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A Pneumatic Spray Gun

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ABSTRACT

A pneumatic spray gun 10 comprises: a pump 12 capable of spraying a liquid; a pneumatic motor 14 and a trigger assembly 16. The pneumatic motor 14 is coupled to the pump 12 and connected to a compressed gas source. The pneumatic motor 14 has a switch 26 which is biased to an OFF position in which the switch prevents a flow of compressed gas to operate the motor 14. The switch 26 is movable by the application of a force to an ON position in which compressed gas can flow into and operate the motor 14. The trigger assembly 16 is coupled to the motor 14 and has finger operable trigger 32. A mechanism 34 is mechanically connected to move with the trigger 32. The mechanism 34 is arranged to apply the force to move the switch between the ON and OFF positions when the trigger is operated.

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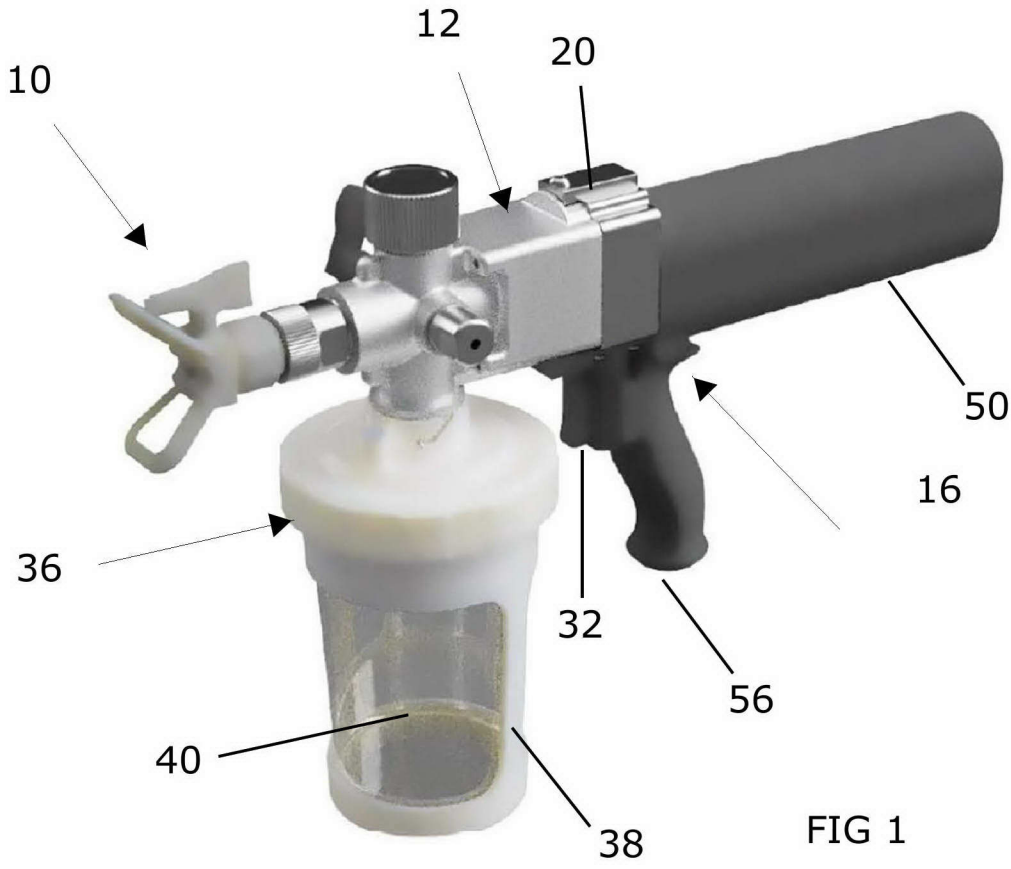

FIG 1

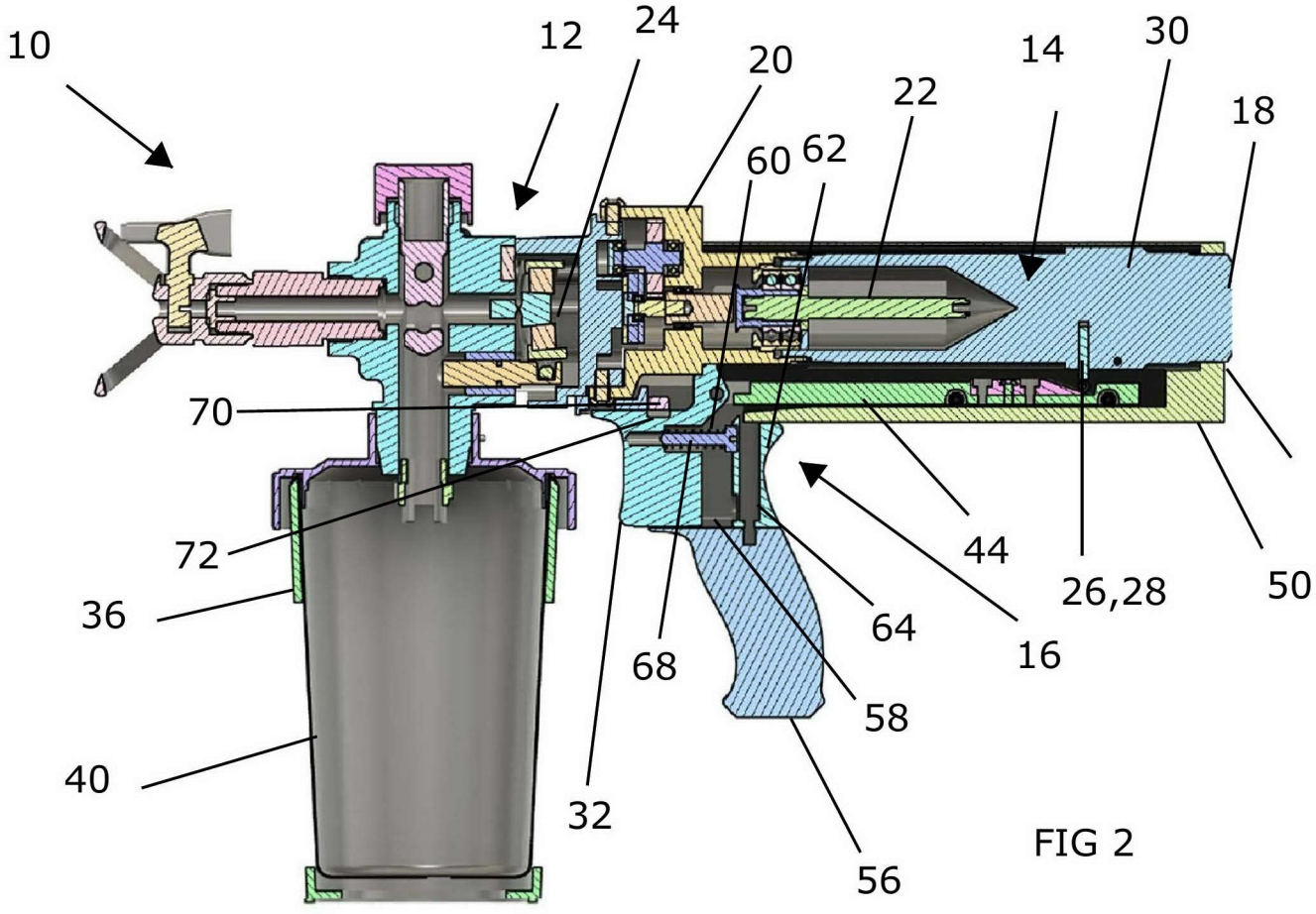

FIG 2

A PNEUMATIC SPRAY GUN

TECHNICAL FIELD

A pneumatic portable spray gun is disclosed. The spray gun may be particularly well-suited to the batch application of settable coatings, such as but not limited to epoxy resins with a short pot life.

BACKGROUND ART

Portable spray guns for spraying liquid such as paints are well-known. Leading manufacturers of such spray guns include Graco and Wagner. Typical features of a portable spray gun include a body with a handle and finger operated trigger/switch, a motor housed in the body, and a pump that is driven by the motor for pumping liquid from a refillable or replaceable container and forcing the liquid through a spray nozzle to produce a fine atomised mist. Often these spray guns have an electric motor powered by a rechargeable battery.

In terms of functionality the currently available portable spray guns are adequate for most applications. Nevertheless, at times the ergonomics or other design aspects of the spray guns leads to difficulties in use or result in operator fatigue and muscle or joint soreness. Also, many conventional commercial spray guns have limited capability spraying liquids with a high viscosity. Electric motor driven spray guns can usually only be used under certain conditions in spark risk environments. These conditions make use of the electric spray gun more difficult and expensive.

The above references to the background art do not constitute an admission that the art forms a part of the common general knowledge of a person of ordinary skill in the art.

SUMMARY OF THE DISCLOSURE

In a first aspect there is disclosed a pneumatic spray gun comprising:

a pump capable of spraying a liquid;

a pneumatic motor coupled to the pump and capable of driving the pump when connected to a compressed gas source, the pneumatic motor having a switch biased to an OFF position in which the switch prevents a flow of compressed gas to operate the motor and movable by the application of a force to an ON position in which compressed gas can flow into and operate the motor; and

a trigger assembly coupled to the motor, the trigger assembly having a finger operable trigger and a mechanism mechanically connected to move with the trigger, the mechanism arranged to apply the force to move the switch between the ON and OFF positions when the trigger is operated.

In one embodiment the mechanism comprises a cam surface which slides linearly across, and applies the force to, the switch when the trigger is operated.

In one embodiment the trigger assembly comprises a housing for receiving the motor and seating the mechanism.

In one embodiment the housing seats the mechanism to move with a fixed distance from a central axis of the motor.

In one embodiment the housing is formed with a channel for slidably seating the mechanism.

In one embodiment the gun comprises one or more bearings acting between the mechanism and the housing to facilitate sliding motion of the mechanism.

In one embodiment the mechanism comprises an arm on which the cam surface is carried and wherein the arm is connected at one end to the trigger.

In one embodiment the arm is pivotally connected at the one end to the trigger.

In one embodiment the one or more bearings are operable between the arm and the housing.

In one embodiment the cam surface lies on the arm between respective bearings.

In one embodiment the switch comprises a pin slidably retained in, and extending from a motor housing, wherein the mechanism pushes the pin into the motor housing when the trigger is squeezed there by moving the switch to the ON position.

In one embodiment the mechanism is arranged to slide in a first linear direction and the pin is arranged to slide in a second direction orthogonal to the first linear direction.

BRIEF DESCRIPTION OF THE DRAWINGS

Notwithstanding any other forms which may fall within the scope of the Pneumatic Spray Gun as set forth in the Summary, specific embodiments will now be described, by way of example only, with reference to becoming drawings in which:

Figure 1 is representation of an embodiment of the disclosed pneumatic spray gun;

Figure 2 is a section view of the pneumatic spray gun shown in Fig 1;

Figure 3 is a partial exploded view of a rear end of the pneumatic spray gun;

Figure 4 is a model of a part of the trigger assembly incorporated in an embodiment of the pneumatic spray gun;

Figure 5 is a representation of part of the trigger assembly shown in Fig 4; and

Figure 6 is an end view of a housing incorporated in an embodiment of the pneumatic spray gun.

DETAILED DESCRIPTION OF SPECIFIC EMBODIMENTS

With reference to the accompanying Figures an embodiment of the disclosed pneumatic spray gun 10 includes a pump 12, a pneumatic motor 14 and a trigger assembly 16. The pump is capable of spraying a liquid. Examples of a pump 12 that may be incorporated in the spray gun 10 are the pumps manufactured by the US company Graco in their range of Graco XForce HD cordless hand-held paint sprayers, including those used in model numbers 3A2308A and 3A2308C. An example of a suitable pneumatic motor 14 that may be incorporated in an embodiment of the spray gun 10 is that in the pneumatic grinding machines manufactured by the Czech Republic based company DEPRAG such as used in their model number GDS 100-190VX I.

The pneumatic motor 14 is powered by a source of compressed gas of (not shown). Typically, the source comprises a compressor which is capable of delivering compressed air pressure of up to 150 psi. A hose (not shown) connects the compressor to a backend 18 of

the motor 14. The motor 14 is coupled to, and thus capable of driving, the pump 12. A gear box 20 transfers torque from a shaft 22 of the motor 14 to a driveshaft 24 of the pump 12.

The pneumatic motor 14 has a switch 26 which is biased to an OFF position. The switch 26 is in the form of a pin 28. The pin 28, depending on its position, opens or closes an orifice through which compressed air from the compressor flows in order to power the motor 14. When the switch 26/pin 28 is in the OFF position it closes the orifice so that the supply of compressed air cannot power the motor 14. When the switch 26/pin 28 is in the ON position, the orifice is opened allowing the supply of compressed air to power the motor 14.

The pin 28 has one end that extends beyond an exterior housing 30 of the motor 14, at least when it is in the OFF position. In this embodiment the pin 28 is able to slide within the motor housing 30 in a direction generally perpendicular to the shaft 22.

The trigger assembly 16 is coupled to the motor 14. The trigger assembly 16 has a finger operable trigger 32 and a mechanically coupled mechanism 34. When the trigger 32 is operated the mechanism 34 applies a force to the switch 26/pin 28 to move it to the ON position which effectively enables the gun 10 to spray a liquid. The liquid is held in a container 36 demountably connected to the pump 12. The container 36 may be in the form of a frame 38 which receives a pliable bladder 40.

With particular reference to Figs 2-4 the mechanism 34 has a cam surface 42 that is able to slide linearly across, and apply force to, the pin 28 when the trigger 32 is operated. The cam surface 42 is carried on an arm 44. In this embodiment the cam surface 42 is made as a separate component from and subsequently attached to the arm 44. However, in other embodiments it is envisaged that the cam surface 42 and the arm 44 may be formed as a one-piece unit. A benefit of forming the cam surface 42 and the arm 44 separately is that they can be made from different materials having different density and hardness. For example, the arm 44 can be made from a plastics material, while the cam surface 42 can be made from a metal. This provides a cam surface 42 with good wear characteristics for repeated application of force against the bias of the switch 26/pin 28. As show most clearly in Figures 3 and 4 the cam surface 42 is formed as a surface on a cam block 46 which is attached to the arm 44.

One end 48 of the arm 44 is pivotally connected to trigger 32. This enables the arm 44 to be pivoted, for example through 90°, to assist in fabrication of the trigger assembly 16 as explained later.

The trigger assembly 16 also comprises a housing 50 for receiving the motor 14 and seating the mechanism 34. More particularly the housing 50 seats the mechanism 34 so that it can move linearly at a fixed distance from a central axis of the motor 14. In this embodiment the central axis of the motor coincides with the axis of the shaft 22. This ensures that the force applied by the trigger 32 to slide the cam surface 42 across the pin 28 results in the cam surface 42 pushing the pin 28 inwardly without any appreciable deflection of the cam surface 42 or arm 44 away from the central axis of the motor 14.

To assist in maintaining the fixed spatial relationship between the cam surface 42 and the motor 14, the housing 50 is formed with a channel 52 (seen most clearly in Fig 6) along which the arm 44 and the cam surface 42 side. Channel 52 runs parallel with the shaft 22. Bearings 54 are incorporated in the trigger assembly 16 to assist in facilitating the sliding motion of the mechanism 32. More specifically cam surface 42 is arranged to lie between the bearings 54 which are coupled to the arm 44. A rear end of the housing 50 has a hole 53 to allow connection of a hose between the motor 14 and the supply of compressed gas.

The trigger assembly 16 includes a handle 56 which retains the trigger 32. The trigger 32 can be dimensioned to accommodate two fingers of a user's hand. On squeezing, the trigger 32 slides rearwardly into a cavity 58 formed in the handle 56 against the bias of a spring 60. This results in the arm 44 also being pushed rearwardly and the pin 28 riding up the cam surface 42 and being pushed into the motor body 30 to the ON position.

On release of the trigger 32 the spring 60 pushes the trigger 32 toward the left with reference to Figure 2 so that a low part 45 of the cam surface 42 registers with the pin 28, allowing the pin 28 to slide in a direction outwardly of the motor body 30 to the OFF position.

A side of the cavity 58 opposite to that from which the trigger 32 is operated, is closed by a stop 62. The stop 62 is formed with an internal hole 64 for receiving a screw (not shown). The screw is used to fix the stop 62 to the handle 56. During the fabrication of the trigger assembly 16, the arm 44 is pivoted upwardly as shown in Figure 5 to allow a screwdriver to extend into the hole 64 to reach the screw.

When fabricating the handle portion of the trigger assembly 16 a post 68 is screwed into the back of the trigger 32. This is used to retain one end of the spring 60. Trigger 32, with the attached arm 44 is then inserted into the cavity 58 from a backside of the handle 56. The spring 60 is inserted into the cavity so that one end surrounds the post 68. The stop 62 is

now inserted into the cavity, the arm 44 is pivoted upwardly and a screw is inserted into the hole 64 and screwed into the handle 56. The trigger 32 is now slidably retained within cavity 58 of the handle 56.

A safety switch 70 is incorporated into the trigger assembly. The safety switch 70 is able to slide from side to side (i.e., laterally with reference to the shaft 22) between a locked and an unlocked position. When in the locked position the safety switch has a portion that slides into a recess 72 formed in an upper surface of the trigger 32. This prevents the trigger from sliding backwards when squeezed, thereby preventing operation of the gun 10.

Testing on an embodiment of the disclosed spray gun 10 has been found it to be particularly suitable for applying relatively highly viscous materials including two-part epoxy resins having a viscosity in a range between 7 and 10 Pas at a temperature of 23ºC and a pressure of CSS750Pa. One example of such a two-part epoxy resin is the two-part coating material sold under the trade name Humidur® FP Brush. Such material is not ordinarily suitable for spray application using a hand-held spray gun, but rather requires the much more expensive and larger plural pump, or as its name suggests, by way of a brush. Initial testing indicates that an embodiment of the disclosed pneumatic spray gun run at a pressure of between 90-100 psi, and more particularly 94-96 psi is capable of spray application of Humidur® FP Brush when heated to the relative low temperature of about 50°C and a pressure dial of the pump 12 set to a position of between 6 and 10. This is around 15°C lower than previously believed possible with a similar pump driven by a cordless battery powered electric motor. A further substantial benefit of the present embodiment is that its pneumatic operation makes it inherently suitable for use in hazardous environments where there is a risk of ignition or explosion from sparking equipment.

The significance of this is that with the reduced temperature the pot life of the coating is substantially increase allowing users more time to apply the product and clean the gun as well as reducing the risk of burns when handling higher temperature coatings. It is believed that these benefit stem from a combination of the higher power available from the pneumatic motor and the use of a lower pressure setting on the pump 12.

While several exemplary embodiments have been presented in the foregoing detailed description, it should be appreciated that a vast number of variations exist. It should also be appreciated that the exemplary embodiments of the pneumatic spray gun are only examples, and are not intended to limit the scope, applicability, or configuration of the present disclosure in any way. Rather, the foregoing detailed description will provide those skilled in

the art with a convenient road map for implementing an exemplary embodiment of the disclosed pneumatic spray gun.

In the claims which follow, and in the preceding description, except where the context requires otherwise due to express language or necessary implication, the word “comprise” and variations such as “comprises” or “comprising” are used in an inclusive sense, i.e., to specify the presence of the stated features but not to preclude the presence or addition of further features in various embodiments of the system and method as disclosed herein.

CLAIMS

1. A pneumatic spray gun comprising:
a pump capable of spraying a liquid;
a pneumatic motor coupled to the pump and capable of driving the pump when connected to a compressed gas source, the pneumatic motor having a switch biased to an OFF position in which the switch prevents a flow of compressed gas to operate the motor and movable by the application of a force to an ON position in which compressed gas can flow into and operate the motor; and
a trigger assembly coupled to the motor, the trigger assembly having a finger operable trigger and a mechanism mechanically connected to move with the trigger, the mechanism arranged to apply the force to move the switch between the ON and OFF positions when the trigger is operated.

2. The pneumatic gun according to claim 1 wherein the mechanism comprises a cam surface which slides linearly across, and applies the force to, the switch when the trigger is operated.

3. The pneumatic gun according to claim 1 or 2 wherein the trigger assembly comprises a housing for receiving the motor and seating the mechanism.

4. The pneumatic gun according to claim 3 wherein the housing seats the mechanism to move with a fixed distance from a central axis of the motor.

5. The pneumatic gun according to claim 3 or 4 wherein the housing is formed with a channel for slidably seating the mechanism.

6. The pneumatic gun according to any one of claims 2-5 comprising one or more bearing acting between the mechanism and the housing to facilitate sliding motion of the mechanism.

7. The pneumatic gun according to any one of claims 1-6 wherein the mechanism comprises an arm on which the cam surface is carried and wherein the arm is connected at one end to the trigger.

8. The pneumatic gun according to claim 7 wherein the arm is pivotally connected at the one end to the trigger.

9. The pneumatic gun according to claim 7 or 8 wherein the one or more bearing are operable between the arm and the housing.

10. The pneumatic gun according to any one of claims 7-9 wherein the cam surface lies on the arm between respective bearings.

11. The pneumatic gun according to any one of claims 2-10 wherein the switch comprises a pin slidably retained in, and extending from a motor housing, wherein the mechanism pushes the pin into the motor housing when the trigger is squeezed there by moving the switch to the ON position.

12. The pneumatic gun according to claim 11 wherein the mechanism is arranged to slide in a first linear direction and the pin is arranged to slide in a second direction orthogonal to the first linear direction.

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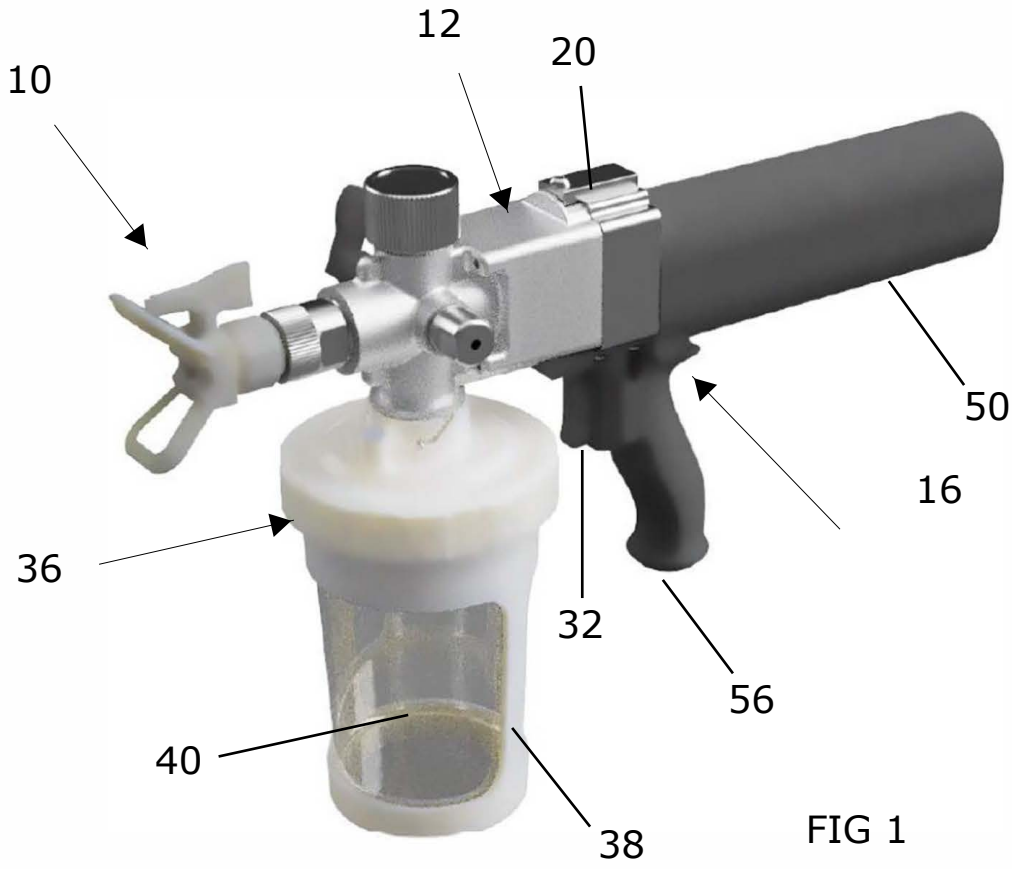

FIG 1

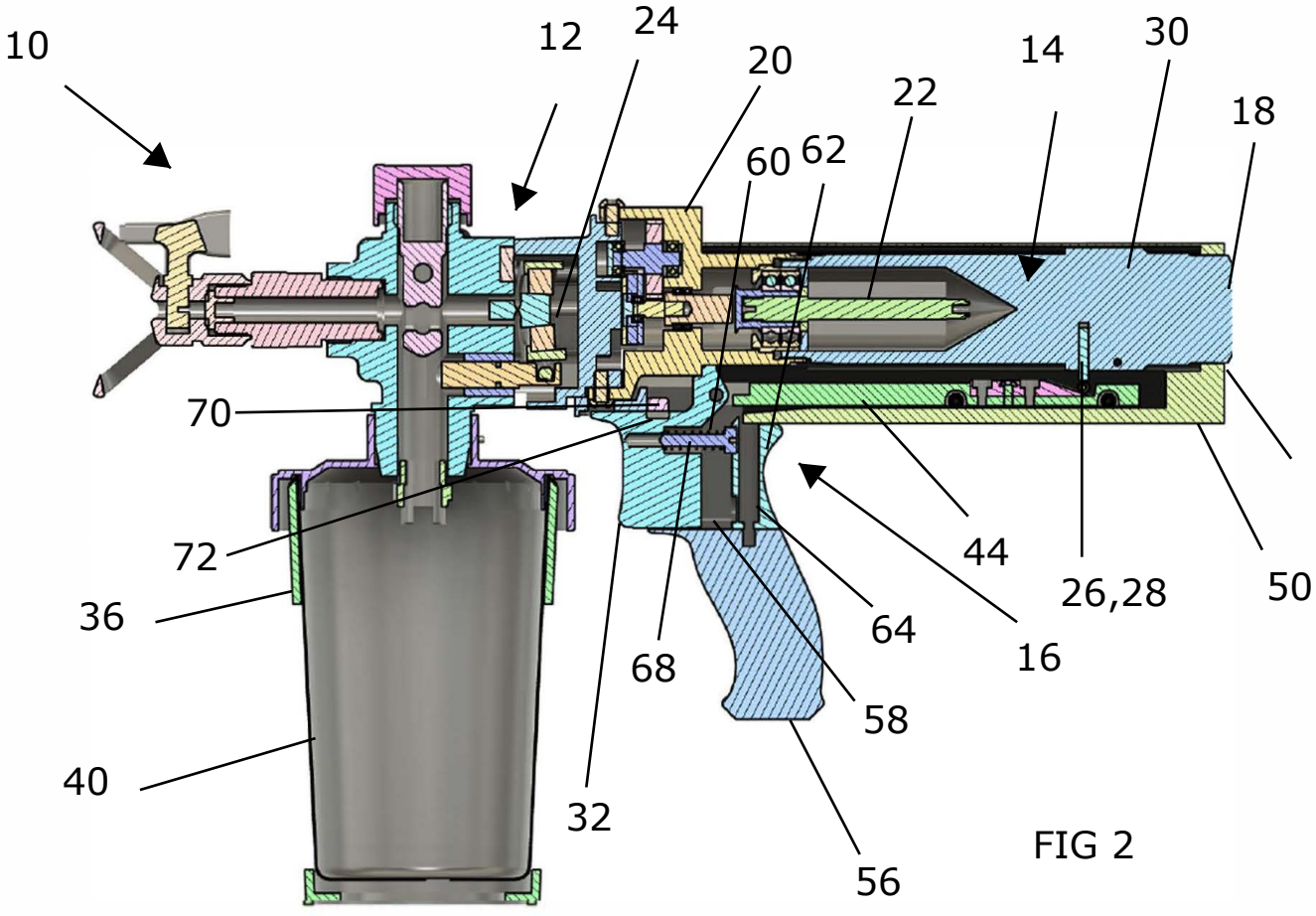

FIG 2

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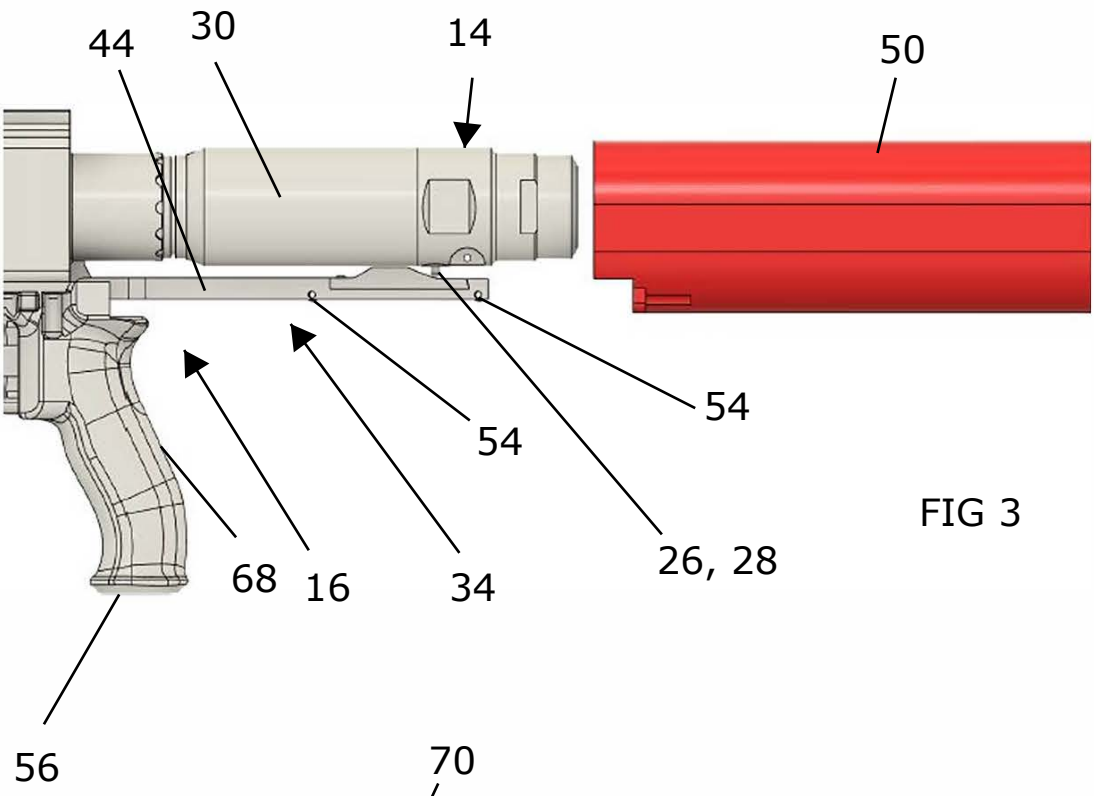

FIG 3

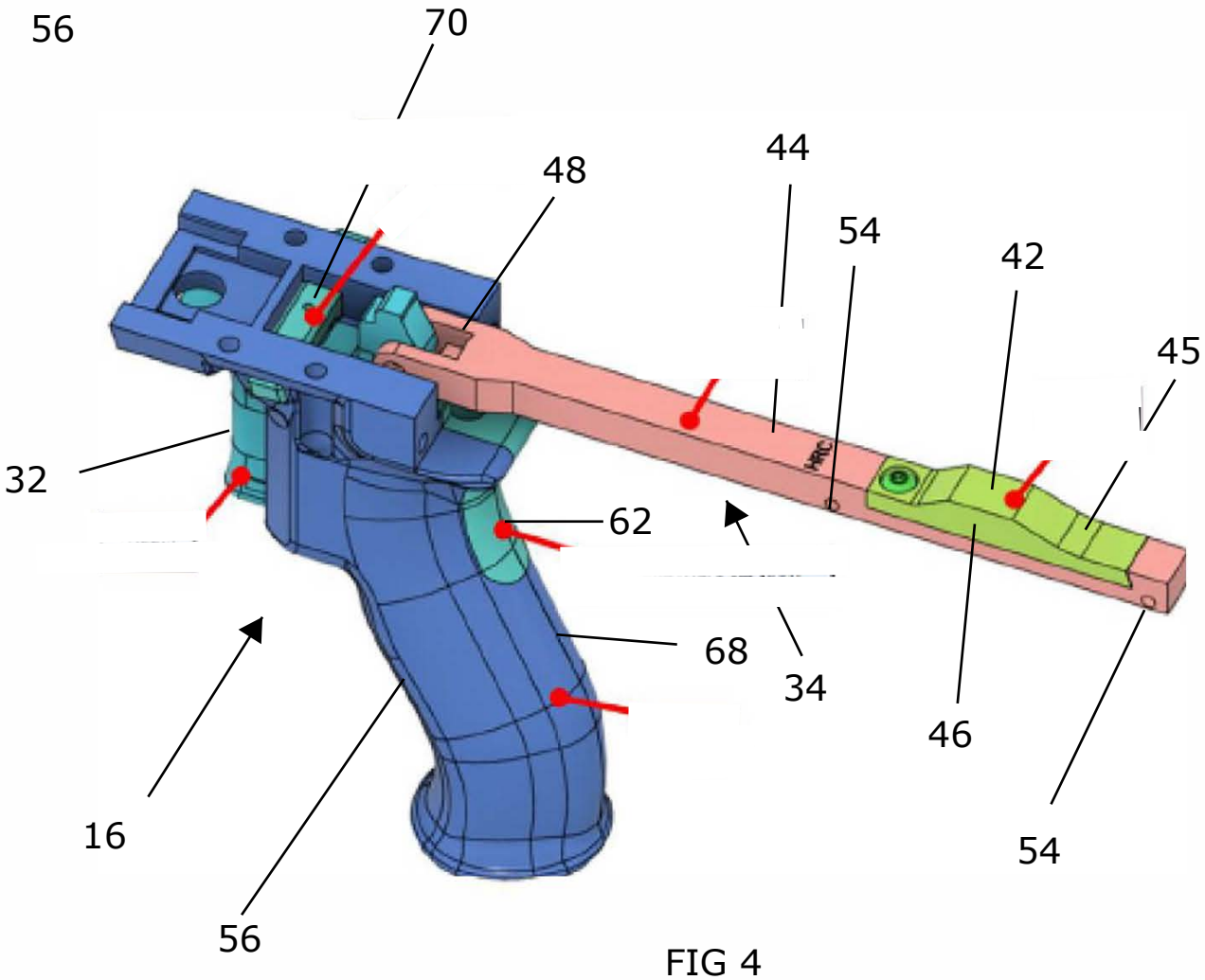

FIG 4

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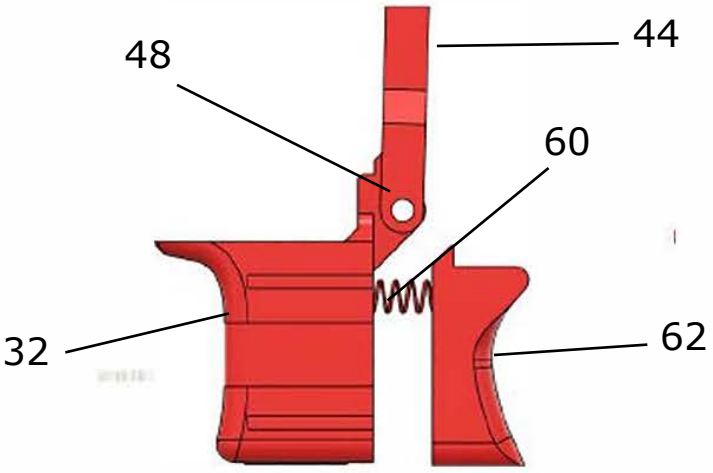

FIG 5

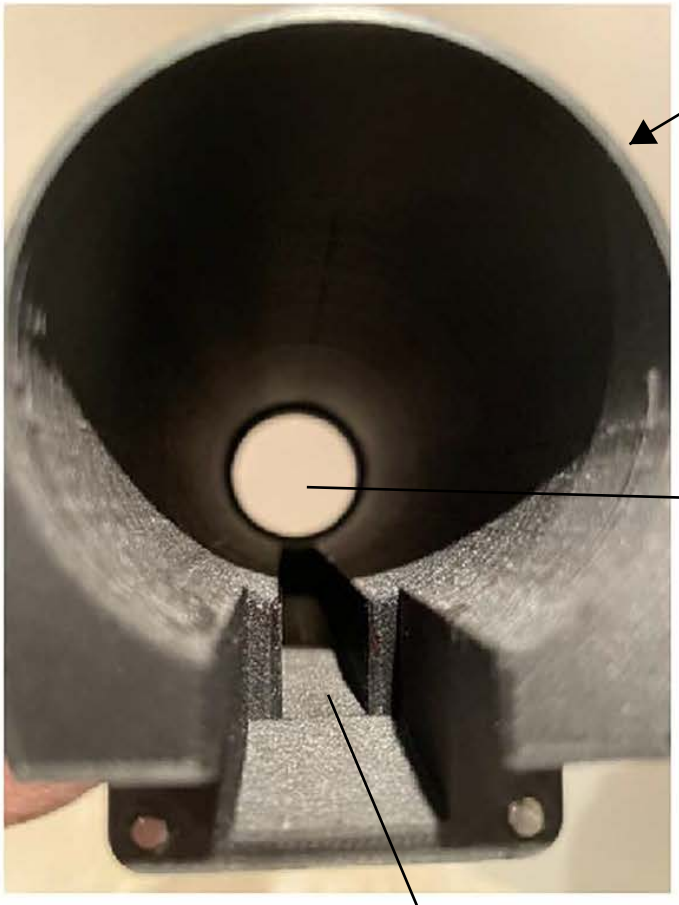

FIG 6