United States Patent

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[54] **DROP CHARGING BAR**
4 Claims, 2 Drawing Figs.

[52] U.S. Cl. 239/15, 346/75
[51] Int. Cl. B05b 5/00, F23d 11/28
[50] Field of Search 346/75, 140; 239/15

[56] **References Cited**

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ABSTRACT: A charging element for a noncontacting coating system is formed as a bar with a series of transversely extending notches with each notch having a coating of an electrically conductive material applied thereto and connected to a control unit for selectively energizing said coatings to thereby discriminately impart electrical charges to coating material passing through the notches in the bar. With this construction not only is fabrication of the bar facilitated, but startup problems are eliminated since the charging bar may be moved into position after the flow of coating material through the coating apparatus has begun.

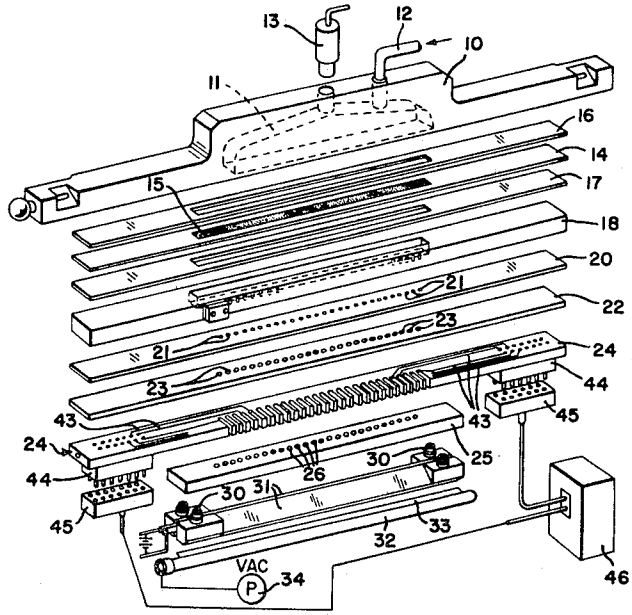


FIG-1

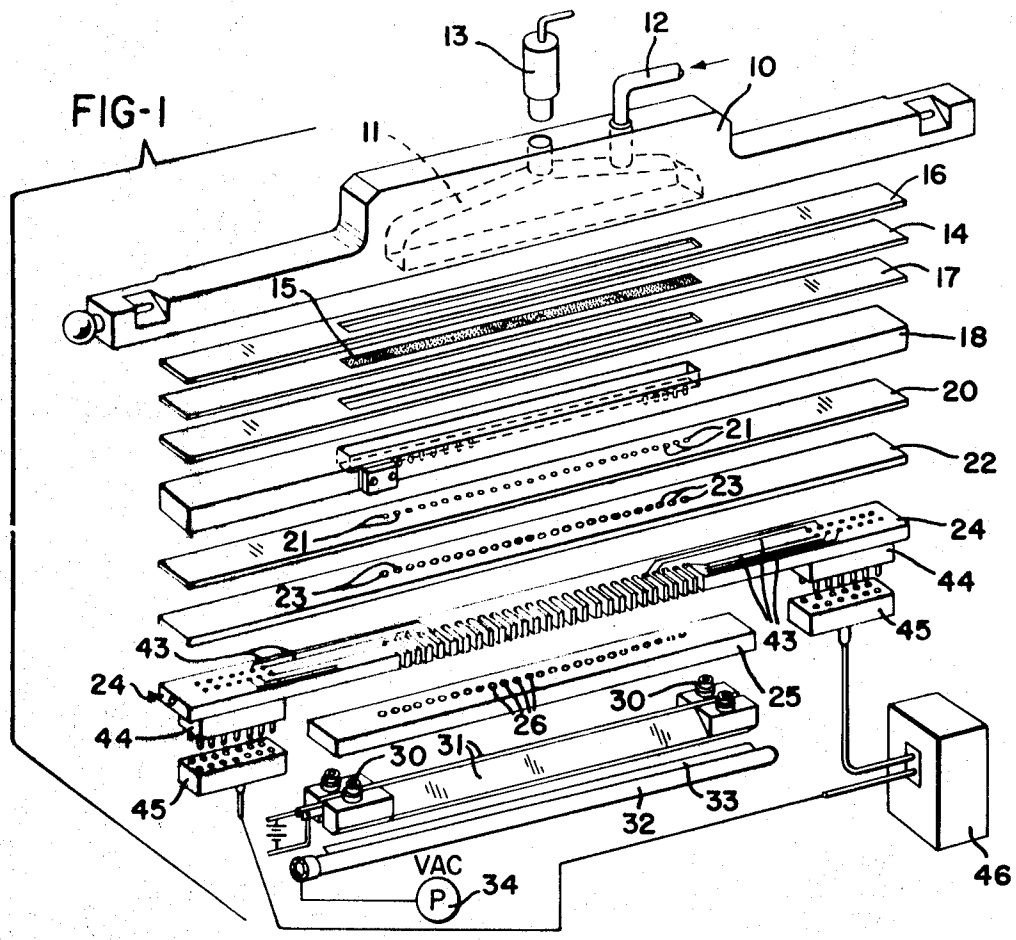
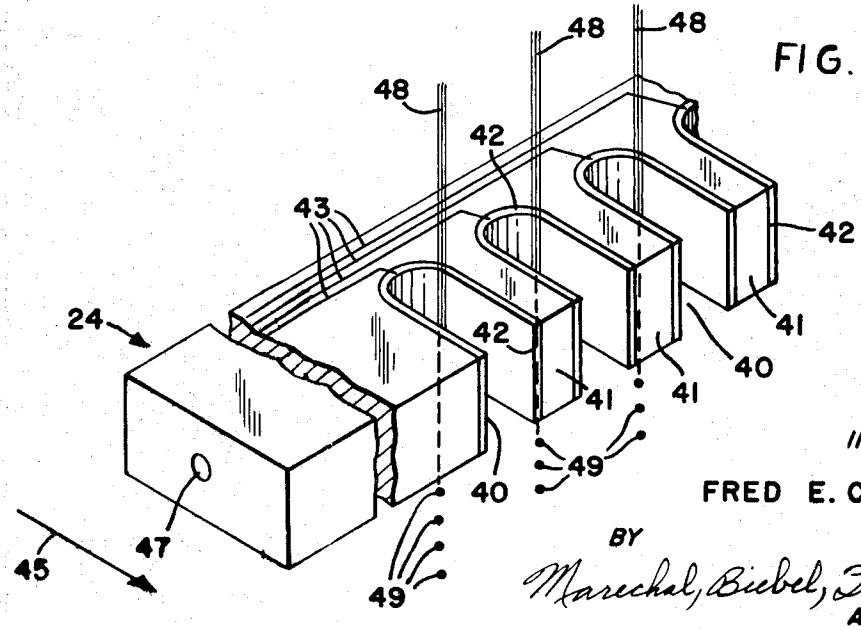


FIG. 2



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DROP CHARGING BAR

CROSS REFERENCE TO RELATED APPLICATIONS

LAMINATED COATING HEAD, Ser. No. 877,250, filed Nov. 17, 1969 by Dale R Beam et. al. (Docket 5041).

BACKGROUND OF THE INVENTION

In the above-noted, related application a laminated coating head is disclosed in which coating material is supplied under pressure to a series of orifices formed in an orifice plate so that a plurality of jets of coating material are ejected through the orifices. A charge ring plate is positioned downstream of the orifice plate and is provided with a series of holes therethrough, each lined with a coating of electrically conductive material and connected to a control source for selectively applying an electric charge to the jets of coating material at the point where they begin to break into a series of discrete drops. An electrostatic filed is established downstream of the charge ring plate to deffect from their normal trajectory those drops which receive a charge as they pass through the charge ring plate.

In this manner a desired pattern of coating can be applied to an object, such as a web of paper moving past the coating apparatus. The dimensions of the components of the coating system are extremely fine and must be controlled precisely in constructing the components of the unit. For example, in a typical charge ring plate the holes therethrough may be 0.025 inch diameter and positioned very closely to each other along the length of the charge ring plate. As a result, there is very little wall material between adjacent holes through the plate and the plates are, consequently, extremely difficult to manufacture.

Additionally, upon startup of a unit the first drop to form is often too large to clear the inside of the hole formed through the charge ring. Since the coating material is a conductive fluid this can cause not only clogging of the hole but an electrical short circuit.

SUMMARY OF THE INVENTION

In accordance with the present invention a charging element of the type having a series of holes formed therethrough, as disclosed in the above noted, related application, is replaced with an elongated bar having a series of notches formed therein extending transversely of the bar from one edge thereof. The surface of each of the notches is covered with a coating of an electrically conductive substance and is connected to a control unit for selectively energizing the coatings of the several notches to apply a charge to selected drops of material as they break from the filaments of coating material being ejected through the orifices in the orifice plate.

With this construction the fabrication of the charging means is facilitated since it is considerably less difficult to form a slot in the edge of the bar than to bore a hole completely through a plate.

Additionally, since the conductive coating is applied to an open-sided slot the entire charge bar may be moved into position after ejection of coating material through the orifices has begun and the size of the drops of coating material has stabilized at a dimension capable of passing through the openings in the charge bar.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded perspective view of a laminated coating head incorporating the charging bar of the present invention; and

FIG. 2 is an enlarged perspective view of a portion of the charging bar.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As seen in FIG. 1 of the drawings, a noncontacting coating system will include a laminated printing head comprising a manifold 10 having a chamber 11 therein supplied with coating material through a conduit 12 and provided with a vibrator 13 vibrating at a preselected, uniform frequency. A filter plate 14 is positioned beneath the manifold 10 and is provided with a central portion 15 having a series of very fine perforations therethrough to filter the coating material as it leaves the manifold 10. Gaskets 16 and 17 are positioned on opposite sides of the filter plate 13 and an inlet plate 18 is laminated to the lower surface of the gasket 17.

Positioned beneath the inlet plate 18 is an orifice plate 20 having a series of uniformly spaced orifices 21 extending therethrough, while a spacer plate 22 is mounted beneath the orifice plate 20 to position the charge bar 24 the proper distance from the orifice plate 20. Thus, it is desirable, as explained in more detail in the above-noted, related application, to impart a charge to the coating material just at the point where the individual drops begin to break from the filaments of coating material being ejected through each of the orifices, and the spacer plate 22 is of the necessary thickness to position the charge bar 24 correctly in this regard.

A clamp plate 25 having a series of openings 26 therethrough is positioned beneath the charge bar 24 and has attached to a lower surface thereof by means of pins 30 a pair of electrodes 31 for establishing an electrostatic deflection field beneath the clamp late 25. The clamp plate 25 will also be provided with a pair of brackets, not shown, attached to its lower surface and supporting the catcher 32, which has a blade 33 projecting from a slot formed in one side of the catcher beneath the opening between the two electrodes 31. The interior of the catcher 32 is hollow and is connected to a vacuum pump 34.

As previously indicated, in the above-noted, related application a charge ring plate having a series of holes therethrough is positioned between the orifice plate and the electrostatic filed to permit an electric charge to be imparted to selected drops as they break from the filament of coating material being ejected through the orifices of the orifice plate. For the reasons noted above this construction has resulted in fabrication difficulties as well as an occasional malfunction upon start up of the system.

To remedy this the present invention substitutes a charge bar 24 for the previously used charge ring plate. The bar 24, as seen in FIG. 2, is provided with a series of slots 40 projecting inwardly from a longitudinal edge 41 transversely thereof with each slot 40 being provided with a coating 42 of an electrically conductive material. A lead 43, which may be applied to the surface of the bar 24 by printed circuit techniques, extends from each of the coatings 42 to a terminal 44 and thence, through the plugs 45 to a controller 46 for selectively energizing each of the coatings to discriminately impart or not impart an electrostatic charge to drops of printing material passing through each of the slots 40.

The various elements of the system shown in FIG. 1, with the exception of the charge bar 24, are secured together in any convenient manner as by bolting or the like, but with a space provided between the spacer plate 22 and the clamp plate 25 to permit the charge bar 24 to be inserted into this space after fluid has been supplied to the orifices 21 and is being ejected therefrom in a series of filaments 48.

After this operation has commenced, the charge bar 24 is slid into position in the direction indicated by the arrow 45 until the detents 47 formed in each end of the bar, only one being shown, seat spring loaded locking balls, not shown, provided on the mounting frame for the system. With the charge bar in place an electrostatic charge may be imparted to each of the jets just at the point where they begin to break down from filaments 48 into a series of discrete drops 49. In this manner the drops 49 can be allowed to either continue in their normal trajectory or be deflected and a desired pattern of coating imprinted on the selected article.

From the above it will be apparent that the present invention avoids the difficulties associated with fabricating the drop charging means of a noncontacting printing system and at the same time obviates the source of malfunction associated with startups of systems of this type.

While the method herein described, and the form of apparatus for carrying this method into effect, constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to this precise method and form of apparatus, and that changes may be made in either without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In noncontacting coating apparatus including an orifice plate having a series of regularly formed orifices therethrough, means for supplying coating material under pressure to said orifices, and means positioned downstream of said orifice plate for establishing an electrostatic field through which drops of coating material from said orifices pass, the improvement comprising:

a. an elongated bar extending substantially coextensively with said orifice plate,

b. means defining a series of open-sided notches in said bar,

c. each of said notches projecting inwardly from a longitudinal edge of said bar and transversely thereof,

d. said notches being positioned with respect to said orifices in a manner such that drops of printing material projected from said orifices pass through said notches,

e. discrete coatings of electrically conductive material adhered to the surfaces of each of said notches, and

f. means for selectively energizing each of said coatings to discriminately impart an electrostatic charge to drops of printing material passing through each of said notches.

2. The apparatus of claim 1 wherein:

a. said slots are substantially U-shaped

3. The apparatus of claim 1 wherein:

a. said bar is movable in directions transverse thereof.

4. The apparatus of claim 1 further comprising:

a. means defining a detent in opposite ends of said bar.

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