July 22, 1969 G. D. DEL VECCHIO ET AL 3,457,405

CORONA WIRE MOUNTING MEANS WHICH COMPENSATES FOR WIRE EXPANSION DUE TO HEAT

Filed Oct. 11, 1966 2 Sheets-Sheet 1

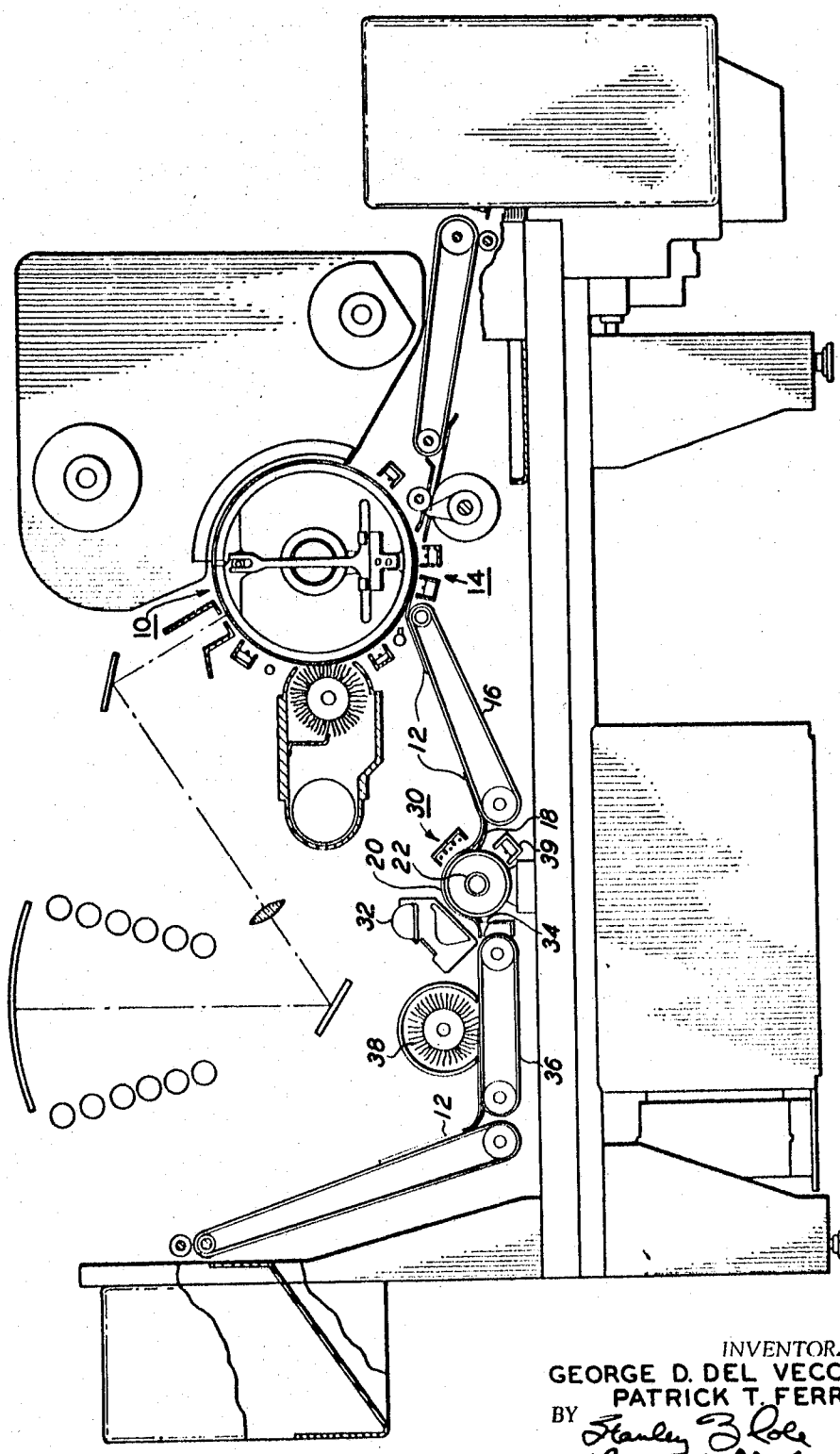


FIG. 1

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2 Sheets-Sheet 2

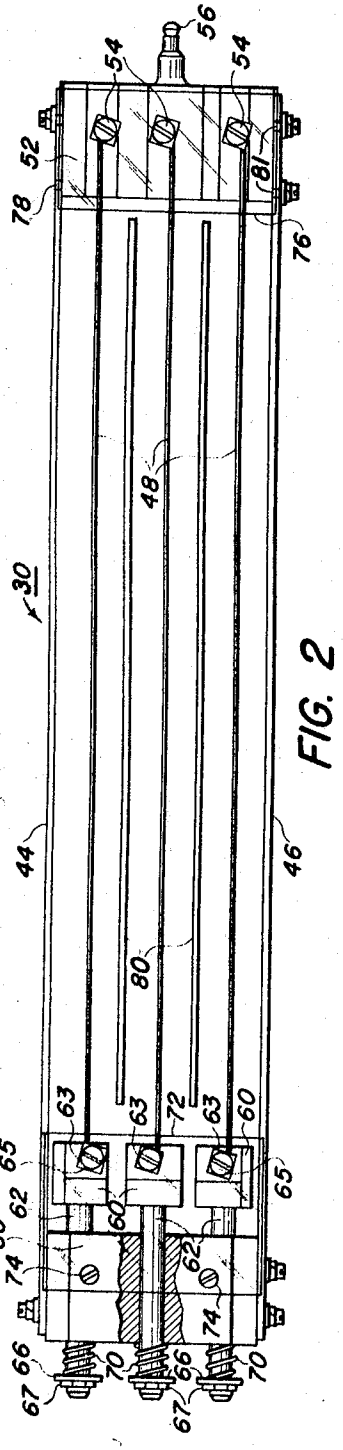


FIG. 2

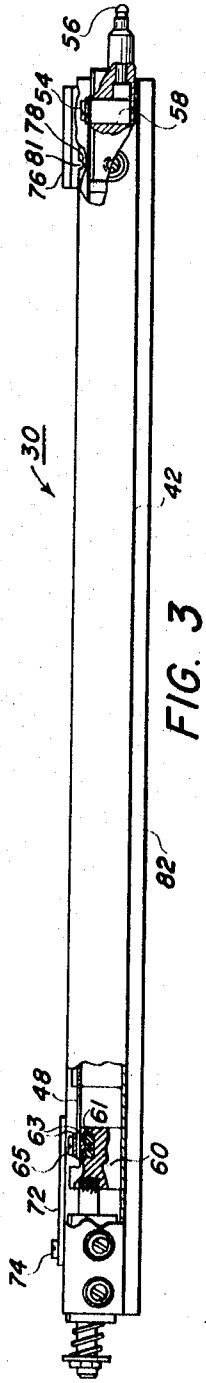


FIG. 3

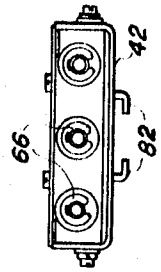


FIG. 4

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3,457,405

Patented July 22, 1969

3,457,405

CORONA WIRE MOUNTING MEANS WHICH COMPENSATES FOR WIRE EXPANSION DUE TO HEAT

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Filed Oct. 11, 1966, Ser. No. 585,783
Int. Cl. H01j 37/26, 1/90, 19/44
U.S. Cl. 250—49.5
6 Claims

ABSTRACT OF THE DISCLOSURE

A corona generating device including an electrically biased corona emitting wire capable of retaining its taut condition even when expanded as through being heated. The wire is mounted at its opposite ends on insulating supports. One of the supports is fixed while the other is movable. A coil spring, mounted with respect to the movable support, permits the movement of the movable support away from the fixed support to retain the wire taut even when it has become expanded through being heated.

This invention relates to an improved corona generating device for creating and maintaining a constant electrostatic charge on a support surface or on a drum.

In one mode of reproduction of copy by xerographic techniques, a uniform electrostatic charge is applied to a xerographic plate, comprising a photoconductive insulating material on a conductive backing. This charged xerographic plate is then exposed to the subject matter to be reproduced, usually by conventional projection techniques. This exposure of the xerographic plate, discharges the plate areas in accordance with the radiation intensity which reaches them and thereby creates an electrostatic latent image on or in the plate coating which may then be developed with an electroscopic material which clings to the plate electrostatically in a pattern corresponding to the latent electrostatic image. The thus formed powder image is usually transferred to a support surface by superposing the support thereon and applying an electrostatic charge to the exposed area of the support surface, whereby the xerographic powder image is electrostatically attracted and bonded to the support surface. The support surface is then separated from the xerographic plate and the xerographic powder image on the support surface is then fixed thereto by a suitable fuser.

In general, the electrostatic charging of the support material to effect tacking of the support material to the transport drum is accomplished by means of corona charging or generating devices whereby an electrostatic charge is applied to the support material as the support material passes over the drum. In such a manner the support material is tacked to the transport drum and carried thereby through the fusing area. A form of corona generating device is disclosed in Vyverberg Patent 2,836,-725, issued May 27, 1958, wherein a single corona wire is connected to a high voltage source and is supported in a conductive shield that is arranged in closely spaced relation to the surface to be charged. Suitable means are usually provided to effect relative movement of the surface to be charged and the corona generating device whereby a uniform electrostatic charge is deposited.

In continuous automatic xerographic systems, such as the disclosed in copending application S.N. 585,971 filed concurrently herewith in the name of Gilbert A. Aser et al. cut sheet material having a powder image thereon is

passed through a fuser whereby the powder image is fused to the sheet material. In such a device the sheet material is passed over a preconditioning roll which preheats the sheet material. The sheet is tacked to the preconditioning roll by a corotron which emits a negative charge. The sheet material is then passed under a source that transmits a high temperature infrared source. To precondition the paper it is necessary to completely tack the sheet material to the drum whereby there is intimate contact therebetween thus eliminating any boundary layers in order to obtain the proper conductive heat transfer. If the sheet material is not properly tacked to the preconditioning drum, preconditioning of the support material cannot be controlled accurately.

Since the fusing system operates at relative high temperatures the corona generating device expands and contracts due to the temperature changes as the fuser is turned on and off, the shield of the corona generating device will expand more rapidly than the wire. Thus, when operating in the fusing system, the corona wire could be stressed because the wire does not expand and contract at the same rate as the shield. In such a case the wire would break. Also a cooling of the wire would result in a sag which would cause the wire to arc.

Accordingly, it is an object of the present invention to improve the construction of corona generating devices whereby a uniform and constant electrostatic charge may be deposited on sheet material, a drum or other surface.

Another object of the present invention is to improve corona generating devices that are particularly suitable for continuous operation under varying temperature conditions.

A further object of this invention is to improve existing corona generating for use in fusing systems.

A still further object of this invention is to improve corona generating devices so that a constant tension is maintained on the corona wire.

Another object of this invention is to improve the construction of corona generating devices that are easy to manufacture and do not require adjustment.

These and other objects of the invention are attained by employing a corona wire or electrode that is connected to a high voltage source and is insulated from, but, supported within a conductive shield. The corona wire is supported on insulated blocks within this conductive shield in such a manner as to prevent the corona wire from stretching or sagging. By this arrangement, it is possible to energize the corona wire to a potential substantially in excess of the corona threshold potential of the wire and, since the shield is maintained at ground potential, most of the corona current emitted goes directly to the shield and only a small portion thereof is effective to charge the support surface or plate.

For a better understanding of the invention as well as other objects and features thereof, reference is made to the following detailed description of the invention to be read in connection with the accompanying drawings wherein:

FIG. 1 illustrates schematically the automatic xerographic reproducing apparatus incorporating a fusing system which includes a corona generating apparatus in accordance with the invention to apply an electrostatic charge to a support surface advanced into contact with the preconditioning drum of the fusing apparatus;

FIG. 2 is a top view of a corona charging device constructed in accordance with the invention with parts broken away;

FIG. 3 is a side elevational view of the corona charging device of FIG. 2 with parts broken away; and

FIG. 4 is a left hand end view of the corona charging device.

Referring now to FIG. 1, there is shown schematically an automatic xerographic reproducing apparatus.

A xerographic plate **10** including a photoconductive layer or light-receiving surface on a conductive backing and formed in the shape of a drum, is mounted to rotate in the direction indicated by the arrow to cause the drum surface sequentially to pass a plurality of xerographic processing stations.

Sheets of support material **12** are advanced seriatim into contact with the xerographic drum in registration with a previously formed xerographic powder image on the drum whereby the image is transferred to the support material.

The support material **12** is transported over a system of belts **16** from the transfer station **14** to a chute **18** where it is directed to the preconditioning drum **20**. The preconditioning drum **20** is heated by means of an internal heating source **22**. The support material **12** is tacked to the drum by means of a corona generating device generally indicated as **30**. The tacked support material is then transported by the preconditioning drum **20** past an infrared energy source **32** where the toner is fused to the support material. The support material **12** is then stripped from the preconditioning drum **20** by means of a stripper **34** where it is directed on to a belt transport **36**. The support material is then moved past a brush **38** where any residual background toner is removed. As the drum **20** continues to rotate, it passes a precondition corotron generator device **39** where any residual negative charge is neutralized and the drum is positively charged. The drum **20** is now ready to accept the next sheet of support material.

Referring now to the subject matter of the invention and, in particular, to FIGURES 2, 3 and 4 illustrating a preferred embodiment of the invention, the corona generating device **30** includes a conducting shield **40** preferably of aluminum or stainless steel. The shield is generally a U-shaped cross section and includes a bottom wall **42** and side walls **44** and **46** in perpendicular relation to the bottom wall **42**.

The shield **40** is formed with divider portions **80** mounted between the wires **48** to provide a uniform electrostatic flow from the wires to the shield or ground surface.

The corona charging device is supported in spaced relation to the preconditioning drum as by a bracket suitably grounded to other elements of the fusing apparatus, the bottom wall **42** of the shield being provided with rails **82** which are attached to the mounting bracket within the fusing apparatus.

A series of high voltage corona wires **48** of any suitable noncorrosive material such as platinum or stainless steel having a uniform thickness are located within the shield. A support block **50** and an insulating block **52** are rigidly mounted within the side walls **44** and **46** at each end of the shield **40**. The corona wires **48** are attached to the insulating block **52** by means of a conductive connecting element **58** mounted therein. The corona wires **48** are attached to the connecting element **58** by screws **54**. A terminal plug **56** is mounted within connecting element **58**. Each of the screws **54** is connected to the connecting element **58**.

The other end of the corona wires **48** are attached to movable insulating blocks **60**. Each block **60** has an insert **61** secured therein. A movable insert **63** is placed within the insert **61** with the corona wire **48** curled around this insert. A screw **65** is threaded into the insert **61** thus attaching the wire **48** to the insulating block **60**. Each of the insulating blocks **60** has a rod **62** attached thereto, the rod **62** extends through the support block **50** through openings **64** therein. The rod **62** is insulated from the wire **48** by the insulating block **60**. A stop **66** is mounted on each end of the rods **64** by a C-ring **67**. A spring element **70** is mounted on the rods **64** between the stop portions **66** and the support block **50**. In such a manner the springs **70** exert a constant force on the insulating blocks **60** by means of rods **62**.

Thus the corona wires **48** are maintained at a constant tension. The purpose of the spring **70** is to compensate for the varying expansion rates of the corona wires **48** and a conductive shield **40**. Also the spring arrangement eliminates the necessity of adjusting the corona wire when the device is manufactured or when the wire is repaired or replaced. The corona wires **48** are maintained at a constant tension, are capable of operating at extreme temperatures without breaking and do not require adjustment.

An insulating shield **72** is attached to the support block **50** by a set of screws **74**. Another insulating shield **76** is attached to cutouts **78** formed on the shield walls **44** and **46**. The shield **76** is formed with ears **81** that allow the same to snap into cutouts **78**.

While the invention has been described with reference to the structure disclosed herein, it is not confined to the details set forth, but is intended to cover such modifications or changes as may come within the scope of the following claims.

What is claimed is:

1. A corona charging device for the emission of corona discharge including

a conductive shield comprising a bottom wall and side walls each side wall including a portion directed toward each other to form an angle therewith,

an insulating support block connected to one end of said shield between said side walls,

at least one additional insulating support block movably mounted at theh opposite end of the shield,

At least one corona wire secured at one end to said insulating support block and at the other end to the movable insulating block in insulated relation to the conductive shield and positioned within the confines of the bottom and side walls, and

means connected to one end of said corona wire and adapted to be connected to a source of high voltage potential.

2. A device as recited in claim **1** wherein the movable insulating block is spring biased to maintain the corona wire at a constant tension.

3. A device as recited in claim **1** wherein the corona charging device includes

at least a second support block mounted at the opposite end of the shield,

said movable insulating block having a pin mounted thereon, said pin adapted to be slidably mounted with said second support block.

4. A device as recited in claim **3** wherein the movable insulating block is spring biased to maintain the corona wire at a constant tension.

5. A corona generating device for the emission of a corona discharge including

a shield,

a first insulating block secured with respect to said shield adjacent one end thereof,

a second insulating block movably mounted with respect to said shield and said first insulating block,

an elongated corona wire mounted at its first end to said shield and said first insulating block,

an elongated corona wire mounted at tis first end to said first insulating block and at its second end to said second insulating block,

a support block fixedly mounted with respect to said shield adjacent said second insulating block and on the side thereof remote from said first insulating block,

resilient means operatively coupling said second in-

sulating block and said support block to resiliently urge said second insulating block toward said support block and away from said first insulating block whereby said corona wire is maintained in tension, and

means connected to said corona wire adapted to be connected to a source of potential for creating corona emissions from said wire.

6. A device as set forth in claim 5 wherein said resilient means includes a spring and rod, said rod being slidably mounted through said support block and secured at its first end to said second insulating block with said spring mounted between said support block and the second end of said rod to thereby urge the second end of said rod away from said support block.

References Cited

UNITED STATES PATENTS

1,480,208	1/1924	Housekeeper	313—278 X
2,863,063	12/1958	Schulze.	
3,075,078	1/1963	Olden.	
3,124,713	3/1964	Randmer	313—278 X
3,277,298	10/1966	Tiger et al.	

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U.S. Cl. X.R.

313—275, 278; 355—3