June 25, 1940. W. H. BRUNKOW 2,205,391

METHOD AND APPARATUS FOR DRYING PRINTED INK

Filed March 8, 1937 2 Sheets-Sheet 1

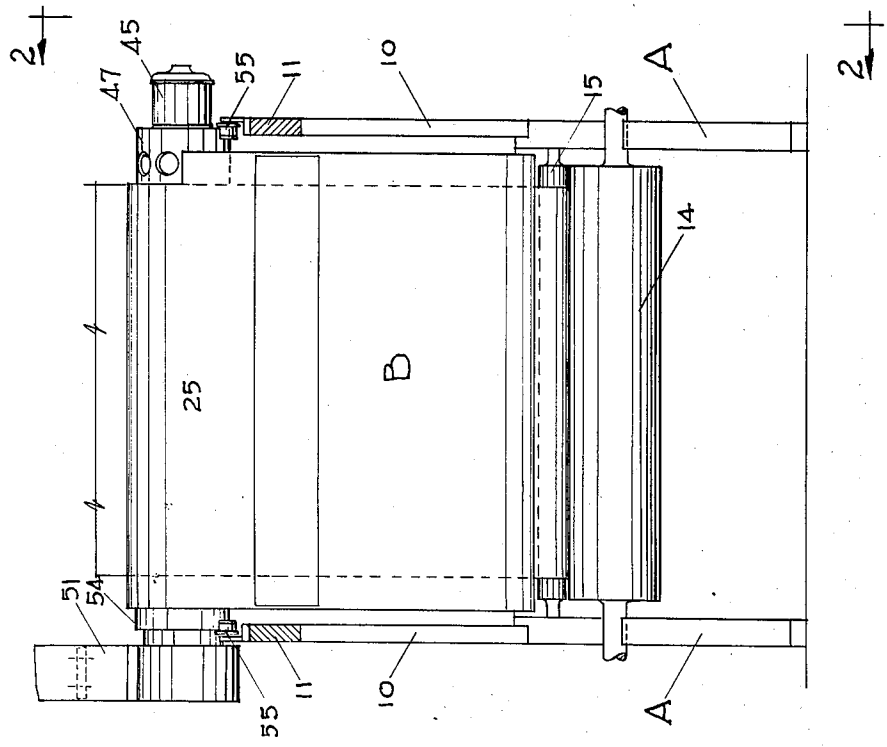


FIG-1

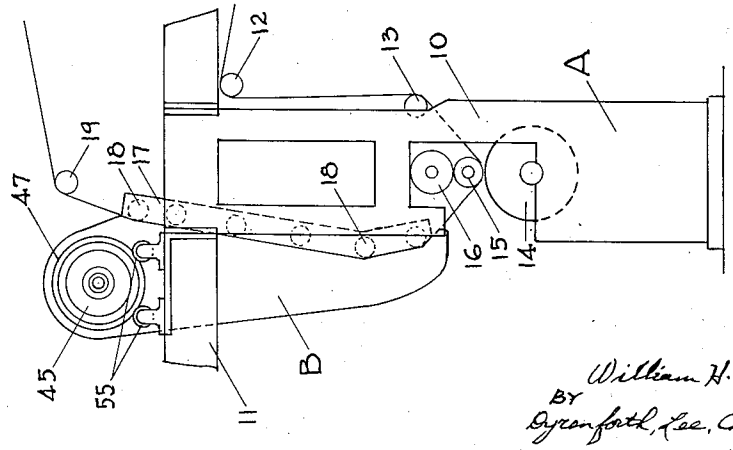


FIG-2

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METHOD AND APPARATUS FOR DRYING PRINTED INK

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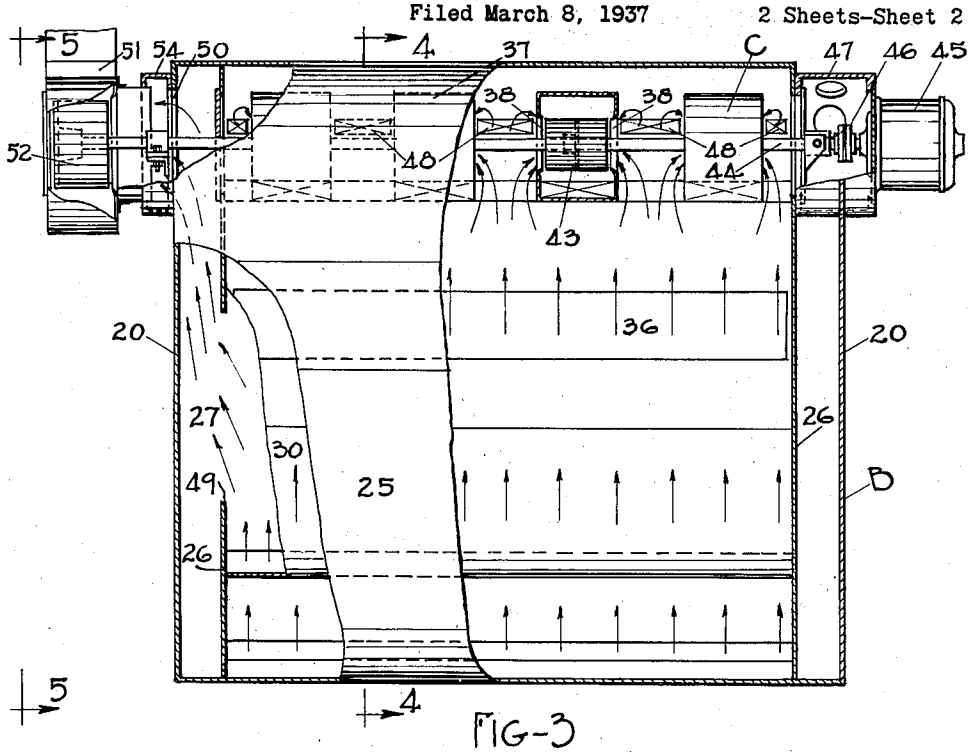


FIG-3

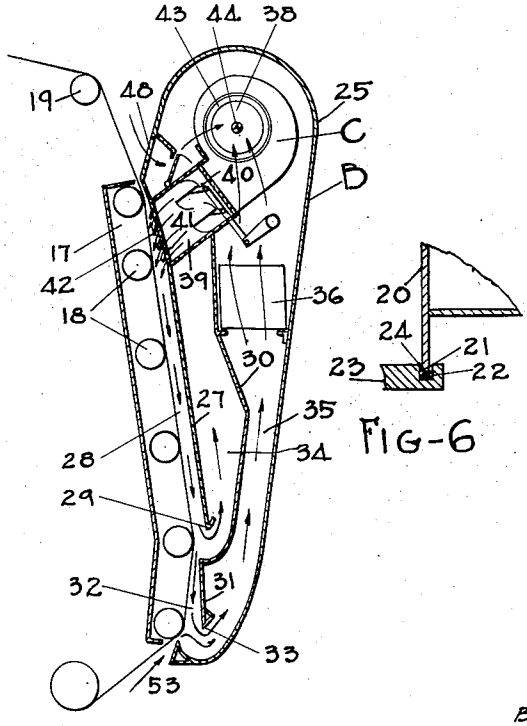


FIG-4

FIG-6

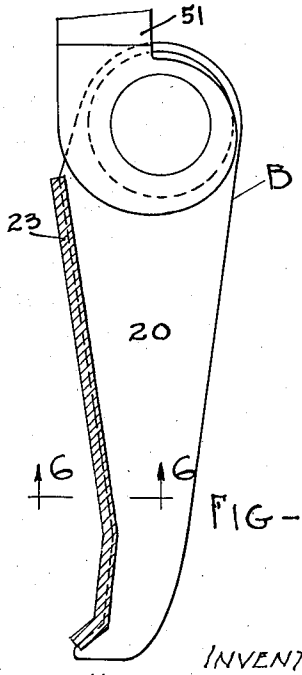


FIG-5

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UNITED STATES PATENT OFFICE

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METHOD AND APPARATUS FOR DRYING PRINTED INK

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Application March 8, 1937, Serial No. 129,744

5 Claims. (Cl. 34—48)

This invention relates to a method and apparatus for drying printed ink, and deals more particularly with the drying of ink on a paper web as the web is drawn from the printing press.

An object of the invention is to provide a method and means for drying printed ink or the like and for oxidizing the same through the circulation and recirculation of air in contact with the ink. A further object is to provide a method and means whereby the volatiles-content of the air is built up through repeated contact with the volatiles-containing ink whereby the enriched air may be withdrawn without dilution and the volatiles therein readily recovered. A further object is to provide means and a method for drying ink or the like by oxidation wherein heat is imparted to the drying medium and the temperature therein economically maintained by recirculation of the medium. A still further object is to provide simple and compact apparatus which can be installed within small areas adjacent the printed web and in which the lower unit or units may be housed, thereby dispensing with the network of ducts heretofore believed necessary. While the apparatus is described in connection with the drying of ink, it will be understood that it is readily applicable to many other materials.

Another object is to provide apparatus in which the blower means for propelling the air along the printed web is contained in the casing adjacent the web and in which the air for drying can be taken from the immediate vicinity of the web to avoid the necessity of a system of air inlet ducts.

The invention is illustrated in a preferred embodiment by the accompanying drawings, in which—

Fig. 1 is a view in front elevation showing my improved drying apparatus; Fig. 2, a view in side elevation; Fig. 3, a broken sectional view showing the arrangement of blowers within the casing; Fig. 4, a sectional view taken as indicated at line 4—4 of Fig. 3; Fig. 5, a side elevational view of the casing and showing the air withdrawal conduit; and Fig. 6, a detail sectional view taken as indicated at line 6—6 of Fig. 5.

As illustrated, the invention comprises a frame A on which is mounted a casing B containing blower means C.

The frame A may be of any suitable construction and may include the vertical side members 10 and top horizontal members 11. It is convenient simply to extend the usual frame of the printing press with which the improved drier means is to be used, it being necessary only to provide a suitable support for casing B and adequate mounting for the rolls on which the web is to be conveyed.

As shown more clearly by Figs. 1 and 2 of the drawings, the paper web may be conveyed to the printing couples by means of rolls 12 and 13 which have their ends suitably journaled in members of frame A. The printing couple consists of a printing cylinder 14 which engages the lower surface of the paper web, and an upper pressure cylinder 15 which is associated with a second cylinder 16 and which is adapted to press the web firmly against the printing cylinder 14.

For conveying the printed paper web and presenting it in position to be dried, I provide a carrier 17 which is attached to frame A and includes a number of rolls 18. The carrier provides a track along which the web may pass and is substantially straight and uniform except for the lower portion which is turned inwardly toward the printing couple. The carrier 17 is adapted to convey the paper upwardly and inwardly, and provides sufficient support for preventing the paper from being blown inwardly. Above the carrier is a roll 19 which receives the dried paper and guides its passage from the machine.

The casing B comprises the two sides 20 which are of the general form shown having their rearward edges 21 cut to conform with the outer surface of carrier 17 on which the paper web passes. Edges 21 fit within grooves 22 of pieces 23 which are shaped to conform with the contour of the carrier 17 and are adapted to lie adjacent the moving paper web. The connection between sides 20 and pieces 23 is shown more clearly by Fig. 6 in which a resilient cushion 24 of rubber or felt is employed to form a joint which is more nearly air-tight.

Extending over the top and front of casing B is an outer shell 25 which joins with the edges of sides 20 and extends from points adjacent the paper web at the top of the carrier 17 to points adjacent the web at the bottom of the carrier. Inner side walls 26 are spaced from sides 20 and have their edges secured to shell 25. At the back side of the casing is the wall 27 which extends between sides 26 and is so arranged as to provide between it and the web an air passageway 28. This wall, however, does not extend to the bottom of the casing and the air passing through passageway 28 may turn about lower edge 29 and return upwardly within the casing.

A second or middle wall 30 extends within the casing between sides 26. This middle wall has

its lower portion 31 extending below wall 27 and substantially aligned therewith. Portion 31 forms with the web an air passage 32 and stops short of the bottom of the casing so that the air moving through passage 32 must turn about the lower edge 33 and return upwardly within the casing. It will be seen that middle wall 30 joins with back wall 27 in forming one return air passage 34 within the casing, and joins with shell 25 in forming a second return air passage 35 within the casing. Within passage 35 is an electric heater 36 which is adapted to heat the air passing upwardly through this passage. It is understood that any kind of heating element may be used here, as steam radiator or gas heater.

The blower means C includes a series of individual casings 37 located in the top part of the casing B. These blower casings are of a common type having circular openings 38 in each of their sides, and having discharge conduits 39 extending rearwardly toward the rear wall 27. In the sides of conduits 39 are dampers 40 of familiar construction. The rearward ends of conduits 39 are joined with rear wall 27, and openings 41 in wall 27 provide discharge openings by which air passes from the blowers into passage 28 adjacent the paper web. Wall 27 may be provided with vanes 42 on its rearward side and adjacent openings 40 for directing the course of the air downwardly into alignment with passage 28.

Each of blowers C is equipped with a fan 43 by which air is drawn into casing 37 through openings 38 and expelled through conduit 39. Each of fans 43 is mounted on a single shaft 44 which is journaled at the sides of the casing and extends through the side openings 38 in all the blower casings. This shaft is propelled at one end by an electric motor 45 which is coupled to the shaft 44 by means of joint 46. Motor 45 is mounted on a drum 47 which is securely attached to sides 20 and 26 at the right hand side of the casing. It is understood that any suitable means of power supply may be provided for actuating shaft 44. For example, gearing may be arranged so that this shaft is propelled by the same motive force as is used to actuate the printing press itself.

While the casing B may be mounted in frame A by any suitable means, it is preferred that cylindrical box 47 at one side of the casing and drum 54 at the other end be rested on rollers 55 so that the casing may move toward and away from the carrier 17, as may be necessary.

For admitting air into the casing the air inlet openings 48 through the rear portion of shell 25 are provided. Preferably, these openings are aligned with the space between the individual casings 37 of the blowers, so that the air passage is more direct. For drawing off air from the casing, I provide an opening 49 in side wall 26 and outlet opening 50 in side 20 which opens into drum 54. A withdrawal conduit 51 is attached to drum 54 and communicates with the interior of the casing through outlet 50. Shaft 44 extends within this conduit and has attached to its end a fan 52 which when actuated through shaft 44 is adapted to draw air from the casing through opening 50 and propel it upwardly through conduit 51.

In the operation of my improved mechanism, the paper web is moved on rollers 12 and 13 to the printing couple in the ordinary way, and receives an ink impression through contact with the printing cylinder 14. From the printing cylinder the printed web moves upwardly along carrier 17 where it comes into contact with air currents in a way later to be explained. From the carrier the web passes to roller 19 and away from the machine in dried condition.

The operation of electric motor 45 or other power means causes the rotation of shaft 44 which in turn actuates fans 43 of the individual blowers and also fan 52 of the air withdrawal means. The suction created by operation of fan 52 causes air from the outside of the casing to enter through inlets 48 and pass into the blowers through their side inlet openings. The force of the blowers propels the air backwardly through conduits 39 and causes it to enter passage 28 through openings 41 and be directed downwardly by vanes 42. The air then comes into contact with the printed web on which is the wet ink. The volatile substances of the ink are taken up by the current of air as it passes along the inked surface. When the air reaches the lower edge 29 of the back wall 27 a part of the air will turn about this edge and proceed upwardly through passage 34, through openings 49 and 50 to conduit 51 and exhausted from the system.

Another part of the air passing downwardly in passage 28 will continue on through passage 32 and turn about lower edge 33 of middle wall 30. After passing about edge 33, this part of the air will return upwardly through passage 35 where it comes into contact with heater 36. The heated air then proceeds upwardly and enters the blowers through their inlet openings 38 to be again propelled into contact with the paper web. By being heated, the air is capable of absorbing a greater amount of volatile materials and is therefore more efficient in quickly drying the ink on the paper web.

This recycling process as just set forth may take place over and over again, the air taking on more volatile matter each time it is brought into contact with the printed web. It is necessary, however, that the air be drawn off from the casing before it has absorbed too great a proportion of the volatiles, and before the proportion of volatiles is so great as to make an explosive mixture. In the embodiment described, the fan 52 produces sufficient suction to draw off the air before the proportion of volatile matter in it becomes too great. The path taken by the air as it passes through the casing is clearly indicated by the arrows in Figs. 3 and 4.

As indicated by arrow 53 in Fig. 4, air may also be allowed to enter the casing at the bottom, and this air proceeds immediately upward through passage 35 to the heater, and then enters the blowers, after which it moves in the air circuit just described.

It will be seen that air from the immediate vicinity of the printing press is utilized for drying the paper. This represents a marked improvement over the former system in which a complicated system of ducts was employed for conducting air from a central blower located in some other part of the plant. With this new apparatus such a system of ducts is avoided, and in addition by taking the air from the press room tends to improve the room ventilation.

The recycling of air to again bring it into contact with the web is a feature which is perhaps of even greater importance. In other methods used for drying a paper web, the air is brought into contact with the paper only once, and in order to effectively dry the ink, great quantities of air must be forced through the conduits. In such methods the air leaving the dryer contains

only a relatively small proportion of volatile matter so that the recovery of such volatile matter from the air is made very difficult, and an excessive amount of heat is required in the drying process. In my improved method the air is given a relatively high proportion of volatiles, and is conveyed to the recovery plant without dilution. Thus the recovery of the volatile matter is made much easier because of the reduced amount of air necessary to be treated.

Heretofore it has been believed necessary to provide ducts to and from the drying unit, the drying medium being circulated through these ducts from a distant blower system. In a press room, where a large proportion of the space is occupied by operating press parts, such ducts have been found to interfere with the operating space required for the process. With my improved mechanism, it will be observed that the large circulating air ducts have been dispensed with and the apparatus has been so arranged as to permit the blower mechanism to be housed within the unit itself, and this is accomplished without increasing the size of the dryer unit. Thus the large space formerly occupied by the large circulating ducts is reclaimed.

It will also be observed that the new apparatus provides a uniform distribution of air over the surface to be dried. This is accomplished by having spaced blower units within the casing, each blower unit distributing a measured or substantially equal volume of air over the surface immediately adjacent to it. Such uniform distribution of the air is further improved by the use of the openings or grill 41 whereby a back pressure is developed, such back pressure equalizing the delivery from the blowers.

The particular structure here employed also lends important advantages. It will be observed that the means for recycling the air and the means for withdrawing the air from the casing is here actuated by single drive means, and that a motor is employed to furnish the power necessary to drive all the necessary mechanism.

While I have described a particular embodiment of the invention, it will readily appear that many changes may be made therein without departing from the spirit of the invention. The foregoing description has been given for clearness of understanding only and no unnecessary limitations should be understood therefrom, but the appended claims should be construed as broadly as permissible, in view of the prior art.

I claim:

1. Apparatus for drying printed ink on a paper web comprising: a frame; rolls mounted on said frame for conveying said web; a casing mounted on said frame and having side walls forming a substantially airtight connection therewith, said cahing forming with said paper web a substantially closed ink drying air passage, and said casing being provided with a fresh air inlet for supplying air to the passage; blower means within the casing having an inlet communicating with said fresh air inlet for recycling air repeatedly through said passage; a conduit connecting the blower outlet and the entrance to said passage; a second conduit connecting the outlet of said passage and the inlet of said blower; and suction means communicating with said passage adjacent the outlet thereof for maintaining the interior of said casing below atmospheric pressure and for withdrawing from the air which has passed through said passage a portion substantially equal to the fresh air introduced into the inlet of said passage.

2. Apparatus for drying printed ink on a paper web comprising: a frame; rolls mounted on said frame for conveying said web; a casing mounted on said frame and having side walls forming a substantially airtight connection therewith, said casing forming with said paper web a substantially closed ink drying air passage, and said casing being provided with a fresh air inlet for supplying air to the passage; blower means having an inlet communicating with said fresh air inlet and being mounted in said casing adjacent the inlet to said passage for forcing air therethrough in contact with said paper web in a turbulent condition and for recycling portions of said air through said passage; a conduit connecting the blower outlet and the entrance to said passage; a second conduit connecting the outlet of said passage and the inlet of said blower; and suction means communicating with said passage adjacent the outlet thereof for withdrawing from the air which has passed through said passage a portion substantially equal to the fresh air introduced into the inlet of said passage.

3. Apparatus for drying printed ink on a paper web comprising: a frame; rolls mounted on said frame for conveying said web; a casing mounted on said frame and having side walls forming a substantially airtight connection therewith, said casing forming with said paper web a substantially closed ink drying air passage, said casing being provided with a fresh air inlet for supplying air to the passage; a plurality of blowers mounted in said casing and communicating with said fresh air inlet for forcing air through said passage in a turbulent condition and for recycling a portion of the air through said passage, a conduit connecting the blower outlet with the entrance to said passage, and a second conduit connecting the outlet of said passage and the inlet of said blower, a foraminous partition between said blowers and the inlet to said passage, said partition causing said blowers to provide a uniform flow of air into said passage by creating a back pressure between said blowers and said partition; and suction means communicating with said passage adjacent the outlet thereof for maintaining the interior of the casing below atmospheric pressure and for withdrawing from the air which has passed through said passage a portion substantially equal to the fresh air introduced into the inlet thereof.

4. Apparatus for drying printed ink on a paper web comprising: a frame; rolls mounted on said frame for conveying said web; a casing mounted on said frame and having side walls forming a substantially airtight connection therewith, a portion of said casing forming with said paper web a substantially closed ink drying air passage, and said casing being provided with a fresh air inlet for supplying air to the passage; blower means within said casing and communicating with said fresh air inlet for recycling air repeatedly through said passage; a conduit connecting the blower outlet to the entrance of said passage; a second conduit connecting the outlet of said passage and the inlet of said blower; suction means communicating with said passage adjacent the outlet thereof for withdrawing from the air which has passed through said passage a portion substantially equal to the fresh air introduced into the inlet of said passage; and single means for actuating both said blower means and said suction means.

5. Apparatus for drying printed ink on a paper web comprising: a frame; rolls mounted on said frame for conveying said web; a casing mounted on said frame and having side walls forming a substantially airtight connection therewith, said casing forming with said paper web a substantially closed ink drying air passage, and said casing being provided with a fresh air inlet for supplying air to the passage; blower means communicating with said fresh air inlet for forcing air therethrough into contact with said web in a turbulent condition and for recycling a portion of said air through said passage; a conduit connecting the blower outlet and the inlet to said passage; a second conduit connecting the outlet of said passage and the inlet of said blower; suction means communicating with said passage adjacent the outlet thereof for maintaining the interior of said casing below atmospheric pressure and for withdrawing from the air which has passed through said passage a portion substantially equal to the fresh air introduced into the inlet of said passage; and single means for actuating both said blower means and said suction means, said blower and suction means causing said air within said passage to move unidirectionally counter to the movement of said web.

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