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PLANOGRAPHIC PRINTING PLATE

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This invention relates to printing plates of the kind used in planographic duplicating machines.

By the use of such a machine copies or duplicates may be made of matter that has been typewritten, printed, or otherwise applied to the printing plate. The duplicating is performed by what is known as the planographic offset printing method. If the matter to be reproduced, i. e., the image, is typewritten on the printing plate, a special so-called "offset" lithographic ribbon is used in the typewriter. The printing plate, containing the matter to be reproduced, is fastened to the impression cylinder of the duplicating machine. During rotation of the impression cylinder the printing plate first comes in contact with a moistening roll saturated with an ink-repellent solution. This solution usually contains major parts of water and glycerine and minor proportions of certain other ingredients, such as phosphorous acid, ammonia citrate, and gum arabic. The surface of the printing plate is such that it is capable of being wetted uniformly by the ink-repellent solution at the clear or non-image portions, but the ink at the image portions will be unwetted by the solution. During further rotation of the impression cylinder the printing plate next comes in contact with an inking roll. The ink carried by the inking roll is a lithographic or greasy ink of a well known type. The non-image portions of the plate which have been wetted by the ink-repellent solution will not pick up the ink from the inking roll, whereas the image portions on the printing plate will pick up some of it in much the same manner that type receives ink in an ordinary printing press. Still further rotation of the printing plate brings it into contact with a rubber transfer roll which receives an impression of the entire image. The transfer roll then transfers the image to the sheet of paper upon which the final copy is to be made. If the image were taken off the printing plate directly onto the sheet of paper, the image would be reversed and this would be objectionable in most cases, as when the matter to be reproduced is reading matter. As is well understood in the art, the transfer roll, by receiving the image directly from the printing plate, receives it in reversed condition, but the image is again reversed when it is transferred by the transfer roll to the sheet of paper, and hence the final impression is in correspondence with the original.

One type of printing plate that has been used quite extensively is made of metal, such as aluminum, having a specially treated surface. Such a plate has the necessary characteristics to make it very satisfactory for use in a duplicating machine of the above described type. It has the ability to be wetted evenly and uniformly by the ink-repellent solution; it is resistant to the solution; it retains its strength after being wetted by the solution and does not warp or become distorted; and it may be stored away and used again for making additional copies of the matter contained thereon. Moreover, the metal plate properly receives and retains the image-forming ink when the matter to be reproduced is applied to it. Since the plate is free from capillary action the image-forming ink and the ink applied by the inking roll do not tend to spread. However, metal printing plates are expensive and there are times when metal shortages make them difficult to obtain.

In accordance with my invention I provide a printing plate which has many of the advantages of a metal printing plate, and some not possessed by a metal plate, but it is made from a non-metallic material which is less expensive than metal. It is made from parchment paper, or so-called "vegetable parchment," that has been prepared in the special way hereinafter described to impart certain characteristics to it which make it peculiarly adapted for the particular use which I make of it and which cause the finished plate to function much like a metal planographic printing plate.

It has been proposed to make planographic printing plates from ordinary parchment paper, but so far as I am aware none of them has the same characteristics as mine or is capable of producing the same results. One type of paper planographic printing plate that has met with some commercial success is a multi-ply sheet, the top layer of which is parchment paper made in the usual way. Being ordinary parchment paper the top layer would wrinkle or warp to an objectionable degree when moistened in the duplicating machine if it were not for a backing sheet which is cemented to it. Such multi-ply printing plates are expensive and although intended for use in a typewriter when applying the matter to be reproduced, they leave much to be desired in the way of flexibility and the ease and convenience with which they may be handled in the typewriter. They require the use of an adhesive to cement the layers together, and if the moistening solution used in the duplicating machine happens to penetrate the top layer, blistering is likely to occur. Moreover when the adhesive absorbs the moisture it increases the tendency of the applied ink to spread.

The special way in which the parchment paper of my printing plate is made makes it unnecessary to use a backing. The plate is a single-ply sheet, no backing of any kind being required or desirable. Thus there is no underlying moisture absorbing material, such as an adhesive.

The improved printing plate is made from parchment paper produced as follows: Short fibered absorbent wood pulp is formed into a web in the usual way on a paper making machine. The web is then passed through a strong sulfuric acid bath, then through a series of washing operations. After this the web passes through a dryer and is then supercalendered. All of these steps are usual ones in making amyloid parchment paper for certain uses. However, whereas it is customary in making ordinary amyloid parchment paper to dry the web to around 3½ to 5% moisture content prior to supercalendering, in making the special parchment paper for my printing plate the web is dried to a higher moisture content, say around 7%. This leaves the cellulose in a gelatinous or plastic form in which it is in a more expanded condition than if it were dried to a greater extent. When the web is supercalendered it is surrounded with steam or other vapor to prevent the web from drying out. During supercalendering the web is subjected to considerable pressure. This is preferably accomplished by passing the web through the supercalendering machine twice with standard pressure employed each time. The relatively high moisture content in the web causes the supercalendering to compress the gelatinous cellulose to its maximum density. The web remains compressed after supercalendering and its bulk is considerably reduced, as distinguished from a web that has been dried to the usual extent which tends to spring back to its original thickness after supercalendering. To give an idea of the degree to which the gelatinous cellulose web is compressed, it might be stated that when the web contains approximately 7% moisture and measures about .004" in thickness before supercalendering, and is then supercalendered as above described, its permanent thickness after supercalendering is about .003"—a reduction in thickness of around 25%. Moreover, the supercalendering of the relatively moist web causes it to spread laterally in all directions to a considerable extent and to retain most of its spread, thus producing what might be termed a pre-expanded parchment paper.

Parchment paper made in the special way described above is more like a cellulose plastic than true parchment paper. It is more brittle than ordinary parchment paper and is probably not suitable for the various uses to which parchment paper is ordinarily placed. It will not readily stand bending and folding, but this is not objectionable when the parchment is used as a planographic printing plate. Moreover, supercalendering the parchment paper with the unusually high moisture content tends to produce what appears to be a blackening effect but this is really an increase in transparency rather than an actual change in color. Neither is this objectionable when the parchment paper is used as a planographic printing plate.

The parchment paper made as above described is cut into sheets of the desired size and shape and after the image is applied to one of such sheets with lithographic ink the printing plate thus formed is ready for use in the duplicating or printing machine.

The cellulose sheet from which the printing plate is made is substantially fiberless. In the parchmentizing operation, the fibrous structure is substantially destroyed since short fiber absorbent pulp is used to start with. The parchment is not only unusually dense because of the special supercalendering treatment, but the high degree of calendering imparts to the dense and substantially fiberless plate a smooth metal-like surface which is excellent for planographic printing purposes. Because of these characteristics the printing plate has little or no capillary action and very little absorptive capacity either for the ink or for the moistening solution. Since the parchment paper is pre-expanded, as above described, its tendency to expand still more when moistened in the duplicating machine and thereby warp or wrinkle is lessened. This, and the other special properties of the parchment paper, make it possible to do without a backing.

If the surface characteristics of the printing plate are judged from the standpoint of a gloss test and a smoothness test, it might be stated that the best results have been obtained with printing plates made from parchment paper that gives a reading of approximately 40 in a Bausch & Lomb Glossmeter and whose smoothness measures approximately 47 seconds when tested by a William's smoothness tester.

The improved printing plate has been found to be especially useful in duplicating machines when it is desired to run off several hundred to several thousand copies of matter typewritten on the printing plate. In such case a sheet of parchment paper made as above described is placed in a typewriter equipped with an "off-set" lithographic ribbon and the matter to be reproduced is typed on the parchment paper. For this and similar work a thickness of the parchment paper sheet of about .003" has been found suitable. While somewhat thinner sheets also work quite well, any departure from the thickness mentioned is preferably in the direction of greater thickness. The absence of any backing sheet preserves the high degree of flexibility of the printing plate which is a distinct advantage when it must be inserted in a typewriter to apply to it the matter to be reproduced.

Being a single-ply sheet my printing plate may be obtained at small cost. The cost per printing plate is an important item where large quantities of them are used, as in organizations whose business it is to mail daily to its customers reports of many different kinds, and to make a number of copies of each report. In such an organization large quantities of the special parchment paper would be used by the typists who would type the various reports on them with lithographic ink as above described, and in so doing the parchment sheets could be handled and used with as much ease and convenience as if letters were being typed on ordinary paper, and with an expense to the organization of not a great deal more than that of ordinary letter paper. In such an organiaztion it is customary to produce many copies of each report. Even though the parchment paper printing plate has no backing it is possible to run off as many as 1500 or 2000 copies of the matter on the printing plate without objectionable wrinkling or warping of the plate. The number of copies that can be made without undue wrinkling or warping of the plate depends somewhat on the proportions of glycerine and water in the moistening or ink-repellent solution used in the dupli-

cating machine. It has been found that for around 1000 to 1500 copies, the solution should contain about 20% of glycerin, whereas for a greater number of copies the proportion of glycerine should be somewhat increased. However, regardless of the exact character of the moistening solution, the improved printing plate has high wet strength as well as high dry strength and is adapted to produce a large number of copies without wrinkling, stretching or warping from the many applications of the solution.

Very little moisture applied to the printing plate in the duplicating machine will form a thin and uniform film which stays on the surface. In fact, it has been found in practice that when using a printing plate made in accordance with this invention the moisture supplying means on the duplicating machine may be set at its minimum adjustment. The non-image portions of the printing plate will be properly and uniformly wetted by the ink repellent solution and will thereafter properly repel the ink on the inking roll of the duplicating machine. The image-forming ink is properly received and retained without noticeable lateral spreading, nor is there any noticeable lateral spreading of the ink that is repeatedly applied to the image by the inking roll. The ultimate result is a clear sharp reproduction of the image carried by the printing plate.

After the printing plate has been used to produce the desired number of copies, the image may be preserved on it by applying gum arabic solution, and the plate may then be stored for an indefinite period until it is desired to produce more copies. No objectionable lateral spreading of the ink will occur during this time since the sheet is substantially free from capillary action.

I claim:

1. A planographic printing plate comprising an unbacked sheet of supercalendered amyloid parchment paper having a surface whose smoothness measures approximately 47 seconds when tested by a William's smoothness tester, and whose gloss as measured by a Bausch & Lomb glossmeter is approximately 40.

2. A planographic printing plate in accordance with claim 1 having a lithographic ink image thereon.

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