Aug. 12, 1969 W. E. BROWN ET AL 3,460,475

APPARATUS FOR RETURNING INK MIST BACK TO ITS SOURCE

Filed May 25, 1967

Fig. 1

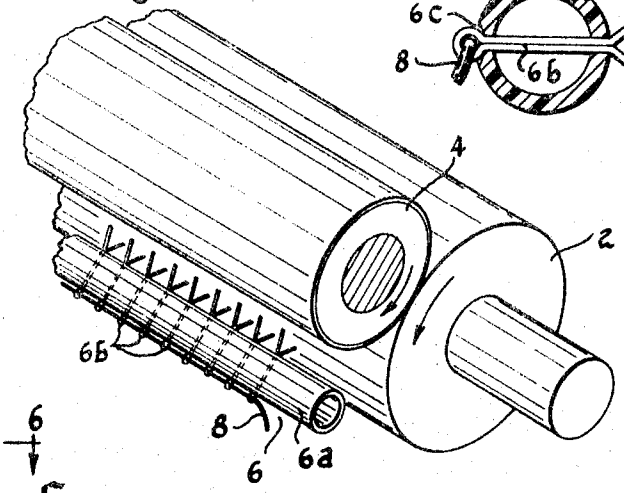


Fig. 3

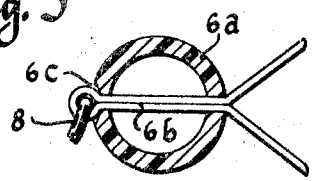
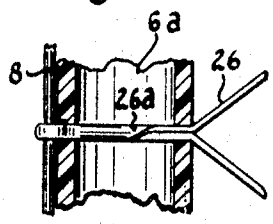


Fig. 6



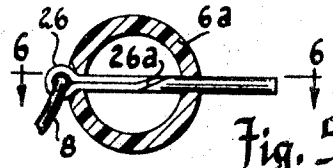


Fig. 5

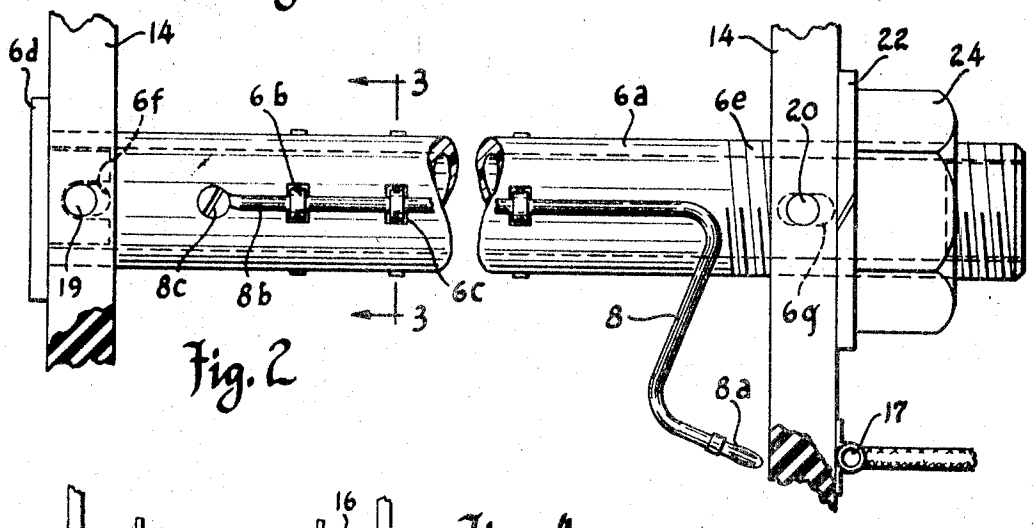


Fig. 2

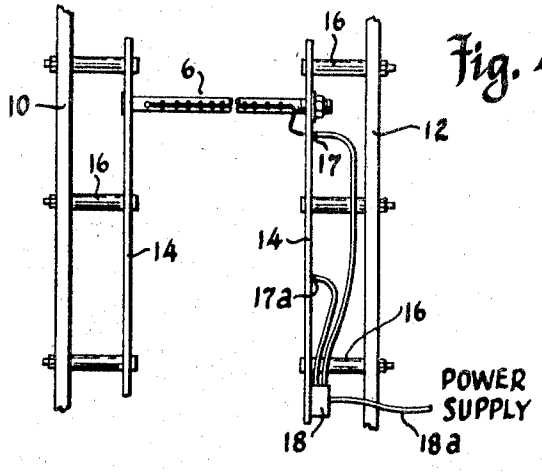


Fig. 4

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APPARATUS FOR RETURNING INK MIST BACK TO ITS SOURCE

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U.S. Cl. 101—350 12 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus for returning ink mist particles back to the high speed ink transfer rolls of a printing press from which such mist emanates. A high voltage multiple electrode having a row of cotter pins mounted on an insulating support and connected by a bare conductor to an individual electrical outlet which leads to a high voltage electrical power supply is mounted opposite the nip of a pair of rolls and the ends of each cotter pin are spread apart to secure it to the support and to form two emitters aimed at and spaced optimum distances from the rolls and to apply contact pressure to the supply conductor.

Background of the invention

This invention pertains to the field of printing and the inking apparatus of a printing press and more particularly to suppression of the ink mist that would otherwise be expelled into the air from the high speed rolls which transfer ink from a fountain to the printing plates. R. W. Jones et al. Patent No. 3,011,435, dated Dec. 5, 1961, discloses the basic concept of using electrostatic means to force the minute ink particles forming an ink mist to return to and be redeposited on the rollers. To this end, the Jones et al. patent teaches positioning of an electrode, energized by a high potential source, at the nip formed by a roller couple. The resulting corona discharge, which ionizes the surrounding air, causes the ink mist particles to become charged and the electrical field created between the electrode and rollers drives the charged particles back to the rollers.

The exemplary electrode disclosed in the Jones et al. patent comprises a conductive member such as a wire. Another type of electrode subsequently proposed for use in the Jones et al. system consists of a row of finishing nails protruding from a nonconductive bar. A conductor leading to a high potential source is wrapped around each nail to energize the electrode.

The present invention relates to an electrode for use in the Jones et al. patented system which is simple, effective, reliable and mechanically strong and safe and yet economical to manufacture and use.

Summary of the invention

In the present invention, cotter pins, extending through a non-conductive bar, are joined to a supply conductor to form an electrode of enhanced efficiency which is economical to manufacture and readily mounted. Inherent problems in this multiple type of electrode, such as loosening of individual electrode elements causing them to fall out, the difficulty of making and maintaining pressure contact connections between the individual electrode elements and the supply conductor and the difficulty of safely mounting the electrode element supporting bar close enough to a roller or a roller nip are overcome by the improved electrode.

An object of the invention is to provide an improved

electrode for returning ink mist back to its source in a high speed ink transfer train.

A more specific object of the invention is to provide an improved multiple electrode element structure for a high voltage ink mist suppressor for a printing press, which doubles the number of emitter tips per emitter holder over that heretobefore available.

Another specific object of the invention is to provide an improved relative orientation of such improved multiple electrode element structure with respect to the ink transfer rolls of a printing press.

Another specific object of the invention is to provide an improved emitter structure and optimum positioning of that structure relative to the ink transfer rolls whereby to focus and concentrate a corona discharge so as to obtain effective mist suppression at less power than present systems use.

Other objects and advantages of the invention will hereinafter appear.

Brief description of the drawing

These and other objects and advantages of the invention and the manner of obtaining them will best be understood by reference to the following description of preferred embodiments of apparatus for returning ink mist back to its source taken in conjunction with accompanying drawing where:

FIGURE 1 is a fragmentary isometric view of an ink transfer roller couple and an ink mist return apparatus positioned relative thereto;

FIG. 2 is an enlarged, front elevational view of the ink mist return apparatus of FIG. 1 and its electrically connecting means;

FIG. 3 is a cross-sectional view taken along line 3—3 of FIG. 2;

FIG. 4 is a reduced, front elevational view of the apparatus of FIG. 2 and including the structure whereby it is mounted to the press frame and connected to the power supply;

FIG. 5 is a cross-sectional view like FIG. 3 but showing a modified individual electrode element; and

FIG. 6 is a fragmentary cross-sectional view taken along line 6—6 of FIG. 5.

Description of the preferred embodiments

Referring to FIG. 1, there is shown a roller couple and ink return apparatus oriented relative thereto for returning ink mist back to the rolls of the couple. This roller couple comprises relatively larger and smaller rolls 2 and 4, respectively, and normally constitutes a part of a larger ink train such as that shown in the aforementioned R. W. Jones et al. patent, which ink train is arranged to transfer ink from a fountain to the printing plate of a rotary printing press. These ink rollers are in peripheral contact and are driven at high speed to transfer a film of ink from one roller to another. The ink return apparatus shown in FIG. 1 comprises a high voltage multiple electrode 6 mounted near one of the nips of the roller couple, preferably the exit nip although such electrode is also effective at the entry nip and at both nips.

Although the ink mist suppressor electrode will be described as preferably mounted adjacent a nip of the roller couple, it could alternatively be mounted near the periphery of the roller away from the nip with the electrode elements aimed toward the periphery of the roller. This position is especially useful where not enough space is available to mount the electrode at the nip and it is effective, though perhaps with slightly less efficiency, to suppress the mist which follows the air stream around the periphery of the roller.

As shown in FIGS. 2 and 3, the multiple electrode **6** is of the double emitter type and comprises a supporting bar **6***a* and a plurality of divided electrode elements **6***b* connected by a conductor **8** to a high voltage power supply. Supporting bar **6***a* is preferably made of electrically insulating material and is constructed and mounted in such a manner that it will not sag. For this purpose, bar **6***a* may be tubular in form as shown in FIGS. 3 and 4 and may be mounted to supporting brackets so that it is under a certain amount of tension as hereinafter more fully described.

In a typical installation, the multiple electrode is mounted on brackets secured to the vertical frame members on opposite sides of a printing press. As shown in FIG. 4, elements **10** and **12** depict the vertical frame members of a conventional printing press. In a printing press, these frame members may be spaced, for example, 81 inches apart. As will be apparent, these are the frame members which support the ink transfer rolls and printing and blanket cylinders at the opposite ends of their axes of rotation. Since the ink transfer rolls such as the roller couple shown in FIG. 1 are shorter than the distance between the frame members, the multiple electrode device must be provided with electrode elements or emitters substantially through the length of the roller couple in order to provide effective suppression of ink mist. For this reason, brackets **14** are provided as shown in FIG. 4 for supporting preferably a plurality of multiple electrodes between the frame members. Each such bracket **14** is made of electrically insulating material and is secured to the side frame member and suitably offset therefrom by a plurality of mounting posts **16** as shown in FIG. 4. The side frame members of the printing press unit are suitably drilled and tapped to receive these mounting posts. The multiple electrodes are then supported at their opposite ends between these brackets **14**.

As shown in FIG. 4, brackets **14** are preferably constructed to mount a plurality of multiple electrodes **6** thereon. Each multiple electrode is provided with its own electrical outlet adjacent one end thereof so that it can be readily disconnected and removed for inspection or cleaning without dismantling the entire ink suppressor apparatus. For this purpose, multiple electrode **6** is provided with an electrical socket **17** mounted adjacent thereto on bracket **14** and adapted to receive a banana plug **8***a* connected to the end of bare conductor **8** as shown in FIG. 2. This socket **17** is preferably connected by a conductor to a multiple connector block **18** mounted on bracket **14**. Other similar sockets **17***a* for banana plugs are also connected in common to connector **18** whereas a supply conductor **18***a* then leads from this connector to the power source.

The manner in which the multiple electrodes **6** are constructed and arranged to prevent significant sagging is shown in FIG. 2 which includes fragmentary illustration of brackets **14**. Supporting bars **6***a* are constructed of light weight, tough plastic insulating material such as "Lexan" or the like and are preferably tubular as hereinbefore mentioned to afford a substantial amount of stiffness without excessive mass. Although tubular form is preferred, conceivably certain plastic materials are light enough in weight and stiff enough so that a solid bar could be used. Holes are drilled in equally spaced relation through tube **6***a* for receiving common cotter pins **6***b*. One end of each such hole is provided with an enlarged notch **6***c* formed therein around the entry end of the hole to provide space to receive the loop of the cotter pin and to sink this loop partially into the surface of the tubular supporting bar. This notch serves the dual purpose of preventing the cotter pin from rotating, thereby retaining the emitter elements in proper orientation with respect to the roller couple, and of pinching the electrical conductor **8**, which may be a bare wire or rod, between the cotter pin loop and the edges of this notch. When the loop of the cotter pin is pressed into this notch after the lead-in wire **8** has been inserted the loops of all the cotter pins, good contact pressure will be obtained between the cotter pin loop and the lead-in wire. When the bifurcated ends of the cotter pin are then spread apart at the other side of the tube, such contact pressure will be maintained and this will also serve to retain the cotter pin on its support.

The unconnected end **8***b* of the bare conductor **8** is inserted into a recess or hole in tube **6***a* so that it is insulated and will not cause arcing to other parts of the installation. This end of the bare conductor is secured in place by a screw **8***c*.

To keep the multiple electrode as light in weight as possible, the cotter pins are preferably made of metal such as aluminum although they can also be made of steel. If made of aluminum, they should preferably be as stiff as steel to prevent them from being bent out of proper shape in the event of a web wrap. Aluminum cotter pins are normally available on the market but if proper length pins are not so available, they can be readily fabricated from cotter pin stock material such as half-round aluminum strip. In this manner, optimum selection may easily be made of the proper thickness of cotter pin material, the proper length of the bifurcated shank affording the making of one bifurcated part shorter than the other by a predetermined amount to obtain optimum spacing of the tips of the double emitter from the respective rolls depending upon the electrically conductive properties of the rolls.

Further in the interest of preventing sagging, tube **6***a* may be placed in tension if required in the manner shown in FIG. 2. As shown therein, the left end of the tube is provided with a cover **6***d*, if desired, inserted in the end of the tube to prevent ink from entering therein. The right end of the tube is threaded at **6***e*. Each end portion of the tube is also provided with an oblong hole **6***f* and **6***g* transversely therethrough, at the point where it passes through a hole in each bracket **14**. As will be apparent, in view of the substantial distance between brackets **14**, first one end of the tube may be inserted in its hole in one bracket **14** farther than its final position and then the other end is inserted in its hole in the other bracket **14** by sliding the tube back a short distance. Pins **19** and **20** are then inserted and fixed into the holes in brackets **14** so that they extend through the oblong holes in the tube. A locking washer **22** and a nut **24** are then placed on the right end of the tube and the nut is tightened enough to tension the tube and keep it from sagging at the center if such is its tendency. Pin **19** secures the left end of the tube to left bracket **14**. Oblong hole **6***g* in the right end of the tube may be made longer so that it provides clearance for pin **20** when the nut is tightened. Pins **19** and **20** hold the tube in proper angular registration so that the emitter elements are pointed in the proper directions and to keep the tube from rotating. The diverging tips of the emitter elements **6***b* are preferably aimed radially at the respective axes of the rolls of the couple and are properly spaced from the surfaces of the rolls, the emitter tip associated with the least conductive roller being closer and the other one being farther. For example, if one roll is steel and the other one is rubber, the emitter tip aimed at the rubber roll would be spaced closer thereto than the other one is spaced to the steel roller because steel is a better conductor of electricity.

FIGS. 5 and 6 show a modification of the invention. Whereas FIGS. 1–4 show double emitter electrode elements with the respective tips of each element aimed radially at the axes of rotation of the respective rolls, the modification shown in FIGS. 5 and 6 has all the emitter tips arranged parallel to the exit nip of the roller couple. Tube **6***a* in FIG. 5 is like the tube shown in FIGS. 1–4. However, cotter pins **26** are twisted ninety degrees at their midportion **26***a* and the bifurcated ends are bent apart in a plane common with the plane of the central axis of the tube so that they diverge at a substantial angle

as shown in FIG. 6. All of the emitter tips are then alined. In mounting this modified multiple electrode, the tips of the emitter elements are spaced closer to one roll than the other depending on the conductive properties of the rolls as described above. With this arrangement, all of the holes in the cotter pin loops will be alined so that a straight conductor or rod can be inserted therethrough to supply high voltage thereto. Alternatively, a straight groove could made in tube *6a* to receive the loops of the cotter pins turned a quarter surn from that shown and the cotter pins then need not be twisted. A flexible conductor is then inserted through the loops.

It will be apparent that in the foregoing description there has been disclosed an apparatus for returning ink mist back to its source that is simple and economical in construction and easy to apply. Since the ink mist generated at the exit nip of the roller couple tends to follow the periphery of the rollers in the respective air streams therearound, the invention is especially effective in suppressing such mist and returning it to the rolls. The construction shown in FIGS. 1 to 4 is especially effective since the emitter tips are aimed radially at the rolls and, therefore, form effective corona emitters to ionize the mist at the periphery of the roll. This construction facilitates applying the invention since the supporting bar need not be mounted so near the exit nip of the roller couple. Although the double emitter construction shown in FIGS. 1–4 wherein the emitter tips are spread apart transversely of the axis of the supporting tube is preferred, the parallel-tip construction also forms an effective ink mist suppressor. Although this parallel-tip device requires closer mounting to the nip if it is used at the nip rather than at the periphery of a roll, it has the advantage over the multiple electrode prior art that each electrode element affords two emitter tips rather than one for a more concentrated electric field. And it, of course, has the other advantages stated at the beginning of this specification.

We claim:

1. In a high speed rotary printing press unit having an ink train for transferring printing ink from a fountain to the printing plate including a plurality of rollers in peripheral contact forming at least one series of rollers for transferring a film of ink from each roller to the next one, the rollers causing formation of unwanted ink mist in response to high speed rotation thereof which mist tends to follow the periphery of each roller in the air stream therearound and will enter and contaminate the atmosphere of the printing plant unless supressed, means for returning the ink mist back to the rollers before it leaves such air stream comprising:

a multiple tipped electrode mounted near the periphery of a roller comprising:

an elongated supporting member;

a plurality of emitter elements extending through holes in said supporting member in spaced apart relation therealong and having a loop at one end and being divided at the other end;

an electrical conductor extending through the loops of said emitter elements and adapted to connect the same to a high voltage power supply;

the divided ends of said emitter elements projecting substantially from said supporting member and being bent apart to diverge from one another thereby to secure said emitter elements to their supporting member;

brackets secured to the press frame near the opposite ends of the rollers for removably mounting said supporting member so that the diverging tips of said emitter elements project within a predetermined distance of at least one roller;

and connector means on one of said brackets forming a quickly detachable connection to one end of said conductor and adapted to be connected to a high voltage power supply.

2. The invention defined in claim **1**, wherein said plurality of double emitter elements comprises:

a plurality of metal cotter pins extending through holes in said supporting member and being held therein by the bifurcated tips thereof being spread apart.

3. The invention defined in claim **1**, wherein said elongated supporting member comprises:

means at the ends thereof for securing it to said brackets under sufficient tension to prevent significant sagging.

4. The invention defined in claim **1**, wherein said elongated supporting member is an insulating tube.

5. The invention defined in claim **1**, wherein:

one of the diverging tips of each double emitter element is aimed radially toward the rotary axis of one of the rollers of a couple;

and the other diverging tip of each double emitter element is aimed radially toward the rotary axis of the other roller of the couple.

6. The invention defined in claim **1**, wherein said brackets are made of electrically insulating material.

7. The invention defined in claim **1**, wherein said elongated supporting member comprises:

a recess extending partway into said supporting member for receiving the unconnected end of said conductor to prevent high voltage arcs occurring therefrom;

and means for rigidly securing said unconnected end of said conductor in said recess.

8. The invention defined in claim **1**, wherein:

the diverging tips of the double emitter elements are arranged in alinement parallel to the nip of the roller couple and are spaced optimum distances from the respective rollers of the couple dependent upon the relative electrical conductive properties of the latter.

9. The inveniton defined in claim **1**, wherein said elongated supporting member comprises:

a notch formed at the entry end of each said hole therein into which the looped head of the emitter element is tightly pressed after the conductor has been inserted through all the loops whereby a pressure connection is provided by pinching the conductor between the edges of said notch and the loop when the bifurcated ends are spread apart.

10. The invention defined in claim **1**, wherein said double emitter elements comprise:

pieces of wire bent at the middle to form a loop with the remaining portions thereof being in contiguous parallel arrangement to afford insertion thereof through the holes in the supporting member;

the loops of said emitter elements being arranged transverse to the axis of said supporting member so that a straight conductor is insertable through the holes in all of the loops;

and each emitter element having a quarter twist at its midportion so that when the external, bifurcated parts are spread apart the tips thereof are in a straight line.

11. The invention defined in claim **1**, wherein said double emitter elements are made of a light electrically conductive metal such as aluminum.

12. A high voltage multiple tipped electrode especially adapted for use in ink mist suppression comprsing:

a stiff elongated supporting member of insulating material having small holes extending transversely therethrough and spaced therealong;

cotter-pin like metallic elements extending through said holes with their looped ends tightly pressed against one side of said supporting member and the two tips of each element being spread apart on the other side of said supporting member to secure said elements thereto and to form pairs of corona emitters when said elements are energized with high voltage;

and an electrical conductor extending through the loops of said elements and being gripped within said loops against said supporting member to afford good con-

tact pressure for connecting a high voltage power supply thereto.

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U.S. Cl. X.R.

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