Feb. 21, 1956 R. MÜLLER 2,735,364

OFFSET PRINTING PROCESS AND MECHANISM THEREFOR

Filed March 4, 1952

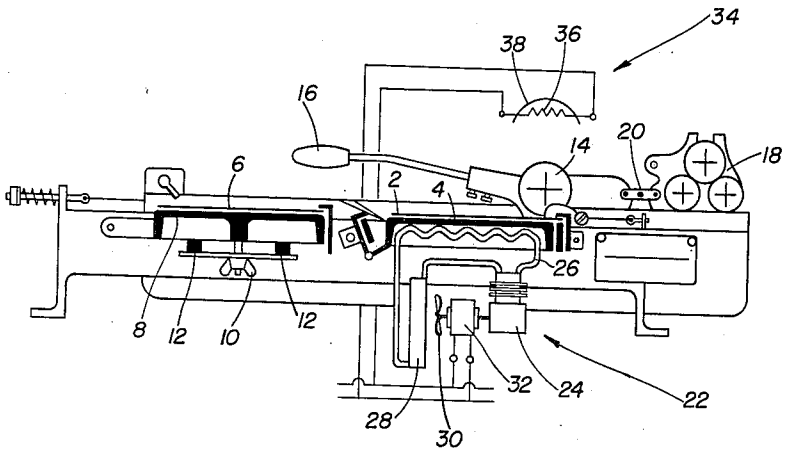


Fig I

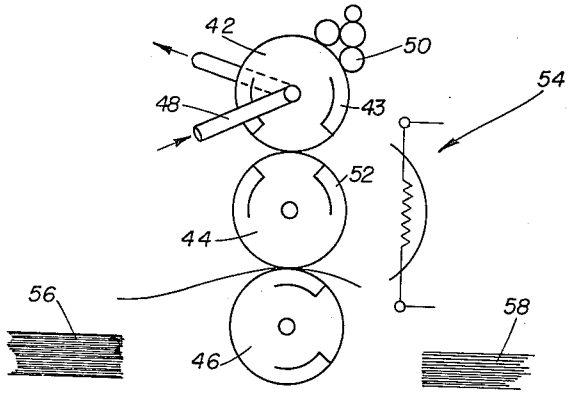


Fig II

INVENTOR
RUDOLF MÜLLER
BY
J. Russell Juten
ATTORNEY

United States Patent Office 2,735,364 Patented Feb. 21, 1956

2,735,364

OFFSET PRINTING PROCESS AND MECHANISM THEREFOR

Rudolf Müller, Mutterstadt-Pfalz, Germany

Application March 4, 1952, Serial No. 274,690

Claims priority, application Germany March 7, 1951

6 Claims. (Cl. 101—142)

The present invention relates to offset printing. More particularly it relates to new offset printing processes practiced without expressly adding water or fountain solution to printing plates of the type which are provided with ink receptive images that are water repelling, the non image areas of the plate being hygroscopic or water receptive and ink repelling in use. The invention also relates to new printing machines for carrying out the new process.

In offset printing, the printing plate is made wet usually by means of a system of dampening rollers which are continuously supplied with water or a fountain solution containing various beneficial agents in addition to water. The regulation of the supply of water or fountain solution and thereby the degree of dampening of the plate requires a great deal of experience. Insufficient water may permit the background areas to take up ink or scum up and too much water may interfere with the transfer of ink and cause the print to look gray instead of black. When the machine remains idle, the plate gets dry rapidly and oxidation takes place which may also result in toning or scumming of the non-image areas of the plate.

It has also been proposed to supply the moisture required on the printing plate by cooling the surface of the plate to a temperature below the dew point of the air by means of a refrigerating machine so that moisture will condense from the air onto the surface of the machine. However, in using this process with motor-driven printing machines, it has been found that ordinarily sufficient moisture is not obtained by merely cooling the plate to below the dew point of the air and it proved necessary to resort to the practice of increasing the quantity of moisture by supplying moistened air to the machine. The apparatus is rendered expensive and uneconomical by such additional equipment. Furthermore, in continuous operation, the printing plate became cold enough to raise the consistency or viscosity of the printing ink on the offset cylinder to such an extent that the ink would no longer transfer perfectly and the prints would be unusable. This effect also severely limited the temperature difference between the plate and the atmosphere which could be used to increase the amount of moisture on the plate.

Whether moisture is applied to the plate by cooling or by means of rollers, it is undesirable for the moisture to transfer to the offset cylinder or rubber blanket. When too much moisture gets on the offset cylinder the prints tend to be gray rather than black and the image areas may be discontinuous, or in severe cases, lines may be broken.

The objects of the present invention are to provide printing processes and machines using the principle of cooling the plate to obtain moisture thereon without the use of transfer rollers or the like, in which the plate may be cooled to lower temperatures than in previous processes and machines but in which the ink remains of the proper consistency and readily transferable and in which the offset cylinder remains completely free of moisture which makes it practical to print on coated papers, sheets of regenerated cellulose and even glass which has been considered very difficult until now.

In the new printing process, the support for the printing plate and the plate itself can be cooled by means of a refrigerating machine to temperatures far below the dew point temperature of the air and even below 0° C.; i. e. below freezing, in case that a so far reaching cooling of the plate proves necessary with respect to the actual prevailing conditions of temperature and humidity. A difference of 5 to 10 degrees between the dew point temperature and the temperature of the surface of the printing plate has proved to be advantageous. In case that cooling below 0° C. is realized, the surfaces of the support and of the printing plate itself are covered with an antifreeze agent to prevent icing. The use of the antifreeze agent between the support and the printing plate also increases the rate of heat flow from the plate to the support so that the cooling is more efficient. Since most antifreeze agents are also hygroscopic, they also tend to help draw moisture to the plate. It is also useful to select antifreeze agents which act as antitoning agents or antiscumming agents or a combination of antifreeze agents may be used. Suitable antifreeze agents are glycerine, ethylene glycol and other polyvalent aliphatic hydroxyl compounds. Acids and gums may also be applied to the plate in combination with the antifreeze agent.

Another important feature of the invention is to heat the offset cylinder and possibly also the inking rollers. This prevents the ink from getting too stiff and also keeps the offset cylinder free of moisture for reasons discussed above. Since the surface of the offset roller is the important part to heat, it is preferred to heat by thermal radiation from electric resistance heating means or from infra red lamps or the like. In general, a rise of temperature amounting from 20 to 30 centigrades brought about on the roller surface by said heating will be sufficient for the vaporization of undesired moisture on the rubber blanket.

The invention will be more fully understood by reference to the following description taken in connection with the accompanying drawings in which:

Figure I is a diagrammatic view in elevation of a flat bed offset printing press constructed according to the invention.

Figure II is a diagrammatic view in elevation of a rotary offset printing press constructed according to the invention.

Figure I shows a hand operated machine, although it will be appreciated that the invention can also be readily used in an automatic machine of the same type. In Figure I, the printing plate **2** is secured to the flat bed support **4** by conventional means. The material to be printed on **6** is carried on the platform **8**. The platform **8** may be provided with height adjustment means such as the wing nut **10** counteracted by the springs **12** in order to enable adjustment for a stack of sheets for example. The offset cylinder **14** may be pulled over the printing plate **2** and over the material **6** by the handle **16** picking up an ink image from the plate **2** and transferring it to the material **6**. The inking rollers **18** which may be of conventional design are pulled after the offset cylinder **14** by means of the link **20** and apply ink to the plate **2** for the next printing cycle.

The refrigerating machine **22** which may be of the conventional household type is provided for cooling the support **4** and the printing plate **2**. The refrigerating machine **22** includes a compressor **24** forcing the refrigerator fluid through an opening into the expansion cooling coil **26** which is mounted in the support **4** and makes good thermal contact therewith for efficient cooling of the support **4** and the plate **2**. An antifreeze agent is applied between the support **4** and the plate **2** and on the upper

printing surface of the plate 2. The refrigerating fluid having absorbed heat from the support 4 is returned to the heat radiator 28 which is cooled by means of a fan 30. The fan 30 may be driven by the same electric motor 32 as is used to drive the compressor 24.

The thermal radiation unit 34 is provided over the offset cylinder 14 to radiate heat to the surface of the rubber blanket thereon. The amount of heat radiated to the offset cylinder is sufficient to keep the cylinder free of moisture and to keep the ink of proper consistency. The thermal radiation unit 34 may consist of a resistance unit 36 and a heat reflector 38 which may have a concave reflecting surface as shown for directing the heat rays at the offset cylinder 14. It will be appreciated that as the inking rollers 18 pass under the thermal radiation unit 34 they will also be heated thereby. If more heating of the inking rollers is desired, the thermal radiation unit may be extended to cover the inking rollers at the end of the stroke or if it is desired to heat only the offset cylinder, the thermal radiation unit may be carried on the side supports for the offset cylinder so that it moves back and forth therewith.

In the rotary offest press shown schematically in Figure II, as is well known in the art, the support for the printing plate 43 is in the form of a plate cylinder 42. The machine is also provided with an offset cylinder 44 and the pressure cylinder 46. The plate cylinder 42 is provided with suitable means for holding a printing plate 43 usually of flexible material so that the image surface coincides with the circumference of the cylinder. The plate cylinder is provided with cooling means which may be a refrigerating machine similar to that shown diagrammatically in Fig. I. In this case, the expansion cooling coil 48 is provided in a position within the cylinder 42 so it can absorb heat therefrom. The cooling of the plate cylinder 42 also results in cooling of the printing plate 43 so as to condense moisture on the surface thereof. Ink is applied to the surface of the printing plate 43 by means of the inking rollers 50. In the usual manner, the condensed moisture will cling to the non-image areas of the printing plate 43 repelling the ink while the image areas will accept the ink from the inking rollers 50. An antifreeze agent is applied to the surface of the printing plate 43 and also between the plate and the plate cylinder 42 for the same reasons as it is applied to the machine shown in Fig. I.

The ink from the image areas of the printing plate 43 is transferred to the rubber blanket 52 provided at the circumference of the offset cylinder 44. A thermal radiation unit 54 is provided to direct heat at the surface of the rubber blanket 52 to keep it free of moisture and to keep the ink of the proper fluidity. The material 56 to be printed is fed by means known in the art between the cylinders 44 and 46. The function of the cylinder 46 is to hold the material in contact with the offset cylinder 44 so that the ink is transferred thereto forming the prints 58. Means may also be provided to heat the inking rollers in order to keep the ink fluid thereon.

In another type of offset printing machine known in the art only two cylinders are provided, one of which has twice the circumference of the other. The smaller cylinder is the offset cylinder and the printing plate is carried around one half the circumference of the larger cylinder. The other half of the larger cylinder acts as a pressure cylinder when the image is transferred from the smaller offset cylinder to the base material for the prints. It will be understood that the invention may also be applied to this type of printing machine by cooling the plate portion of the large cylinder and heating the smaller offset cylinder.

By treating the surfaces of the flat bed support or plate cylinder and the surface of the printing plate with an antifreeze agent, it is possible to maintain their temperature far below 0° C. Thus it is possible to produce a great difference between the surface temperature of the printing plate and the dew-point temperature of the air so that an adequate quantity of water will be precipitated onto the plate from the air for all normal temperatures and humidities.

The thermal radiation striking the surface of the offset cylinder brings about a sudden rise in the temperature of the outside surface including the greasy ink film image covering the rubber blanket, due to the fact that the mass of ink is very small and the heat conductivity of the greasy ink and rubber blanket is low. This rapid rise in temperature results in the immediate vaporization of any moisture which may have transferred from the printing plate to the offset cylinder. The radiation method of heating is preferred to heating by means of hot air for example because the latter method is likely to carry dust which will be picked up by the greasy ink film.

When the new procedure is used the surface of the offset cylinder which touches the paper or other image receiving material is completely free of moisture and the ink coming into contact with the paper is in a highly fluid state so that it readily penetrates into the pores of the paper forming deeply colored prints of high contrast. Perfect prints can also be obtained on glass because no moisture is present which would interfere with the adhesion of the ink to the glass and the ink is in a highly fluid condition so that continuous uniform images may be transferred.

It will be appreciated that the invention eliminates many disadvantages hitherto experienced in connection with the offset printing process and opens new fields to offset printing.

Having thus described the invention, what is claimed is:

1. In a mechanism for lithographing of the offset type comprising a supporting means for a printing plate, a printing plate supported thereon having image and non-image areas, means for applying printing ink to said plate, means for cooling said supporting means to condense moisture on said plate whereupon the moisture will cling to the non-image areas thereof and repel printing ink, the printing plate being cooled thereby to a temperature below the dew point of the atmosphere, an offset cylinder containing means for transferring an inked image from the plate onto material to be printed, means for heating the surface of said offset cylinder to keep it free of moisture and maintain the inked image thereon in an image transferable consistency, and a liquid water soluble freezing point depressant located on said printing plate.

2. The mechanism of claim 1 wherein the depressant is also located on the surface between the supporting means and the printing plate.

3. In a mechanism for lithographing of the offset type comprising a supporting means for a printing plate, a printing plate supported thereon having image and non-image areas, means for applying printing ink to said plate, means for cooling said supporting means to condense moisture on said plate whereupon the moisture will cling to the non-image areas thereof and repel printing ink, the printing plate being cooled thereby to a temperaure below the dew point of the atmosphere, an offset cylinder containing means for transferring an inked image from the plate onto material to be printed, a thermal radiation unit directed at the surface of said offset cylinder to keep it free of moisture and maintain the inked image thereon in an image transferable consistency, and a liquid water soluble freezing point depressant located on said printing plate.

4. The mechanism of claim 1 wherein the heating means is also arranged to heat said ink applying means.

5. The process of offset printing comprising the steps of condensing moisture on an inked printing plate, while simultaneously subjecting the exposed surface of said plate to a liquid water soluble freezing point depressant, transferring the inked image from said plate to the surface of an offset cylinder, heating the offset cylinder surface to

maintain it free of moisture and the inked image thereon in a transferable consistency, and transferring the inked image from the offset cylinder surface to a preselected material to be printed.

6. The process of offset printing comprising the steps of condensing moisture on an inked printing plate by cooling it while simultaneously subjecting the exposed surface of said plate to a liquid water soluble freezing point depressant whereby the temperature of said plate is maintained below 0° C., transferring the inked image from said plate to the surface of an offset cylinder, heating the offset cylinder surface to maintain it free of moisture and the inked image thereon in a transferable consistency, and transferring the inked image from the offset cylinder surface to a preselected material to be printed.

References Cited in the file of this patent

UNITED STATES PATENTS

643,372	Cornwall	Feb. 13, 1900
897,831	Hergesheimer	Sept. 1, 1908
1,479,819	Kluever	Jan. 8, 1924
2,025,046	Goedike	Dec. 24, 1935

FOREIGN PATENTS

584,240	Great Britain	Jan. 9, 1947

OTHER REFERENCES

Printing Inks, Carelton Ellis, Reinhold Publishing Corp., New York, 1940, page 475.