United States Patent

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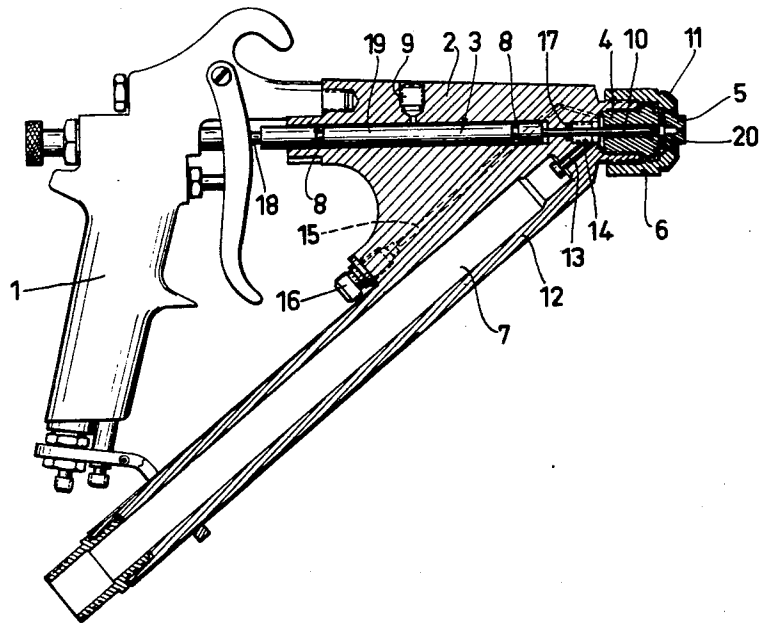
[54] **PAINT SPRAY GUN**
6 Claims, 1 Drawing Fig.

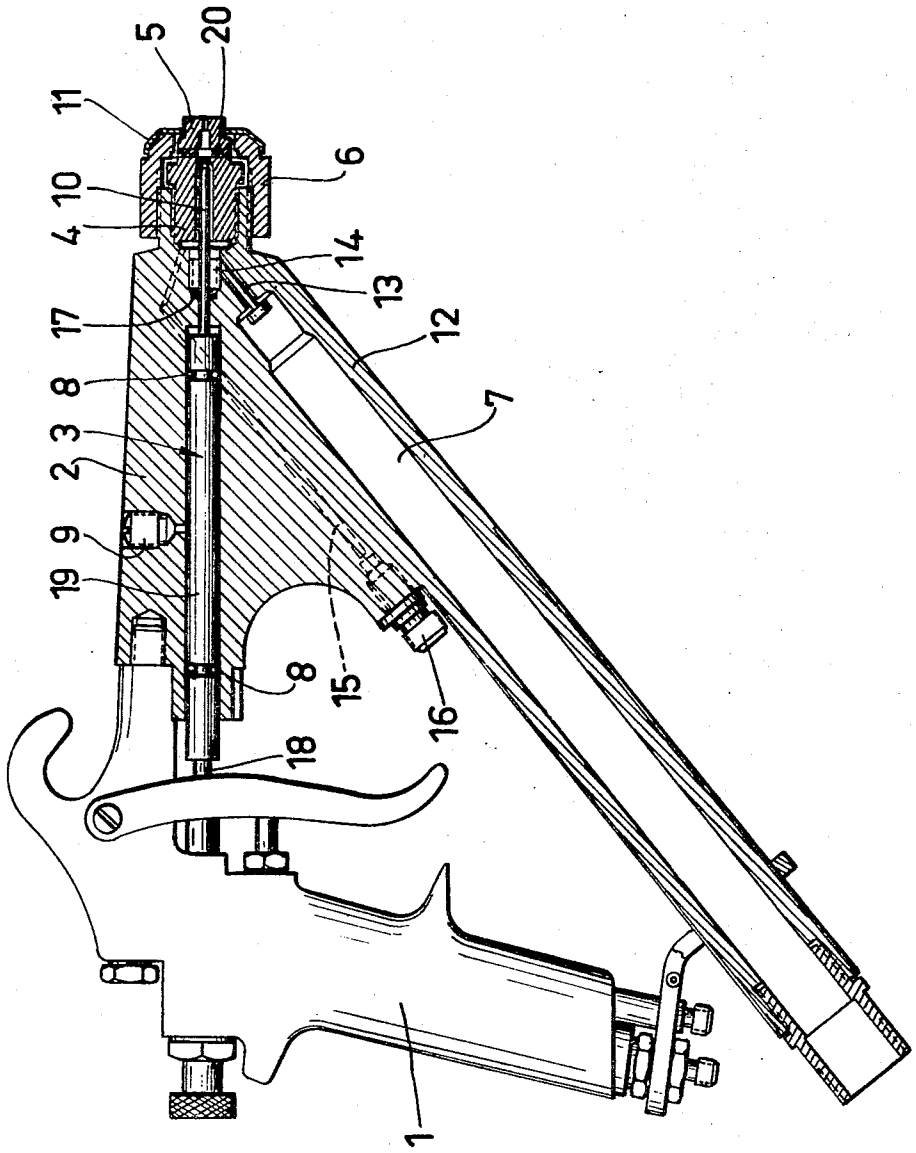
[52] **U.S. Cl.** **239/15,** 239/3
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[50] **Field of Search** 239/15, 3

[56] **References Cited**
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ABSTRACT: An electrostatic paint spray gun has a spray head body of electrically nonconductive material. The body includes a device for effecting the charging and atomization of the paint, characterized in that the paint control needle has an extension forming a paint needle, the extension being in electrical contact with a high voltage line and extending with clearance as a passageway into an inner paint nozzle, through which clearance the paint passes for being electrically charged to be ejected in and through an outer paint nozzle prior to the atomization of the paint. The paint control needle has a central portion of electrically nonconductive material.




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PAINT SPRAY GUN

This invention relates to a spray gun of electrostatic type in which paint atomization is effected preferably by hydrostatic or pneumatic pressure, the gun being adapted for manual control and provided with a grounded control member, preferably in the form of a handle, and a spray head body of electrically nonconductive material, said body comprising a paint control needle, a supply device for paint, a device including the front portion of a high voltage line, and a device for effecting the charging and atomization of the paint.

The spray gun according to the invention offers the advantages as follows: high electrostatic painting effect, insignificant electrostatic voltage losses, the spray nozzle remains clean, and the paint circulates through passageways in the spray gun right to the paint nozzle.

The invention is described in the following with reference to the accompanying drawing, which by a lateral view shows the cross section of a selected embodiment of the spray gun according to the invention, which embodiment shows a spray gun with hydrostatic paint atomization. The characterizing features of the invention become evident from the claims enclosed.

The spray gun comprises in known manner a grounded handle **1**, a spray head body of electrically nonconductive material **2**, a control needle **3**, an inner paint nozzle **4**, an outer paint nozzle **5**, a holder ring **6** and a connecting body **12** for a high voltage cable **7**, said connecting body **12** being an integrating part with the spray body **2**.

Painting with electrostatic spray guns has been known for many years by way of the embodiment in which paint under a very high pressure, approximately 25—100 kg./cm.^{2} and higher, is pressed out through an atomizing nozzle by which the paint is atomized. The present invention, according to which the spray gun, for example, operates with a very high pressure on the paint and by atomization with or without assistance by compressed air, involves substantial advantages over previous electrostatic spray guns.

The spray head body **2**, which is made of an electrically nonconductive material, is also resistant to the solvents now being applied in the paint industry. The spray head body is the central part in the spray gun and comprises a plurality of essential details. The control needle **3** is composed of four parts, a rear steel part **18**, an electrically nonconductive intermediate part **19**, which at each end is provided with sealings **8**, for example O-rings of rubber, and a front steel part **10** forming a paint needle so designed with a conical point that by abutment to a seat in the front part of the nozzle **4** the paint is prevented from flowing out. The O-rings retain a liquid, which by the pressing screw **9** is maintained under pressure in the gap between the intermediate part **19** and the O-rings **8** of the control needle and the control needle guide means located in the spray head body. The liquid is intended for additionally insulating against electrical control parts in the direction to the gun. The paint needle **10** constitutes the electrode and, thus, transfers to the paint all electrons, which charge the paint electrostatically. The charging, thus, takes place before the paint is atomized outside of the nozzle **5** which in its turn takes place immediately when the paint jet leaves the nozzle.

In this connection it may be mentioned that the voltage decreases with increasing possibility of the electrode to discharge electrons. This applies particularly to manually operated electrostatic equipments where from a safety point of view only very limited effects can be applied. It is also known that externally pointed parts, preferably of metal, discharge great amounts of electrons and easily form electron paths to grounded objects. It is further known that low voltages very substantially reduce the electrostatic effect. The problems have been to be able by different types of external points to balance strong electron paths with resulting decrease in voltage, but still to obtain high voltages for achieving good electrostatic effects. It is also generally known that only a small part of available effects at electrostatic spraying is utilized for the electrostatic effect.

The present invention offers a solution of the problem heretofore involved. A limited electron outflow, which effectively is transferred directly to the paint particles, maintains high electrostatic voltage, which renders possible a very high charging of the paint and thereby a high electrostatic painting effect. The transfer of electrons is effected in that the paint is pressed through a passageway into the paint nozzle **4** where the paint needle of the control needle is under high voltage and leaves open only an insignificant gap for the paint to be pressed forward through the paint nozzle **4**. Hereby an effective charging of the paint is obtained, because between the paint needle **10** and the paint nozzle **4** only a very narrow gap is formed, which charging is additionally increased at the paint needle point by its conical pointed shape. Due to the fact that the area of the paint quantity in the gap is only very small, the electric resistance in the paint is very high and results in a reduced electric current leakage in rearward direction. In the paint nozzle **4** a seat is formed for the point **10** of the paint needle, to provide sealing when the gun is not in operation.

The nozzle member comprises four parts, viz an inner and an outer paint nozzle **4** and **5**, respectively, a holder ring **6** and a protective plate **11**. The inner paint nozzle **4** is made of an electrically nonconductive material, which is resistant to paints and solvents. The outer paint nozzle **5** is a paint nozzle generally known for atomization of paint. The holder ring **6**, which is made of an electrically nonconductive material, is intended to keep together the paint nozzle **4** and the atomizing nozzle **5**, whereby the intermediate sealing **20** prevents leakage. The protective plate **11**, which is mounted on the front portion of the holder ring **6** and made of a very thin, electrically conductive material, has as its object to keep the nozzle **5** clean. The protective plate **11** is energized. At experiments with different types of paint it has been found that, for example, paints with low resistance, e.g. 100—150 megohm, immediately strike back at spraying and cover the nozzle when no protective plate is provided. This phenomenon can so be explained that the nozzle **5** receives a voltage higher than that of the atomized paint, which at low resistance often can maintain its charge only with difficulty. Hereby the paint nozzle **5** attracts these particles, which results in a coat. This problem has been solved by the invention by means of the protective plate, which in a self-adjusting manner prevents the occurrence of electrostatic unbalance between the nozzle **5** and atomized paint. The protective plate **11**, thus, repels the charged paint particles. There are formed electrostatic field lines to the object to be painted, which represents the positive pole, and the paint already charged follows the field lines, which partially also extend behind the object to be painted whereby this object, according to its size, also is coated with paint on its rear side. The electrostatic high-voltage cable **7**, which is led through an electrically insulating pipe **12** formed in one piece with the spray head body **2**, is in electric contact with the paint needle **10** of the control needle **3** through a contact pine pin **13** and the guide gland **14**.

The paint is supplied through double parallel lines **15** and fed through connection fittings **16**. The paint lines **15** open into a space between the gland **14** and the paint nozzle **4**. The paint is continuously circulated, which is advantageous as it prevents sedimentation of the paint in the lines at interruptions of the spray painting and maintains the temperature in the paint constant when the spray painting is carried out with heated paint. There is, thus, a continuous circulation in the two passageways **15** also during the spray painting operation, becaUse the supply of paint exceeds the paint consumption at spray painting.

The invention subject matter preferably is intended for use in connection with heated paint for obtaining a lower viscosity. Heated paint renders considerably better painting results in several different respects, at the same time as the paint can be subjected to a lower pressure, which results in a lower speed of the paint particles ejected and thereby in a more favourable electrostatic painting effect. The paint passageways **15** have so been placed in the spray head body that by circulation of the

heated paint no pockets are formed which would render it impossible that all paint always is given the desired temperature. The paint is supplied through high-pressure hoses, which are connected to paint lead-in nipples **16**.

In order to prevent paint from leaking into the space where the central portion **19** of the control needle is disposed, the paint needle **10** is effectively sealed by the packing gland **14** and control needle packing **17** due to the fact that the gland **14** is screwed into the spray head body.

The spray gun though being described above as a paint spray gun with atomization of paint under hydrostatic pressure, may of course also be imagined to be provided with compressed air means whereby the compressed air, for example, is advanced through a passageway to the atomizing nozzle **11**, which thereby is replaced by a corresponding nozzle of known type for atomization by compressed air.

I claim:

1. An electrostatic paint spray gun adapted for manual control wherein paint is atomized under hydrostatic or pneumatic pressure has a grounded control handle and an electrically nonconductive spray head body comprising, a paint control needle, a paint supply device, a means for effecting the charging and atomization of the paint including the forward end of a high voltage line, characterized in that the paint control needle has an extension forming a paint needle, which is in galvanic contact with the high voltage line and extends with clearance as a passageway in an inner paint nozzle, through which clearance the paint passes for being electrically charged to be ejected in and through an outer nozzle prior to the atomization of the paint, and the paint control needle also having a central portion of electrically nonconductive material before the paint needle, said central portion being provided with a sealing ring adjacent its ends for defining electric insulation liquid introduced under pressure between said central portion and the passage of the spray head body in order to additionally insulate the grounded control part of the gun against leaking electric current.

2. Gun according to claim claim **1**, characterized in that the paint needle in its front portion terminates in a point for increasing at operation of the gun the electrostatic charging of the paint, and at a break in the operation of the gun to form a sealing together with a seat formed in the paint nozzle.

3. Gun according to claim **1**, characterized in that the outer paint nozzle is mounted on the gun body by a holder ring of electrically nonconductive material, the front portion of the holder ring being covered by a protective plate of electrically conductive material.

4. Gun according to claim **1**, characterized in that the insulation liquid is supplied through a threaded hole in the spray head body, which hole is closed by a screw of electrically insulating material whereby the pressure on the liquid is built up when the screw is being screwed in.

5. Gun according to claim **3** characterized in that the paint needle in its front portion terminates in a point for increasing at operation of the gun the electrostatic charging of the paint, and at a break in the operation of the gun to form a sealing together with a seat formed in the paint nozzle.

6. Gun according to claim **4** characterized in that the paint needle in its front portion terminates in a point for increasing operation of the gun the electrostatic charging of the paint, and at a break in the operation of the gun to form a sealing together with a seat formed in the paint nozzle.