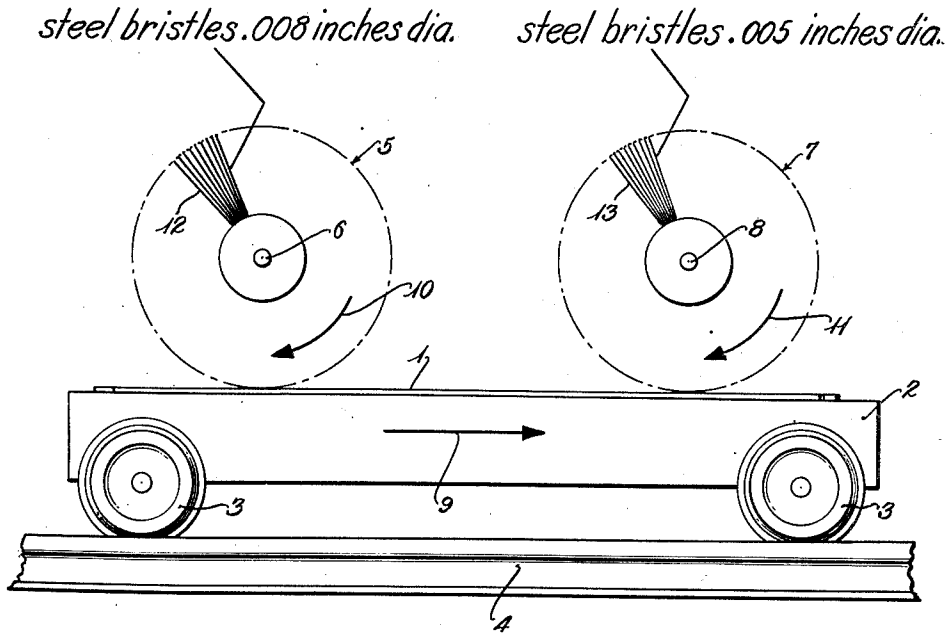
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PROCESS FOR PRODUCING LITHOGRAPHIC PRINTING PLATES

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PROCESS FOR PRODUCING LITHOGRAPHIC PRINTING PLATES

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The present invention relates to a process for producing lithographic printing plates having improved qualities and characteristics. More particularly the invention relates to a process for treating aluminum sheets to prepare lithographic printing plates which process involves combined mechanical and chemical treatment of the aluminum sheets to produce printing plates which have improved qualities and characteristics not heretofore obtainable.

Among the objects of my invention are to provide aluminum lithographic printing plates which can be used to produce large numbers of copies of printed or other matter, which have indefinite shelf life, which reduce the time and cost of preparation for printing, which resist oxidation, which require no scrubbing, counter-etching or pre-etching by the user, which perform uniformly in all weather conditions and which perform satisfactorily irrespective of the manner in which the image is placed on the plate. Another object of the invention is to provide an aluminum printing plate which will reduce the cost of lithographic printing by enabling complete runs to be made with one plate, thereby eliminating remakes and idle presses while remakes are being prepared. Still another object of the invention is to provide a process which imparts absolute uniformity to lithographic plates.

Present conventional metal lithographic plates are marble grained to provide a surface which will retain the image and which will hold a sheen or film of moisture on that portion of the surface of the plate which is not covered by the image. Marble graining is accomplished by agitation of marbles on the surface of the plate in the presence of moisture and a powdered abrasive. Such plates must be scrubbed and counter-etched to remove oil which has been adsorbed by the metal during rolling and also to remove particles of abrasive and metal which remain in or on the grained surface. The marble graining process is expensive and requires considerable skill.

Metal lithographic plates have also been produced by subjecting surfaces of the plates to certain chemicals which produce a grain similar in appearance to the marble grained plates. Chemically grained plates are now used almost exclusively for those operations in which the image can be applied directly to the plate, such as by typing. The action of the graining chemical appears to be progressive and such plates have been found to have relatively short shelf life.

Both marble grained and chemically grained plates are quite susceptible to oxidation which makes the plates extremely difficult to handle in tropical climates and during hot humid weather. Aluminum is exposed to oil during the rolling operation to form sheets. It appears that some of this oil remains adsorbed in the metal of the sheets. In both marble grained and chemically grained plates there is a tendency for this oil to

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seep into the grain after the plates have been stored for a short time. It will be apparent that presence of oil in the grain is deleterious in a printing process which depends upon immiscibility of water and oil.

I accomplish the objects of my invention and overcome the foregoing deficiencies in prior lithographic plates by using a novel two step mechanical graining process followed by a chemical treatment.

Referring to the accompanying drawing, which diagrammatically illustrates one form of apparatus for the mechanical treatment of the plates, the reference numeral 1 designates an aluminum sheet which may be of the size and configuration of a lithographic printing plate or which may be a larger sheet from which a plurality of such plates are to be cut. The plate 1 is positioned on a flat horizontal support such as a bed 2 provided with rollers 3 so that it can be moved over a track or support 4. The aluminum sheet 1 is at least 99% pure aluminum which is known in the trade as "purity stock" and which is virgin aluminum containing no scrap. The hardness of the sheet is that known in the trade as "half hard minus."

A first rotary brush 5 mounted on a power driven shaft 6 is positioned above the bed 2 in position to contact the upper surface of the plate 1. A second brush 7 is mounted on a power driven shaft 8 above the bed and is similarly positioned to contact the upper surface of the plate. The bed 2 moves in the direction of the arrow 9 and the brushes 5 and 7 rotate in the direction of the arrows 10 and 11 respectively.

The brush 5 is provided with hardened steel bristles 12 having diameters of .008 inch to .009 inch. The brush 7 is provided with hardened steel bristles of .005 inch diameter. The shafts 6 and 8 are driven at such speeds that the outer end of the bristles 12 and 13 have peripheral or linear speeds of approximatly 1400 feet per minute. In actual practice the brushes 5 and 7 are equal in diameter and the shafts 6 and 8 are driven at equal speeds. I have obtained the advantages of my invention by using brushes of 6 inches diameter rotating at speeds of 900 revolutions per minute, which causes the ends of the bristles 12 and 13 to have linear speeds of about 1414 feet per minute. The bed 2 and the plate 1 are moved in the direction of the arrow 9 at a speed of approximately 17.5 feet per minute.

The bristles 12 of the roller 5 break the "skin" of the aluminum sheet and produce a decided grain which is relatively coarse. The bristles 13 of the brush 7 appear to modify or subdue the coarse grain produced by the brush 5 and the sheet is left with a beautifully uniform grain.

The aluminum sheet is then ready for the chemical treatment which modifies the mechanically produced grain and conditions the plate for use to obtain the objects and advantages of

the invention. I add calcium hydroxide to hot water in an amount in excess of that which can be dissolved. The temperature of the bath is accurately maintained at 180° F. by means of thermostatically controlled electric heaters. A saturated solution of calcium hydroxide and water is thus produced. I have found it advisable to permit the freshly prepared sclution to age or season at the 180° F. temperature for about one hour before use. The aging or seasoning is also found desirable after additional calcium hydroxide has been added to a bath which has already been used. The aging or seasoning eliminates any tendency toward the formation of a coating on the plates or sheets.

The brush grained sheet which has been mechanically prepared as described above is immersed in the aged or seasoned bath for 40 seconds, the bath being maintained at the temperature of 180° F. These values have given the best results and the temperature of the bath and the time of immersion of the aluminum sheets appear to be quite critical. It is possible to use temperatures as low as 175° or as high as 185° but the time of immersion must be adjusted accordingly. At temperatures below 175° F. the bath is not effective. If the temperature of the bath is elevated above about 185° F. or if the plate is left in the bath for too long an interval, the plate will be chemically grained and the advantages of the mechanical pretreatment will be lost. Immersion times of from 25 to 55 seconds are possible but I have found that the full advantages of the invention cannot be obtained with immersion times below 35 or above 45 seconds.

The aluminum sheets or plates are withdrawn from the bath and promptly scrubbed with a rotary brush having fibre bristles operating under a constant spray of fresh water. The plates may then be passed between wringer rolls to remove excess water, force dried by mild heat or air blast, inspected and packed.

Plates produced according to the foregoing process are remarkably resistant to oxidation. One of my plates was placed in a tropical room maintained by the United States Army for test purposes under conditions of high temperature and excess humidity. After a period of 45 days the plate was found to be in perfect condition. The chemical treatment appears to completely remove or effectively seal any residual oil within the metal of the plates and this eliminates the oil hazard and the necessity for scrubbing and counter-etching the plates prior to use. I am not aware of the precise nature of the chemical action which occurs during immersion of the plates in the bath. There is considerable foaming while the sheets are immersed in the bath. The appearance of the grained surface is somewhat changed, although no coating appears to be formed on the sheets. The resistance to oxidation is greatly increased and this enables the plates to be stored indefinitely before use and causes the plates to handle and produce efficiently under even the most adverse weather conditions.

My plates are sensitive to all known image forming materials and at the same time are quite susceptible to action of all standard plate etches after the images have been placed on the plates. The susceptibility to the action of the plate etch on the portion of the plate not covered by the image enables the plate to produce a clean and sharp image without tone or scum outside the image. My plates may be uniformly sensitized by applying the sensitizer to the grained surface of the plate by hand and the plates do not require the whirling action of a whirler. However, if desired the plates can be sensitized by wetting with water, placed on a whirler and sensitized in the manner conventional with marble grained plates.

My plates have been used to produce 215,000 copies of printed matter without remakes and without loss of quality of reproduction. This number is far in excess of the numbers which it has heretofore been possible to produce with a single plate and is of tremendous practical and economic advantage because it enables extremely large runs to be made without "remakes."

The practice of my process is inexpensive and the cost of producing the improved plates is relatively low. The process can be conducted in a more or less continuous manner. The apparatus which has been described above is exemplary only and it is apparent that other arrangements of apparatus would be suitable so long as the action on the aluminum sheets or plates remains essentially unaltered.

Having thus described my invention, I claim:

1. A process for producing a lithographic plate which comprises brushing one side of a sheet of at least 99% pure aluminum with a first brush having relatively coarse steel bristles to tear the skin of the sheet and to form a coarse grain, brushing said side of said sheet with a steel brush having relatively finer bristles to subdue the coarse grain formed by said first brush, immersing said sheet in a saturated aqueous solution of calcium hydroxide maintained at a temperature between 175° F. and 185° F. for a period of from about 25 seconds to about 55 seconds, and water scrubbing and drying said plate.

2. A process for producing a lithographic plate which comprises brushing one side of a sheet of at least 99 percent pure aluminum with a first brush having steel bristles approximately .008 inch in diameter moving at a speed of about 1400 feet per minute, brushing said sheet with a second brush having steel bristles approximately .005 inch in diameter moving at a speed of about 1400 feet per minute, immersing said plate for from 35 to 45 seconds in a saturated aqueous solution of calcium hydroxide maintained at about 180° F., and water scrubbing and drying said plate.

3. A process for producing a lithographic printing plate which comprises passing a sheet of at least 99% pure aluminum into contact with a first brush having steel bristles of a diameter of approximately .008 inch moving at a speed of approximately 1400 feet per minute, passing the sheet beneath a second brush having steel bristles of approximately .005 inch diameter moving at a speed of approximately 1400 feet per minute, said plate being moved oppositely to the direction of movement of the engaging bristles at a linear speed of approximately 17.5 feet per minute, immersing said plate for approximately 40 seconds in a bath consisting of a saturated aqueous solution of calcium hydroxide maintained at about 180° F., and water scrubbing and drying said plate.

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