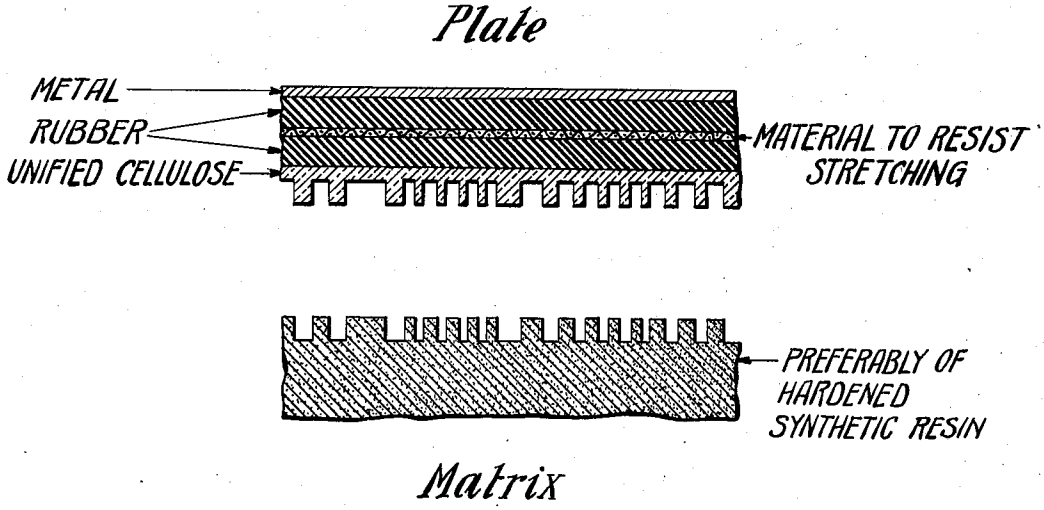
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PRINTING PLATE

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INVENTORS
Hylton Swan
Siegfried Higgins
BY Jno. N. Nielsen
ATTORNEY

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PRINTING PLATE

Hylton Swan, Upper Montclair, and Sigfried Higgins, Verona, N. J., assignors to Bakelite Corporation, New York, N. Y., a corporation of Delaware

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This invention relates to a printing plate and method of preparing same.

The relief printing trade at the present time greatly desires a printing plate which is of general application, that is, one which may be used with smooth or roughened paper and which is applicable either to flat-bed or cylindrical types of presses. In an effort to provide such a plate, the rubber plates have found favor but the rubber printing surfaces are subject to attack by the oils which are in the common inks. In order to prevent the deterioration of the printing surface of the plate, it has been proposed to make plates with either a synthetic resin face or a metal face. A difficulty with a plate faced with synthetic resin, however, is that the resin sets to a hard brittle condition so that it must be molded either flat or curved for a particular type of press. A difficulty with the metal faced plates is that they cannot be used for a high grade printing job on rough finished or "antique" papers.

Among the objects and features of the present invention is a plate which can be made easily and quickly from materials readily obtainable in the open market and which, when prepared, may be used either on a flat-bed press or a rotary cylinder press. By virtue of its resiliency our plate has the definite advantage of materially reducing the time required in accurately setting up the plate on the printing press, technically known as "make-ready". The printing surface of the plate is extremely tough and wear resistant, not attacked by oils and of surprising resistance to wear and deterioration both in use and in storage before and after use. The printing surface takes ink very well from inking rollers or other inking devices and gives it up very readily to the material upon which the printing is being done.

The printing surface faithfully reproduces the smallest hair lines and dots on the matrix as well as the largest printing areas without the use of extremely high forming pressures which may damage the matrix surface, for instance with damp regenerated cellulose a molding pressure in the neighborhood of 1000 pounds per square inch may be used whereas with metal faces pressure in the neighborhood of 7000 pounds per square inch and upwards are usually found necessary in commercial practice. Furthermore, the plate is resilient so that it may be used to print on either smooth or rough paper. Moreover, the printing surface does not stick to the surface of the synthetic resin matrices which are highly desirable for use in forming the plate due to their strength, light weight, durability and fidelity in reproducing the original type or other printing areas.

Other objects and features of the invention will be pointed out in the claims and will be understood from the following part of the specification wherein one of the preferred forms of the invention is disclosed, together with the drawing illustrating a plate and matrix.

We have discovered that a plate comprising a rubber body and a printing face comprising a substantially non-thermoplastic unified cellulose material for example regenerated cellulose with or without modifying agents, plasticizers, for instance glycerine, waterproofing agents, waxes, etc., for instance the material known on the market as Cellophane, has the desirable characteristics which adapt it for almost universal use.

The regenerated cellulose is extremely tough and wear resistant and we have found that it has sufficient strength so that fine lines and small dots do not mushroom or spread when printing pressure is applied yet, on the other hand, when backed up with a rubber body of the proper yield, it is sufficiently flexible and yieldable to print satisfactorily on rough paper. In thin sheets, the regenerated cellulose can rather easily be forced to conform to and accurately reproduce the finest detail in a matrix. The sheets of regenerated cellulose which we use may for example be from .001 to .035 of an inch in thickness. They may also be roughened on one side, for instance by sand-blasting, to assist the bonding of the surface to the rubber body.

The rubber body should have sufficient yield to permit the plate to be used on rough paper but should not be extremely soft, particularly where the rubber body is thick, else the plate will not be solid enough to resist pull or movement in planes parallel to the surface, for accurate register for instance in color work. This lateral displacement is particularly noticeable on rotary presses where, if the plate is too yieldable, there is a tendency for the printing surface of the plate to shift laterally with relation to the base at the time that the leading edge of the plate meets the impact of the impression cylinder. Thus a plate which has a relatively thin rubber body should contain rubber which is softer than the rubber in a plate having a thick rubber body because with a thin rubber body there is less of the elastic yieldable rubber to permit the plate to yield on rough paper and there is less tendency for the printing surface to

shift laterally with regard to the base. In the case where a thick rubber body is used, it is preferably of harder rubber sufficiently yieldable to permit of some compression when printing on rough paper but hard enough to resist lateral displacement of the printing surface. For relatively thin rubber bodies, for example where the rubber is from .125 to .150 of an inch in thickness, the body may test between 50 and 65 durometer test and for a relatively thick rubber body, for example where the rubber is from .180 to .250 of an inch in thickness the body may test between 60 and 75 on the durometer. The proper amount of yield may be obtained by regulating the amount of vulcanizing agent accelerators, etc., incorporated with the rubber or by incorporating fillers, for instance zinc oxide, carbon, barium sulphate, asbestos, etc. The preferred plate has a body of rubber including one or more sheets of absorbent paper or similar material, for instance rubber-impregnated blotting paper or cork which is readily compressible but has relatively great resistance to stretch or movement in a plane parallel to the plane of the printing surface.

If desired, a metallic foundation plate or sheet may be fastened to the rear face of the rubber body to assist in holding the plate on the press. The rubber or rubber-filler composition may thus be of a thickness sufficient to give a plate of the desired cross section or it may be thinner to allow for the thickness of the metal or other similar sheet.

An illustrative method of making the plate will now be described, it being understood that the description is by way of example only and that variations thereof may be made as desired.

A sheet of rubber either with or without filler or embedded fibrous material is first procured. This sheet should contain sufficient vulcanizing or curing agent to produce the required stiffness upon heating.

The rubber sheet is coated with an adhesive which adheres to both the rubber and the regenerated cellulose for example an acid degenerated rubber in a solvent solution. A general example of a suitable adhesive is an emulsion or dispersion comprising rubber and a rubber solvent with ingredients which render tacky the surface of the regenerated cellulose. Thus one part of the adhesive may comprise an aqueous dispersion of rubber which may for example be reclaimed rubber or rubber latex, rosin and lime or calcium resinate. A solvent for the rubber, for instance gasoline or benzol may be included also. Another part of the adhesive may comprise an aqueous dispersion of rubber, a water soluble adhesive, for example gum arabic or gelatin, a peptizing agent, for example, triethanol amine or glycerol and a water soluble solvent for cellulosic materials for instance ethyl lactate. The dispersion or emulsion of these ingredients may be used to coat the adjoining surfaces of the rubber and regenerated cellulose or a sheet of fibrous material, for example paper, blotting paper or cloth may be coated or impregnated with this adhesive and used as an intermediate bond between the rubber and regenerated cellulose. The surface of the regenerated cellulose sheet may be coated if desired.

After coating the surface or surfaces to be joined, with the above adhesive or other suitable material, and preferably after waiting until the adhesive has a tacky surface, the sheets are assembled and pressed together to form a unitary composite sheet. If a metallic foundation plate is used, the adjoining surfaces of the metal and rubber or an intermediate cementing sheet may be coated or impregnated with a suitable metal-rubber adhesive for instance with the first mentioned part of the composite adhesive, namely the rubber dispersion, rosin and lime or calcium resinate, and gasoline or benzol; and then brought together under pressure. Where the metallic sheet is used, it may be cemented to the rubber before, or after or during the time that the rubber is cemented to the regenerated cellulose. A stack of the assembled sheets may be held under pressure until the cement has thoroughly set. If desired, however, the composite sheets may be molded directly after assembly but if wet adhesive is used the press should be vented to allow the escape of the volatile ingredients of the adhesive.

Having made the plate blank, it may be formed into a printing plate in the following manner. The matrix used is preferably of a heat hardened synthetic resin, for instance a phenol formaldehyde condensation product which is unaffected by temperatures suitable for the vulcanization of the rubber and which does not adhere to the regenerated cellulose. The surface of the regenerated cellulose may be moistened slightly with a damp cloth or steam to enable it to stretch more easily. The composite blank is laid in a press, preferably heated, with the regenerated cellulose face against the matrix and is subjected to the heat and pressure until the printing surfaces have been formed on the face and preferably until the rubber has reached the desired state of hardness. It is possible to remove the plate from the press before the rubber has vulcanized sufficiently to give the desired hardness and then continue the heating in an oven but this is not recommended as the plate may be damaged by such removal. The molding of the printing face preferably takes place in a semi-positive mold so that there is some check offered to the side flow of the plastic material which gives a plate with a substantially uniform density and definition at the corners and edges.

As the rubber softens under the heat it is pressed toward the matrix forcing the regenerated cellulose surfacing to conform to and thus fill, and reproduce the reverse of, the matrix surface. As the rubber hardens it holds the regenerated cellulose surface film in the positions given it by the matrix face and upon removal from the mold the plate has a tough printing surface which is smooth and relatively hard yet sufficiently yieldable to print on rough paper. The surface does not scratch easily as does a surface of a metal soft enough to be formed by a corresponding pressure; nor do the small printing areas, for instance the fine dots on photographic - screen - reproduced printing areas, spread or mushroom under repeated impacts of the inking rollers or impression cylinder as would the soft rubber without the regenerated cellulose facing.

A preferred form of the invention has been described but it is not intended to exclude modifications thereof. Under proper conditions other types of ink resistant surface sheets may be used such, for instance, as paper treated with zinc chloride or by excessive hydration, as well as bodies of synthetic rubbery products now on the market such, for instance, as the hydrochloride divinyl acetylene product one form of which

is sold as Duprene, vulcanized sulphur hydrocarbon products one form of which is known as Thiocold, factis, or a rubbery fatty oil-phenolic-methylene product. The oxidized fatty oils, for instance oxidized linseed oil, may be used in part as a modifying agent as may other modifiers. It is therefore recognized that there are many variations of the invention and it is desired that the invention be construed as broadly as the claims taken in conjunction with the prior art may allow.

We claim:

1. A printing plate comprising a facing of regenerated cellulose and a body of rubber.

2. A printing plate comprising a facing of regenerated cellulose and a body of yieldable rubber.

3. A printing plate comprising a facing of regenerated cellulose and a body of vulcanized rubber.

4. A printing plate comprising a molded facing of regenerated cellulose and a body of rubber.

5. A printing plate comprising a facing of unified cellulose and a yieldable body.

6. A printing plate comprising a facing of non-thermoplastic unified cellulose and a yieldable body.

7. A printing plate comprising a facing of unified cellulose and a yieldable body having a durometer reading from substantially 50 to substantially 75.

8. A printing plate comprising a facing of unified cellulose, a yieldable body and a stretch resisting layer.

9. A printing plate comprising a facing of unified cellulose, a yieldable body and an interior stretch resisting layer.

10. A printing plate comprising a facing of unified cellulose, a yieldable body and an interior fibrous stretch resisting layer.

11. Method of producing a printing plate comprising forming a composite sheet having a facing of unified cellulose and a body including rubber, laying the composite sheet in molding position with the unified cellulose toward a matrix and subjecting the assembled parts to pressure to mold a printing surface on the unified cellulose from the matrix.

12. Method of producing a printing plate comprising forming a composite sheet having a facing of unified cellulose and a body including rubber and a vulcanizing agent, laying the composite sheet in molding position with the unified cellulose toward a matrix, subjecting the assembled parts to pressure to mold a printing surface on the unified cellulose from the matrix and vulcanizing the rubber.

13. Method of producing the printing plate comprising forming a composite sheet having a facing of unified cellulose and a body including rubber and a vulcanizing agent, laying the composite sheet in molding position with the unified cellulose toward a matrix, and subjecting the assembled parts to heat and pressure to mold a printing surface on the unified cellulose from the matrix and vulcanizing the rubber to the desired stiffness.

14. Method of producing the printing plate comprising forming a composite sheet having a facing of unified cellulose and a body including rubber and a vulcanizing agent, laying the composite sheet in molding position with the unified cellulose toward a matrix, subjecting the assembled parts to pressure to mold a printing surface on the unified cellulose from the matrix and vulcanizing the rubber to a durometer reading from substantially 50 to substantially 75.

15. A printing plate comprising a facing of unified cellulose, a yieldable body and a backing plate.

16. A printing plate comprising a facing of unified cellulose, a yieldable body and a thin backing plate, adapted to be curved whereby the plate may be used either flat or curved.

HYLTON SWAN.
SIGFRIED HIGGINS.