

UNITED STATES PATENT OFFICE

2,374,070

PLATE AND METHOD OF PREPARING THE
SAME FOR OFFSET PRINTING

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No Drawing. Application February 2, 1942,
Serial No. 429,342

13 Claims. (Cl. 101—149.2)

This invention relates to printing and, particularly, to an improved plate for use in offset printing and to a method of preparing the same for such printing process.

Heretofore, in printing by the offset method, both by the direct image and photolithic processes, it was generally the practice to use aluminum or zinc plates upon which the desired images were applied for printing. While such plates were satisfactory, the present curtailment of the use of aluminum and zinc for non-defense purposes necessitated the development of a plate made from some other suitable material. Various plastic and paper plates have been suggested and used, but they have not been developed to the point where satisfactory results can be obtained thereby and the use thereof is limited.

Steel, by reason of its hardness and non-porous characteristics, has long been recognized as a superior support for direct or photolithic line or half-tone images in offset printing. However, employment of a plate made of this metal has heretofore been denied the printing industry for practical use by reason of its susceptibility to oxidation. It is to the use of a steel plate for offset printing and to a method of preparing the surface of the same, to prevent oxidation thereof, that the present invention relates.

Accordingly, it is the general object of the present invention to provide a steel plate for offset printing and an improved means for protecting the surface thereof from oxidation, not only when the same is in use, but also when it is not in use.

It is another object of the invention to provide an improved metallic plate for offset printing which is efficient and effective in its use and, at the same time, a plate which can be easily and conveniently prepared so as to provide a surface thereon which is oxidation resistant.

It is a further object of this invention to provide an improved medium or solution for protecting the surface of metallic plates, used in offset printing, from oxidation, which is not only inexpensive, but simple in its preparation and application and effective in its use.

It is still another object of the present invention to provide an improved method of preparing the surface of metallic plates for use in the offset printing process whereby the plates may be successfully used in either the direct image or photolithic method.

It is still a further object of the invention to provide an improved metallic plate for use in offset printing which will produce a greater

number of printed copies and a plate which will have a longer endurance than any plate heretofore suggested or used.

Various other objects and advantages of my invention will become more apparent during the course of the following specification and appended claims.

The improved metallic plate of my invention for use in offset printing consists of a steel plate preferably having a relatively high carbon content and a thickness preferably of at least .002 of an inch. The thickness of the plate varies according to the particular purpose for which it is to be used and depends on whether it is to be used in a typewriter or merely as a support for a photolithic image, the size and make of the press with which it is adapted to be used, and other factors.

In employing metallic plates for offset printing, a number of steps are necessary in order to prepare the surface of the plate for receiving the images for printing. It is necessary that the surface of the plate be first suitably grained to provide a water retentive surface. Such graining consists of roughening one or both of the surfaces of the plate by means of abrasives in a conventional type graining machine, in a manner well known to those skilled in the art. After the surface of the plate has been grained, the plate is in condition to receive the image, or images, and the same is applied thereto in a well known manner.

Carbon steel plates thus grained may be employed for either the direct image or the photolithic method in the actual production of printed copies by the offset printing process. By the "direct image" method is meant the direct reception of typewriting, drawings, or carbon paper transfers.

According to the present invention, after the image (or images) has been applied to the grained surface of the steel plate, the surface is then etched with a medium or solution so as to prevent oxidation of the same. It has been found that a solution consisting of a mixture of ammonium phosphate, ammonium nitrate, ammonium fluoride, tartaric acid, ammonium bi-chromate, water, and glycerine is a satisfactory solution for such etching. Such a solution is prepared preferably by mixing together (1) approximately 10 oz. by weight of ammonium phosphate, 5 oz. by weight of ammonium nitrate, and 100 oz. by volume of water; (2) mixing together approximately $\frac{3}{4}$ oz. by weight of ammonium fluoride, $\frac{1}{2}$ oz. by weight of tartaric acid, and 60 oz. by

volume of water; and (3) mixing together approximately $\frac{1}{4}$ oz. by weight of ammonium bi-chromate, and 6 oz. by volume of water, and then mixing together all of these ingredients, i. e., (1), (2), and (3), as above separately mixed, and finally adding an equal part by volume of glycerine. That is to say, such a solution is prepared by mixing together approximately (1) 40 parts by weight of ammonium phosphate, 20 parts by weight of ammonium nitrate, and 400 parts by volume of water; (2) mixing together approximately 3 parts by weight of ammonium fluoride, 2 parts by weight of tartaric acid, and 240 parts by volume of water; and (3) mixing together approximately 1 part by weight of ammonium bi-chromate and 24 parts by volume of water, and then mixing together all of these ingredients, i. e., (1), (2), and (3), as separately mixed, and finally adding approximately 730 parts by volume of glycerine. The etching solution as above described is applied to the typewritten plate or the plate having the images thereon so that it will cover the entire plate but not the typewritten letters nor the image on the plate. The typewritten letters preferably are formed with a greasy ink which repels the etching solution. Accordingly, the etching solution will not be disposed over the images or typewritten letters. The etching solution is permitted to remain on the surface of the plate during the use thereof while printing, and this solution protects the surface of the plate from corrosion or oxidation during the printing process.

After the press run, and the plate has been used for printing, the plate can be prepared for storing or filing for subsequent use. To preserve the surface of the plate further and to prevent oxidation thereof, the surface of the plate is coated preferably with a gum arabic solution which is worked well into the grain of the metal, preferably by means of absorbent cotton, and the plate is then dried. The dried gummed surface of the plate is then coated with anhydrous-solox which serves the dual purpose of removing surface ink from the image or images, and absorbs any moisture remaining in the gummed coat. Anhydrous-solox is a commercial product and consists of 100 parts by volume of S. D. # 1 alcohol, 1 part methyl isobutyl ketone, 1 part ethyl acetate, and 1 part aviation gasoline. The S. D. # 1 alcohol consists usually of 100 parts of ethyl alcohol and 5 parts of wood alcohol. When it is desired to again use the same plate for making additional printed copies, the etching solution as hereinbefore described is applied to the surface of the plate. The etching solution dissolves the gum and anhydrous-solox coating on the plate, leaving the ink on the typewritten letters forming the image and the letters exposed for further application of ink by means of the inking roller of the printing press during the printing process. The ink is not disposed on that portion of the surface of the plate surrounding the letters or image, for the reason that a small portion of the etching solution and water is retained and held in the minute grains or pits surrounding the letters or image and repels the ink.

In the photolithic method, it is necessary to employ colloids which have been rendered light-sensitive by the addition of ammonium bi-chromate which, in turn, renders the colloid insoluble when exposed to the action of actinic light. When the photolithic method is used instead of the direct image method, the steel plate is first grained as before. There is then applied to the surface of

the plate a sensitizing solution which is distributed evenly over the surface of the plate by any suitable means, such as a whirler. The photographic image or negative is then exposed upon the plate, preferably in a vacuum printing frame, in a manner well known to those skilled in the art. After proper exposure of the sensitized metal has been completed, a coating of greasy ink, preferably a developing ink, is applied to the bi-chromated albumin film. The purpose of the developing ink is to prepare the basic greasy image necessary in lithography and to provide visibility to the exposed and insoluble colloid image. After this ink has been applied, the plate is washed with water so as to remove the remaining soluble colloids of the sensitized solution which were not effected by the actinic light. The surface of the plate is then etched with the same etching solution as prescribed for the direct image method which has been described hereinbefore. The plate is then ready for use in printing as many printed copies as is desired. After the printing has been completed, and it is desired to store or file the plate for future use, the surface of the plate is coated with a gum arabic solution as in the direct method. Then, when it is desired to use the plate again, the gum coating is washed therefrom preferably by means of turpentine and asphalt in a well known manner, at which time it is again ready for use in producing printed copies by the offset printing process.

Oftentimes it is desirable to prepare the plates in advance so that they will be in condition for receiving the typewritten letters or images. That is, the plates have been grained and are waiting the application of the images thereto. If the surfaces of such plates are not protected, it will be understood, as has been explained, that they will readily oxidize and be of no further use. In such a case, it has been found that the surface of these grained steel plates can be satisfactorily protected from oxidation by coating the surface thereof with anhydrous-solox. The anhydrous-solox thoroughly absorbs any moisture in the grain of the plate and provides a relatively light protective film thereon which will prevent the surface of the plate from oxidizing for a period of as long as several weeks. If the plate is to be retained for a longer period before use, it has been found that a light application of neutral mineral oil adds further protection from oxidation over a relatively long period. If such plates have been coated with anhydrous-solox to protect them before use, it is necessary to remove this protective film before any typewritten letters or images can be applied to the surface of the plate. It has been found that the anhydrous-solox can be conveniently removed from the plate by means of carbon tetra-chloride, after which the plate is ready to receive the images. After the image (or images) has been applied to the surface of the plate, it has been found that corrections thereto can easily be made by erasing the image to be corrected with a small piece of absorbent cotton saturated with carbon tetra-chloride.

As a result of my invention, it will be seen that there is provided a steel or metallic plate having a surface which is at all times protected from oxidation. It has been found that the steel plates will endure longer and produce a great many more printed copies than can be produced by the use of zinc or aluminum or any other type of metallic plate. For instance, it has been found that a steel plate will satisfactorily produce at least

100,000 printed copies without showing any appreciable wear or breakdown. This is a decided improvement when compared with plates made of other metals, which yield only 6,000 to 15,000 printed copies from direct image plates and about 50,000 copies from photolithic plates.

From the above description of my invention, it will be apparent that many modifications of the same may be devised within the scope thereof and all such modifications are contemplated as may fall within the scope of the appended claims.

I claim:

1. A plate for printing of the class described, comprising a metallic plate which has been etched by solution including a mixture of ammonium phosphate, ammonium nitrate, ammonium fluoride, tartaric acid, ammonium bi-chromate, water, and glycerine.

2. A plate for printing of the class described, as defined in claim 1, wherein the metallic plate consists of a steel plate.

3. A plate for printing of the class described which consists of a steel plate having a coating of anhydrous-solox disposed thereon so as to provide a protective film for the surface thereof whereby the surface of the plate is protected from oxidation.

4. A plate for printing of the class described which consists of a steel plate having a coating of anhydrous-solox disposed thereon with a film of mineral oil disposed thereover so as to protect the surface of the plate from oxidation.

5. A solution for etching metallic plates for use in printing of the class described comprising a mixture of ammonium phosphate, ammonium nitrate, ammonium fluoride, tartaric acid, ammonium bi-chromate, water, and glycerine.

6. A solution for etching metallic plates for use in printing of the class described which consists of ammonium phosphate, ammonium nitrate, ammonium fluoride, tartaric acid, ammonium bi-chromate, and water which are mixed together with an equal part of glycerine.

7. In the process of printing by the offset method, the method of preparing a solution for etching metallic plates for use therein which includes the steps of mixing together a quantity of ammonium phosphate, ammonium nitrate, and water, mixing together a quantity of ammonium fluoride, tartaric acid, and water, mixing together a quantity of ammonium bi-chromate and water, and finally mixing all of the above ingredients together and adding an equal part of glycerine.

8. In the process of printing by the offset method, the steps which include the providing of a relatively thin steel plate, graining the surface of the plate, applying the desired images to said surface for printing, and finally etching said surface of the plate with a solution including a mixture of ammonium phosphate, ammonium nitrate, ammonium fluoride, tartaric acid, ammonium bi-chromate, water, and glycerine.

9. In the process of printing by the offset method, the steps which include the providing of a relatively thin steel plate, graining the surface of the plate, and finally coating said surface with anhydrous-solox which absorbs any moisture on said surface of the plate and protects the same from oxidation.

10. In the process of printing by the offset method, the steps which include the providing of a relatively thin steel plate, graining the surface of the plate, coating said surface with anhydrous-solox which absorbs any moisture on said surface and protects the same from oxidation, removing said coating of anhydrous-solox from said surface when it is desired to use the plate for printing, applying the desired images to said surface for printing, and finally etching said surface with a medium so as to prevent oxidation thereof during the printing process.

11. In the process of printing by the offset method, the steps which include the providing of a relatively thin steel plate, graining the surface of the plate, coating said surface with anhydrous-solox which absorbs any moisture on said surface and protects the same from oxidation, removing said coating of anhydrous-solox from said surface when it is desired to use the plate for printing, applying the desired images to said surface for printing, and finally etching said surface with a solution including a mixture of ammonium phosphate, ammonium nitrate, ammonium fluoride, tartaric acid, ammonium bi-chromate, water, and glycerine, so as to protect the surface from oxidation during the printing process.

12. In the process of printing by the offset method, the steps which include the providing of a relatively thin steel plate, graining the surface of the plate, coating said surface with anhydrous-solox which absorbs any moisture on said surface and protects the same from oxidation, removing said coating of anhydrous-solox from said surface when it is desired to use the plate for printing, applying the desired images to said surface for printing, etching said surface with a medium so as to protect the surface from oxidation during the printing process, coating the surface of the plate with a gum arabic solution after the plate has been used for printing and drying the same, and finally coating the surface of the plate with anhydrous-solox so as to prevent oxidation of said surface when the plate is not in use.

13. In the process of printing by the offset method, the steps which include the providing of a relatively thin steel plate, graining the surface of the plate, coating said surface with anhydrous-solox which absorbs any moisture on said surface and protects the same from oxidation, removing said coating of anhydrous-solox from said surface when it is desired to use the plate for printing, applying the desired images to said surface for printing, etching said surface with a solution including a mixture of ammonium phosphate, ammonium nitrate, ammonium fluoride, tartaric acid, ammonium bi-chromate, water, and glycerine, so as to protect the surface from oxidation during the printing process, coating the surface of the plate with a gum arabic solution after the plate has been used for printing and drying the same, and finally coating the surface of the plate with anhydrous-solox so as to prevent oxidation of said surface when the plate is not in use.

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