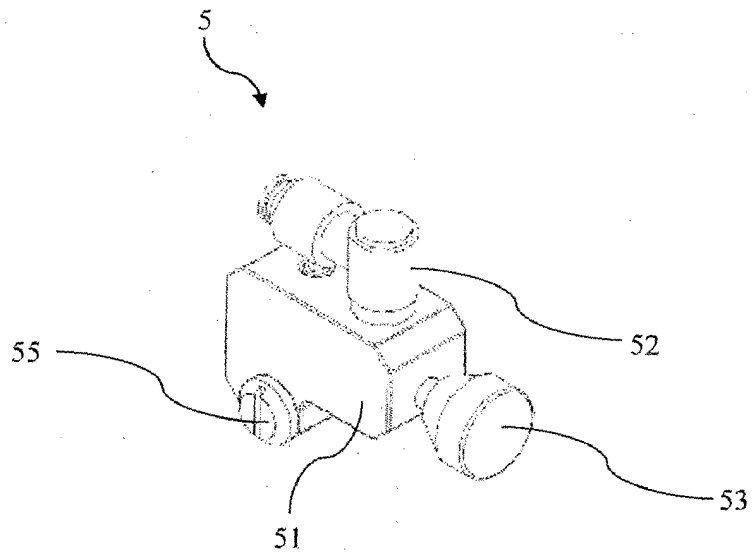
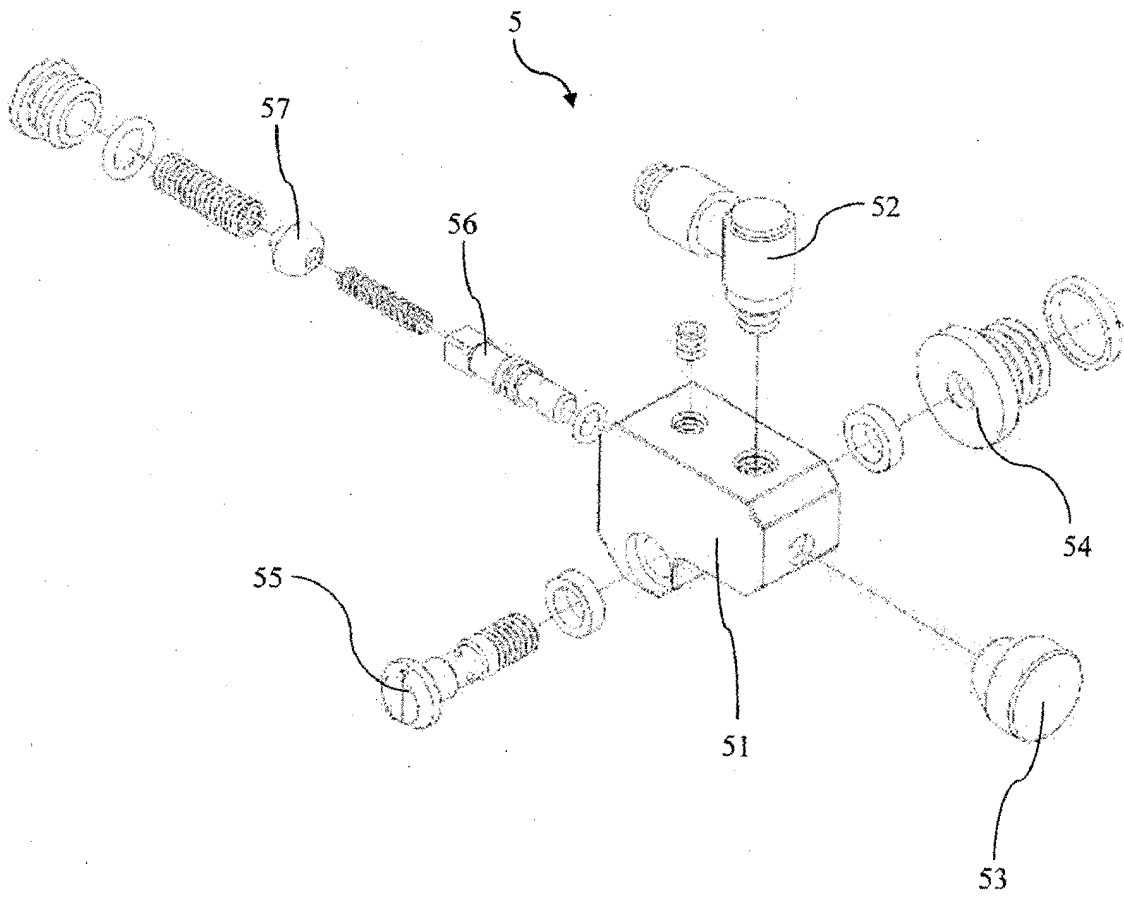


Figure 3



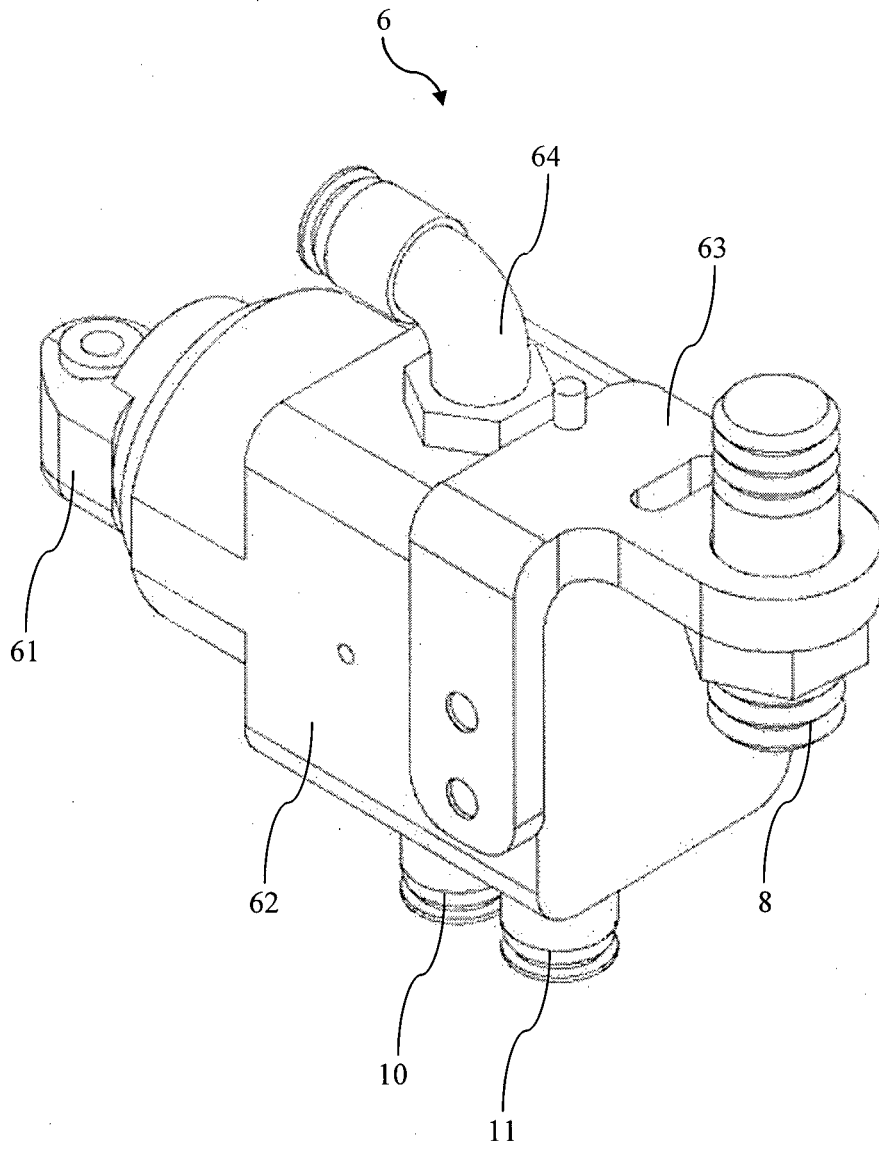


Figure 5

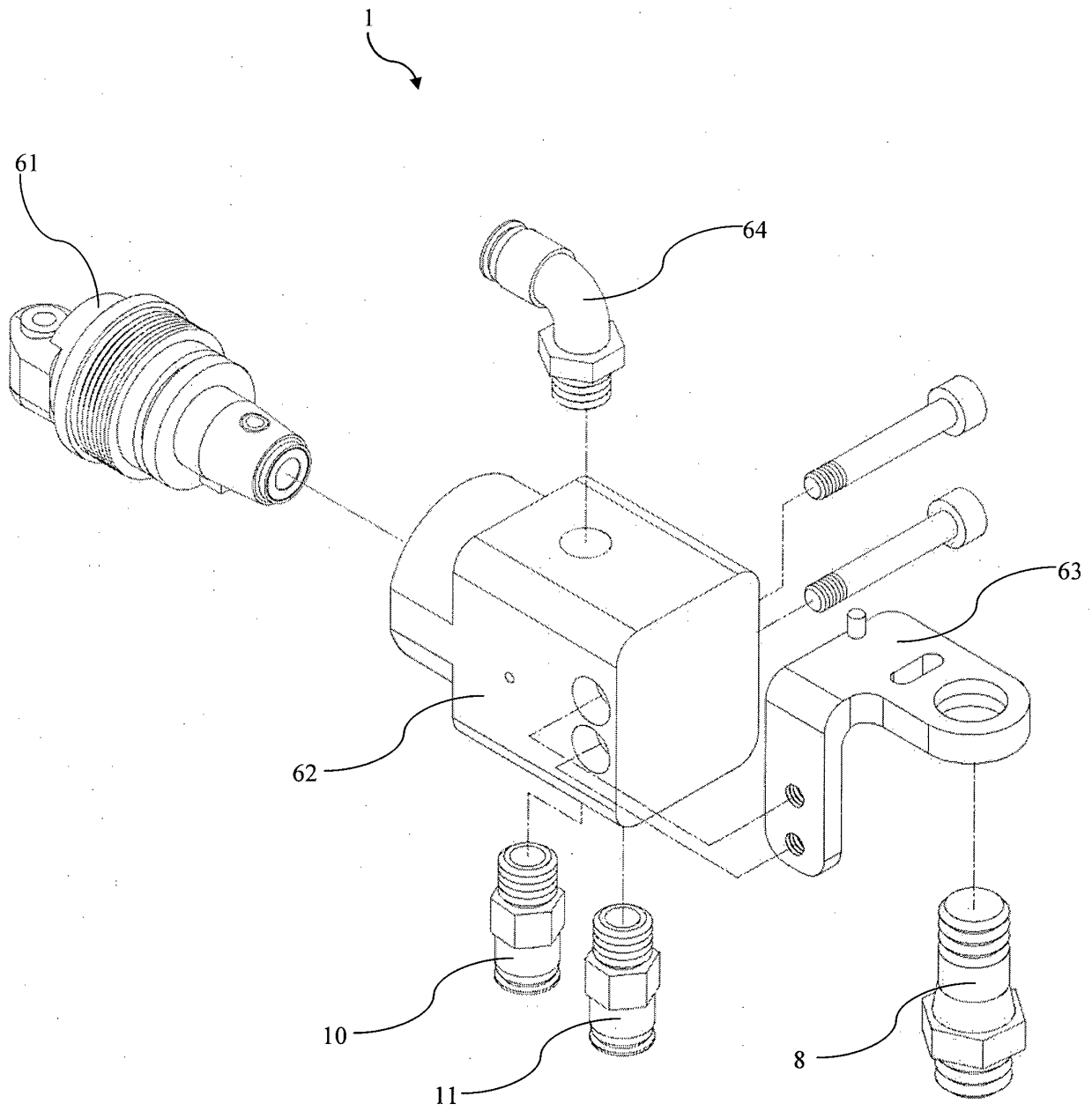


Figure 6

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 20100196616 A1 [0008]
- US 20020007788 A1 [0009]
- US 2005229845 A1 [0010]