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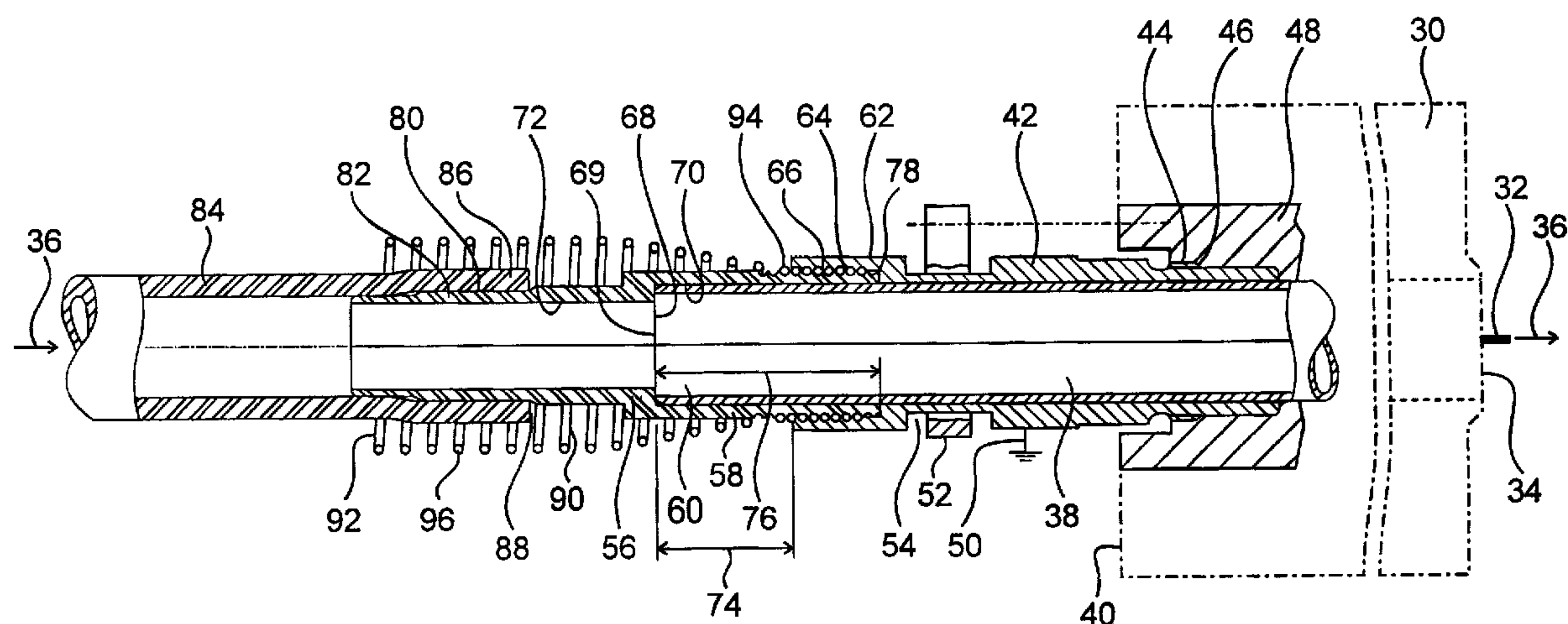
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(54) Title: A COATING-POWDER SPRAY GUN



(57) **Abrégé/Abstract:**

The invention relates to a high-voltage powder spray gun, in particular for spraying metallic powders. The rear terminal segment (60) of a powder tube (38) and the front terminal segment (58) of a hookup tube (56) are inserted far enough in axial and sealing manner to subtend between their overlap ends (69,78) a powder-tight, electrically insulating expanse (76) to preclude electrical leakage currents. An electrically conducting bush (42) runs over the outer overlap end (78) of the hookup-tube/powder-tube connection to shunt any electric charges that might issue at the outer overlap end (78) between the hookup tube (56) and the powder tube (38). This powder spray gun preferably also is fitted with an electrically grounded shielding sheath (90), preferably a helical compression spring, which is configured radially away above the outer overlap end (88), said sheath being configured between the rear terminal segment of the hookup tube (56) and the front end of powder hose (84) slipped over said rear terminal segment. This configuration prevents arcing on the hand of an operator in the event electric charges were to issue between the powder hose (84) and the hookup tube (56).



A COATING-POWDER SPRAY GUN

ABSTRACT

The invention relates to a high-voltage powder spray gun, in particular for spraying metallic powders. The rear terminal segment (60) of a powder tube (38) and the front terminal segment (58) of a hookup tube (56) are inserted far enough in axial and sealing manner to subtend between their overlap ends (69, 78) a powder-tight, electrically insulating expanse (76) to preclude electrical leakage currents. An electrically conducting bush (42) runs over the outer overlap end (78) of the hookup-tube/powder-tube connection to shunt any electric charges that might issue at the outer overlap end (78) between the hookup tube (56) and the powder tube (38). This powder spray gun preferably also is fitted with an electrically grounded shielding sheath (90), preferably a helical compression spring, which is configured radially away above the outer overlap end (88), said sheath being configured between the rear terminal segment of the hookup tube (56) and the front end of powder hose (84) slipped over said rear terminal segment. This configuration prevents arcing on the hand of an operator in the event electric charges were to issue between the powder hose (84) and the hookup tube (56).

A COATING-POWDER SPRAY GUN

The present invention relates to a coating-powder spray gun.

Accordingly the invention relates to a coating-powder spray gun comprising at
5 least one high-voltage electrode electrostatically charging the powder, a powder tube made of an electrically insulating material situated at an input side in the powder spray-gun, a hookup tube made of an electrically insulating material and of which the front end is connected to the rear end of the powder tube and of which the rear end can be plugged into a powder hose, an electrically conducting bush enclosing and thereby sealing the powder tube and which can be grounded to
10 shunt electrical charges.

Fig. 3 of the attached drawings shows a hose/powder-tube hookup of this kind in a known coating-powder spray gun. A bush 6 made of electrically conducting aluminum is slipped onto the rear terminal segment 2 of a powder tube 4 running from the hookup end of a powder spray gun 5 into this gun, and said bush is bonded to the powder tube. The bush is fitted at its
15 front end with an outer thread 8 to allow screwing it into a threaded borehole inside the powder spray gun. A hookup tube 10, or a hookup nipple, is inserted into said bush's rear terminal segment 12 which projects beyond the rear end of the powder tube 4, said tube 10 or nipple being sealed by an O ring 14 with respect to the bush 6. A powder hose 16 can be plugged onto the rear terminal segment of the hookup tube 10 projecting from the bush 6. The bush 6 can be
20 connected to electrical ground. The bush 6 is electrically conducting and is separated for instance by 300 mm from one or more high-voltage electrodes 18 of the powder spray gun 5 which is sketched here in merely schematic manner. This feature meets the operator's electrical-safety requirement (operator exposure to arcing and currents), however in extreme conditions there will be danger of the electrical potential breaking down at the high-voltage electrode 18 if

metallic powder (coating powder containing metal powder or metal particles) is used for coating objects. As regards a number of different kinds of metallic powders, the metal particles deposit in unwanted manner on the inside of the powder tube 2, of the hookup tube 10 and of the powder hose 16. These deposited metal particle constitute an electrically conducting layer which may
5 shunt the high voltage between the mutually adjoining end faces 15, 17 of the powder tube 4 and of the hookup tube 10 to the bush 6 and hence to ground. This effect is the more pronounced the closer the high-voltage electrode 18 shall be to the bush 6. The powder flow per se causes the high-voltage breakdown, because said flow is also somewhat conductive. The high-voltage electrode(s) 18 is situated near or inside a mouth 20 of a atomizing nozzle which atomizes the
10 coating powder 22 and sprays it onto an object to be coated.

Similar high-voltage coating-powder spray guns are known from the patent documents US 5,022,590 (EP 0 383 031 B1) and US 4,196,465 (DE 28 51 006 C2).

The objective of the present invention is to prevent in simple manner the high-voltage breakdown of the minimum of one high-voltage electrode of the powder spray gun even
15 when the coating powder is a metallic powder.

The invention solves this problem by means of the features of claim 1.

Accordingly a high-voltage powder spraygun of the invention is characterized in that the front terminal segment of the hookup tube and the rear terminal segment of the powder tube are inserted into each other in axially overlapping and airtight manner so that they constitute
20 between themselves an electrically insulated expanse precluding electric currents between their inside and their outside and in that the bush runs axially as far as or beyond the outer overlap end of the hookup-tube/powder-tube connection to shunt any electric charges that might occur in spite of the said insulated expanse at the outer overlap end between the hookup tube and the powder tube.

The dependent claims disclose further features of the invention.

The invention is elucidated below in relation to the attached drawings and an illustrative embodiment.

Fig. 1 schematically shows an axial section of powder hookup elements of a high-voltage coating-powder spray gun of the invention, and

Fig. 2 schematically shows a sideview of a special embodiment of a powder spray gun of the invention fitted with the hookup elements of Fig. 1.

Fig. 3 schematically shows a hose/powder-tube hookup in a known coating-powder spray gun.

In the present specification, "front" means downstream with respect to the direction of powder flow and "rear" means upstream. Accordingly, in Fig. 1, "rear" always connotes "left" and in Fig. 2 it always connotes "down". "Front" in Fig. 1 always means "right" and in Fig. 2 always means "up".

The high-voltage, coating-powder spray guns of the invention resp. 30 and 30-2 shown in Figs. 1 and 2, in particular used for metallic powders, (metal powders or in particular powders containing metal particles, for instance plastic powders) are fitted with at least one high-voltage electrode 32 near or in a spray aperture 34 for the purpose of electrostatically charging coating powders 36. The coating powder 36 flows inside the powder spray gun at least in its initial segment through a powder tube 38 made of an electrically insulating material and projecting from a gun intake side 40. A (thread-in) bush 42 made of an electrically conducting material such as aluminum is hermetically plugged onto the powder tube 38 and is adhesively bonded at its inner periphery to the outer periphery of the powder tube 38. The metallic bush 42 is fitted at its terminal segment with an outer thread 44 by means of which it is screwed into an inside thread 46 of a seat 48 for the powder spraygun 30.

The electrically conducting bush 42 can be grounded (50) for instance using a grounding bolt or a metal clasp 52 pivotably mounted on the seat 48 and allowing being pivoted into or out of an external, peripheral groove 54.

5 A hookup tube 56 and the powder tube 38 are inserted into each other, preferably by plugging. The hookup tube 56 or hookup nipple is made of an electrically insulting material such as plastic and comprises a front tube segment 58 which is plugged hermetically onto a rear terminal segment 60 of the powder tube 38. The front tube segment 58 of the hookup tube 56 projects axially forward into an annular space constituted between the powder tube 38 and a diametrically widened rear terminal segment 62 of the bush 42 and therein is axially and radially
10 connected to the bush 42. For that purpose the front terminal segment 58 of the hookup tube 56 may be fitted with an outside thread 64 which is screwed into an inside thread 66 of the bush 42. Another affixation procedure would resort to bonding or to snap-in connections.

The rear terminal segment 60 of the powder tube 38 projects axially to the rear and out of the bush 42. The rear powder-tube end 69 is seated on an annular offset 68 constituted
15 in the hookup tube 56 between a front borehole segment 70 of relative large diameter and receiving the powder tube 38 and a rear borehole segment 72 of relatively small diameter of the hookup tube 56.

The powder tube 38 projects rearward by a stub length 74 beyond the rear end of the electrically conducting bush 42. The rear powder tube end 69 of the electrically insulating
20 powder tube 38 and the front end 78 of the hookup tube 56 also made of an electrically insulating material overlap axially to subtend a sufficiently long insulating expanse 76 which prevents electrical charges draining out of the powder tube 38 toward the electrically conducting and grounded bush 50. The bush 42 runs axially beyond the outer overlap end 78 (front hookup tube end 78) of the hookup-tube/powder-tube connection in order to receive and drain any electrical

charges that might leak out -- in spite of the long, electrically insulating expanse 76 -- at the outer overlap end 78 between the hookup tube 56 and the powder tube 38.

Because, (contrary to the situation of the state of the art), the electrical high-voltage charges at the boundary between the powder tube 38 and the hookup tube 56 no longer can drain to ground 50 the high voltage from the high-voltage electrode 32 may run through the powder path as far as into the powder hose 84 used for powder feed, said hose being plugged onto the cross-sectionally contoured outer periphery 80 of the terminal segment 82 of the hookup tube 56. The powder hose is made of an electrically insulating material. If the powder hose 84 is not plugged deep enough onto the hookup tube 56, or if electrically conducting coating powder finds its way between the hookup tube 56 and the powder hose 84, sparkover and the like may take place between the powder hose 84 and the hookup tube 56 onto the operator's hand if this hand should be in the vicinity of the front hose end 86. Therefore the invention provides in advantageous manner that the critical region situated beyond the overlap end 88 between the front hose end 86 and the hookup tube 56 shall be enclosed by a shielding sheath 90 configured at a safe radial distance to prevent arcing, said shielding sheath being electrically conductive and furthermore being electrically connected at its front end to the bush 42 which may be grounded at 50. Preferably the electrically conducting shielding sheath 90 shall be resiliently compressible in order that, when plugging the powder hose 84 onto the hookup tube 56, the rear end 92 of the shielding sheath 90 shall be displaceable forward toward the bush 42 at least by the length by which the powder tube 84 must be plugged onto the hookup tube 56.

Preferably the front terminal segment 94 of the shielding sheath 90 is inserted, in particular it will be clamped, between the outside periphery of the hookup tube 56 and the rear terminal segment 62 of the bush 42, said terminal segment overlapping said tube. In the process, the front terminal segment 94 of the shielding sheath 90 may enter the turns of the threads 64

and 66 of these two components. These components also may be bonded to each other in this region. The front terminal segment 94 of the shielding sheath 90 exhibits a diameter which is reduced to the outside diameter of the front terminal segment 58 of the hookup tube 56, whereas its rear terminal segment 96 exhibits a larger inside diameter at least at the overlap end 88 of the
5 plug-in hookup-tube/powder-hose connection. As shown in Fig. 1, the shielding sheath 90 preferably shall be a helical compression spring.

The high-voltage, coating-powder spray gun 30 schematically shown in Fig. 1 may assume overall a "pistol" shape or be elongated, the powder tube 38 axially projecting from the rear, spray-gun intake side.

10 As shown in Fig. 2, the high-voltage powder spray gun 30-2 also may be in the shape of a "pistol" barrel 100 fitted with a downward projecting spray gun grip 102 at the lower end of which -- when this is the spray gun intake side 40 -- projects the rear terminal segment 60 of the powder tube 38. The same references are used for elements in Fig. 2 which correspond to those of Fig. 1 and therefore shall not be described again. Fig. 2 additionally shows that instead
15 of being provided from the outside, the high voltage for the high-voltage electrode 32 of the powder spray gun 30-2 also can be provided from an integrated high-voltage source 104 which may be applied from a low voltage source through a cable 106. The cable 106 furthermore may contain an electric hookup line to ground the bush 42 (namely in the form of a preferably aluminum element which shall be screwed into the gun). This embodiment also may be fitted
20 with a compressed-air adapter 108 to feed compressed air to the high-voltage electrode 32 and with a trigger 110 to manually turn spray gun operation ON and OFF.

WHAT IS CLAIMED IS:

1. A coating-powder spray gun comprising at least one high-voltage electrode (32) electrostatically charging the powder, a powder tube (38) made of an electrically insulating material configured at a gun intake side (40) and into the powder spray gun, a hookup tube (56) made of an electrically insulating material of which the front terminal segment is situated near the rear terminal segment of the powder tube (38) and of which the rear terminal segment can be plugged into a powder hose (84), a bush (42) made of an electrically conducting material and enclosing the powder tube (38) in sealing manner and connectable to electrical ground and used to shunt electrical charges,

characterized in that

the front terminal segment (58) of the hookup tube (56) and the rear terminal segment (60) of the powder tube (38) are axially inserted into each other in overlapping and airtight manner so deeply that they subtend between themselves an electrically insulating expanse (76) to prevent current from arising between their inside and their outside, and in that the bush (42) runs axially as far as or beyond the outer overlap end (78) of the hookup-tube/powder-tube connection (56, 38) for the purpose of shunting any electrical charges that might issue in spite of the insulating expanse (76) at the outer overlap end (78) between the hookup tube (56) and the powder tube (38).

2. Powder spray gun as claimed in claim 1, characterized in that the rear terminal segment (60) of the powder tube (38) is inserted into the front terminal segment (58) of the hookup tube (56).

3. Powder spray gun as claimed in claim 2, characterized in that the hookup tube (56) comprises a front borehole segment (70) of which the diameter is larger than

that of the adjoining rear borehole segment (72), whereby an offset (68) is subtended between the two borehole segments (70, 72) and in that the rear terminal segment (60) of the powder tube (38) is inserted into the front borehole segment of the hookup tube (56) and rests on its offset (68).

4. Powder spray gun as claimed in one of the above claims, characterized in that the outer overlap end (88) of the hookup-tube/powder-hose plug connection (56, 84) is enclosed by an electrically conducting shielding sheath (90) which is spaced at a radial and axial air gap and is electrically connected to the bush (42), said air gap being configured to act as a safety gap to prevent electric arcing between said outer overlap end (88) and the shielding sheath (90).

5. Powder spray gun as claimed in claim 4, characterized in that the shielding sheath (90) is affixed to the bush (42).

6. Powder spray gun as claimed in claim 5, characterized in that the front terminal segment of the shielding sheath (90) is inserted into an annular space between the bush (42) and the hookup tube (56) and is held in place axially and radially therein by the two components.

7. Powder spray gun as claimed in one of claims 4 through 6, characterized in that the front terminal segment of the shielding sheath (90) exhibits a diameter smaller than its rear terminal segment which runs at a radial spacing above the outer overlap end (88) constituted between the hookup tube (56) and the powder hose (84).

8. Powder spray gun as claimed in one of claims 4 through 7, characterized in that the shielding sheath (90) is a helical spring of which the turns enclose the hookup tube (56).

9. Powder spray gun as claimed in one of claims 4 through 8, characterized in that the shielding sheath (90) is resiliently compressible in the axial direction.

10. Powder spray gun as claimed in one of the above claims, characterized in that at least one of the mutual junctions

- (a) of the powder tube (38) and the bush (42) and/or
- (b) of the powder tube (38) and the hookup tube (56) and/or
- (c) of the bush (42) with the hookup tube (56)

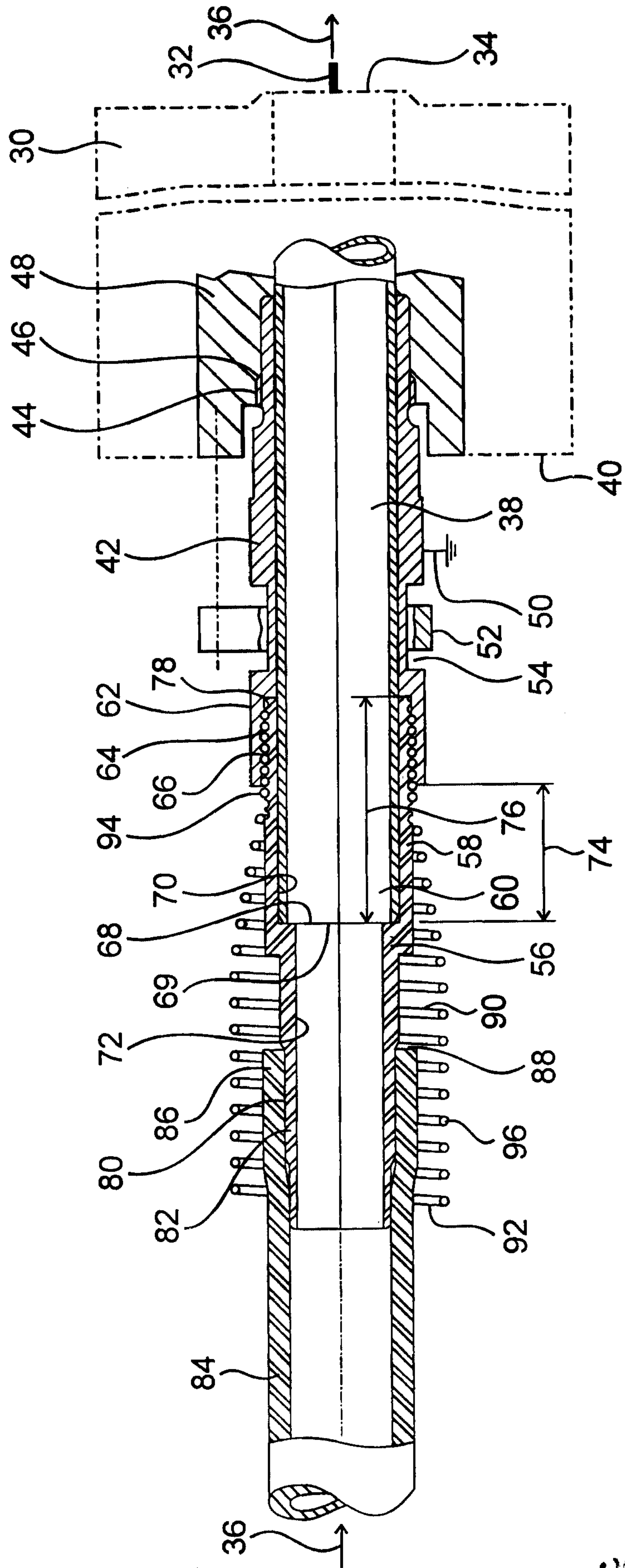
represents a plug-in connection.

11. Powder spray gun as claimed in claim 10, characterized in that at least one of the plug-in connections contains adhesive and is an adhesive connection.

12. Powder spray gun as claimed in one of the above claims 1 through 9, characterized in that the hookup tube and the bush each are fitted with a thread and are joined together by means of those threads.

13. Powder spray gun as claimed in one of the above claims, characterized in that the rear terminal segment (82) of the hookup tube (56) is fitted with a cross-sectionally contoured outer surface (80) onto which is plugged the powder hose (84).

FIG. 1



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FIG. 2

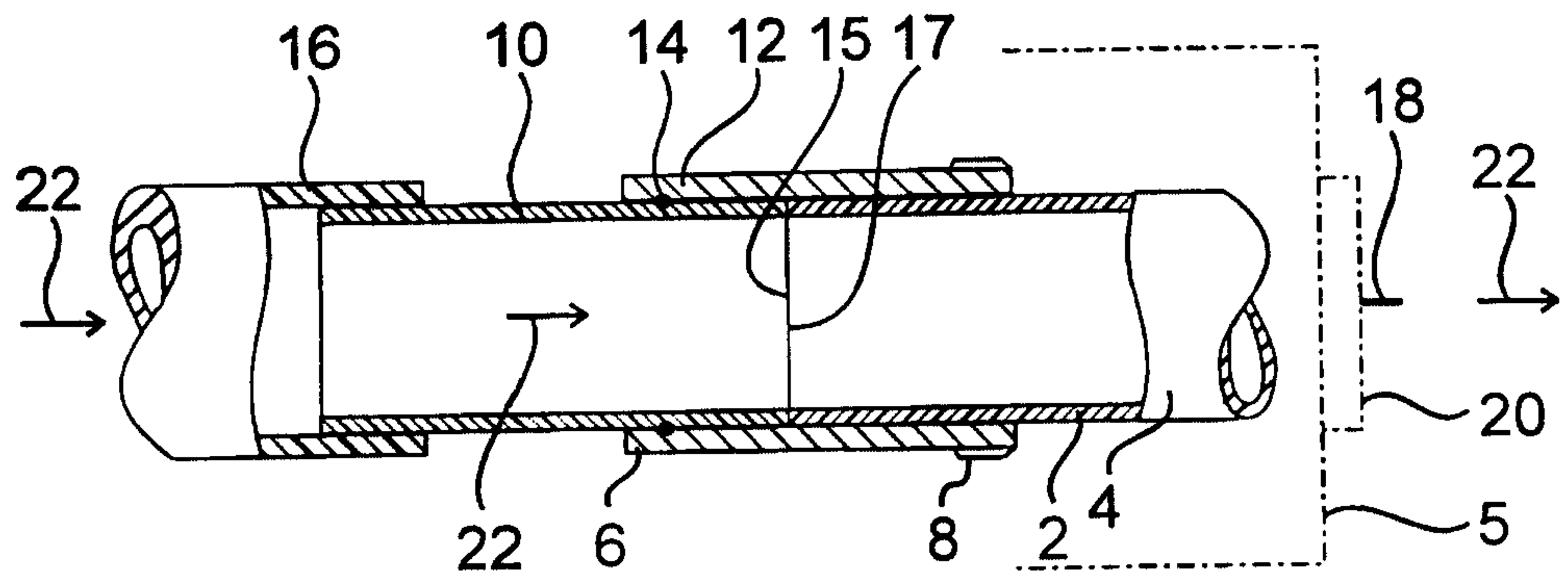
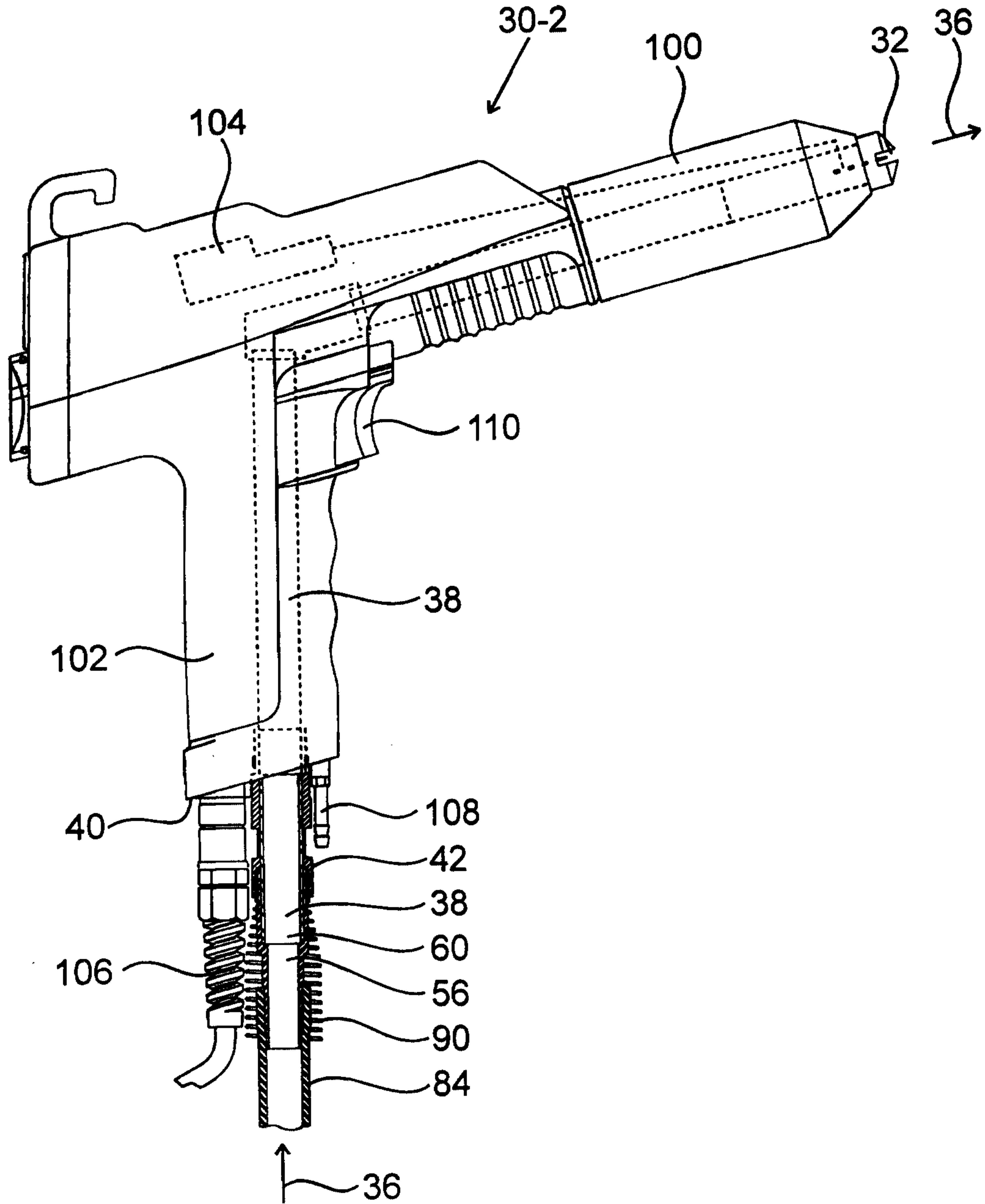


FIG. 3

