

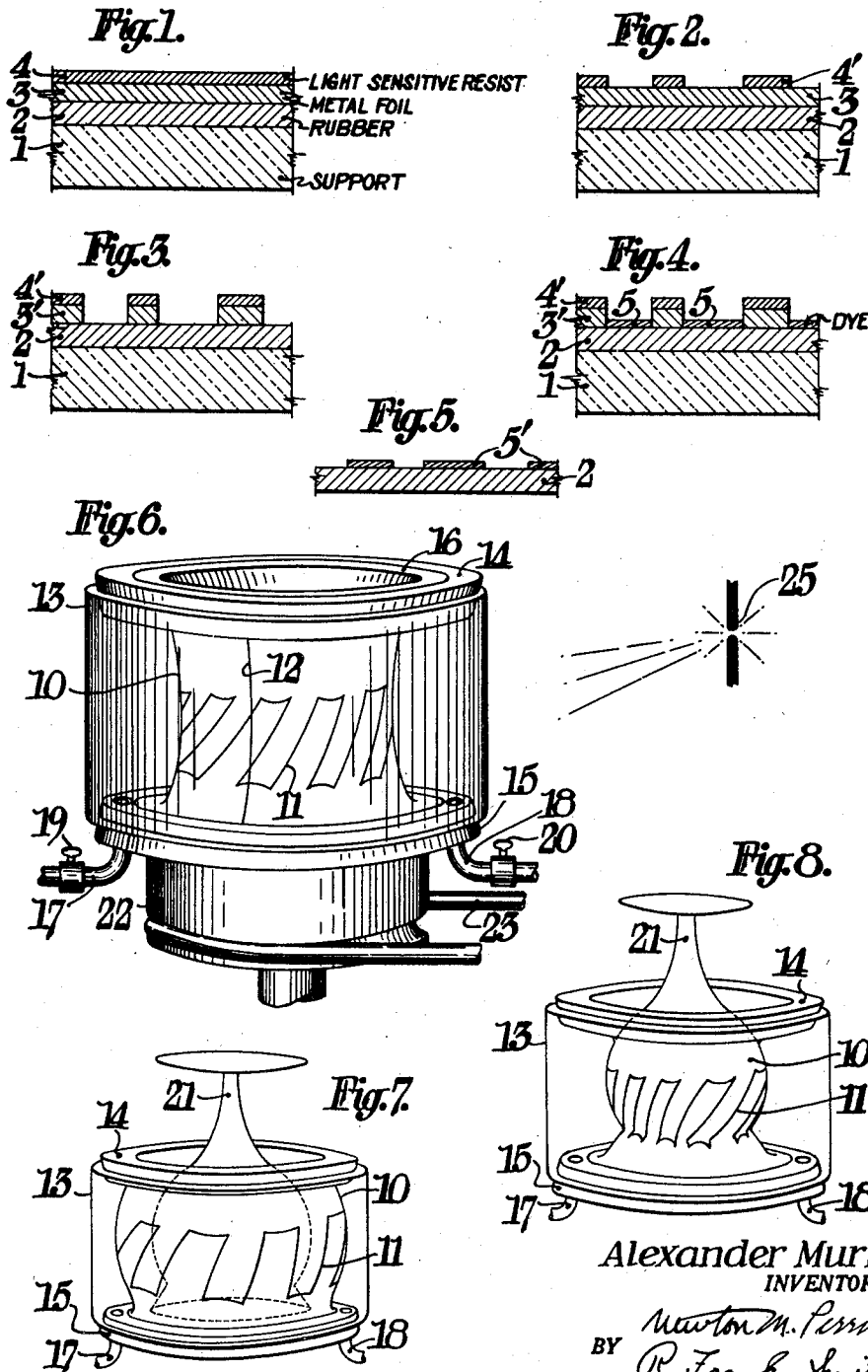
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PHOTOGRAPHIC STENCIL MATERIAL

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PHOTOGRAPHIC STENCIL MATERIAL

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Application December 7, 1935, Serial No. 53,381,
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24, 1934. Divided and this application Janu-
ary 22, 1938, Serial No. 186,413

3 Claims. (Cl. 95-5)

This invention relates to a photographic ele-
ment which may be used for making etched de-
signs on glass and metal objects, such as bowls,
tumblers, vases, cylinders, stem-ware, and the
like.

This case is a division of application Serial No.
53,381, filed December 7, 1935, now Patent
2,158,194, which in turn is a division of applica-
tion Serial No. 727,304, filed May 24, 1934, now
Patent 2,073,313.

It has been difficult to make deeply etched or
cut designs of uniformly high quality upon the
surface of solid objects such as stem-ware, ex-
cept by processes requiring a large amount of
time consuming and highly skilled hand work.
I have invented a method of etching such glass-
ware in a simple and comparatively inexpensive
manner. This comprises the formation on a free-
ly extensible sheet, such as rubber, of an image
that is extensible with the rubber and applying
this image bearing stencil or negative, prefer-
ably in the form of a closed or tubular band, to
the surface of the object to be etched, which also
carries a sensitive coating. This is then exposed
to uniform illumination from all sides, the nega-
tive removed, and the glass or metal etched by
a photoengraving process.

My invention resides in the various methods
herein described of making the elastic stencil, in
the sensitized elastic element, and in the com-
pleted elastic stencil band.

Reference will be made to the accompanying
drawing, in the several figures of which like nu-
merals represent like parts and in which:

Fig. 1 is a section on an exaggerated scale of
a sensitized element made according to my inven-
tion.

Fig. 2 is a similar section of the element after
exposure and removal of the resist at the ex-
posed portions.

Fig. 3 is a section of the element after etching.

Fig. 4 is a section of the element after appli-
cation of a dye thereto.

Fig. 5 is a section of the elastic sheet bearing
the dye design, after removal from the support.

Fig. 6 is a perspective view of a frame carry-
ing an endless rubber stencil strip.

Fig. 7 is a similar view showing the band ex-
panded to permit insertion of a goblet to be or-
namented.

Fig. 8 is a similar view showing the goblet and
band in position for printing.

It is obvious that a prime desideratum in a
photographic negative or stencil having a highly
flexible or elastic base is that the image shall be

fully as extensible and flexible as the support.
This is not the case with ordinary photographic
emulsions of gelatine, collodion or the like, and
the image, if formed originally in such a layer,
must be printed or stenciled upon the support
itself and the original layer removed.

I will first describe my preferred method of
forming such a stencil or negative, reference be-
ing made to Fig. 1.

Upon a suitable support 1 which may be a glass
plate, a sheet of a cellulosic derivative compo-
sition, waxed or otherwise waterproofed, card-
board or any other reasonably rigid sheet, a thin,
elastic, soft, translucent, vulcanized rubber sheet
2 is temporarily attached by means of a suitable
stripping adhesive, such as wax or a rubber cem-
ent. The rubber sheet would be held smoothly
but ordinarily not under tension. A suitable cem-
ent is a .5% solution of rubber in benzene.

Commercial rubber sheeting having a thick-
ness of .003-.004 inch is preferred but the thick-
ness may vary within wide limits, as between .0005
and .01 inch.

A thin, preferably unelastic stencil material 3,
as for instance, a sheet of brass, nickel or other
metal foil .001 inch thick, is then attached to
the rubber layer by means of a rubber cement. If
the element is to be used immediately, brass is
preferred, but since brass tends to affect rubber
if kept in contact with it, nickel or some other
inert material would be used if the plate is to
be stored for some time.

To the sheet of foil 3 is then applied a coat-
ing 4 of a light sensitive resist, an example being
the following:

	Grams
Dicinnamal acetone	32.5
Syrian asphaltum	97.5
Phenol	1.80
Solvent naphtha (coal tar)	500.0
Toluene	270.0

The resist mentioned is of the type covered
in my prior Patent No. 1,965,710, granted July 10,
1934, and forms a hard coherent coating.

A line negative or positive is placed in contact
with the sensitive coating and exposed to the
light of a 30 ampere arc lamp at a distance of 24
inches for 5 minutes. The unexposed parts of
the resist are removed by treatment with kero-
sene. The solvent action is controlled by ob-
servation and is stopped by removal of the kero-
sene by washing with soap and water. The ele-
ment after this treatment is illustrated in Fig. 2,
the resist being indicated by 4.

The stencil sheet is then etched in the exposed parts of the design with aqueous ferric chloride solution of above 36° Baumé until the brass is removed to the rubber which the etching solution does not affect. The element then appears as shown in Fig. 3, the etched brass sheet being indicated at 3'.

After rinsing with water and drying, the etched surface is treated with a stain, solution or dye which deposits upon the areas of rubber laid bare by etching, a coloring matter which becomes physically extensible with the rubber, as indicated at 5 in Fig. 4. This may be a "rubber ink" or stain, sprayed or brushed upon the stencil and coating the rubber in the stencil openings. This solution may consist of:

	Grams
Nogrosine (Schulz No. 985).....	5
2% crepe rubber in benzene.....	30
20 Ether.....	65

The resist areas would also be more or less colored, but no use is made of this property, as it is merely incidental.

The stencil foil sheet carrying the resist is readily stripped from the rubber by stripping the rubber sheet from the support and then stretching it, whereupon the inextensible foil, not stretching with the rubber and being attached thereto by a stripping layer, separates from it. There is now left a rubber sheet 2, as shown in Fig. 5, having the properties already enumerated and carrying substantially integral with it and extensible with it, a light absorbent or obstructive pattern 5' formed as a result of a photographic process.

A second method of making the negative is by applying to the rubber layer a bichromated fish glue solution of familiar type such as

40 Photo-engraving glue (fish glue)....grams...	360
Ammonium bichromate.....do.....	55
Water.....liters.....	1

When dry, the plate is exposed to a suitable light design, the print developed by washing in water, and dried. It is now covered with a suitable stain such as the one already described, or

	Grams
Oil Red C dye (Schulz No. 532).....	1
50 Nigrosine.....	4
1.0% rubber solution in benzene.....	20

When dry, the rubber sheet is stripped from the temporary support and washed in warm water to remove the remaining glue. This is aided by stretching the rubber. There is left a rubber sheet carrying a stain, which ordinarily will be a line image.

A third method, which is non-photographic, of making the rubber negative or positive will now be given. The rubber sheet is placed over a design to be copied. The rubber sheet may be either mounted on a glass sheet as before or placed tightly on the design on a drawing board and both held in place by thumb tacks. The design or pattern is then drawn in water color on the rubber by hand using a suitable fine brush. When dry it is stained with dye solutions of the type already described. The water color is then washed off leaving the stain image.

Still a fourth method is the following. A rubber sheet, mounted as before, is coated with a silver halide-gelatine emulsion, exposed to a light image of the design, and developed in a tanning developer of known type, such as pyro. The untanned gelatine is removed by washing in warm

water. After drying the negative is stained as above described and the remaining tanned gelatine stencil removed by any usual means that does not attack the rubber or the stain.

By whichever method is used, there is obtained an elastic negative, the support of which is a thin, elastic, soft, translucent, vulcanized sheet of rubber carrying a perfectly extensible design in or on its surface, and which stretches and contracts with the rubber support without cracking or peeling. Numerous uses of such a negative at once suggest themselves. It may be used for making distorted or cartoon pictures by extending the rubber sheet more in one direction than another. The effects of motion, useful in making animated cartoons, may be made by constantly changing the extension of the rubber in one or more directions or unevenly. If extended uniformly, in all directions, an enlarged print may be made by direct contact printing.

By stretching to a precisely determined degree, a negative having calibration marks on it may be used in the calibration of individual instrument scales where the same scale readings are shown but in somewhat different dimensions on the several instruments.

The principal use which I have in mind, however, is the printing of photographic designs upon the surface of an object having other than a plane surface. Such objects may be glassware, such as bowls, tumblers, jars, stem-ware including goblets, wine glasses and vases, and other dishes; metal cylinders used in printing processes or for any other purpose; molded metal forms, such as picture frames, convex dials, watch cases and furniture parts and other objects too numerous to catalog. In general the printing would be made by stretching the negative over or around the object to be ornamented or marked and which would carry upon its surface a light sensitive coating. The rubber sheet would by its own tension hug closely and contact the surface of the object, except for concavities. The first photographic image could be the permanent one if the object were not to be subjected to rough usage but the coating usually would be of a type adapted to act as a resist, and after exposure, would be developed by a wash-off or solvent process, leaving a resist design through which a suitable etching fluid could act on the metallic or glass object, after which the resist would be removed. The particular resist used would have to be one capable of withstanding the etching fluid used. Many such are known for use with metallic surfaces but few photographic resists are known prior to my invention capable of withstanding the action of hydrofluoric acid ordinarily used for glass etching.

Reference will now be made to Figs. 6, 7 and 8 which show a device for applying the negative to the surface of an object such as a goblet. A negative strip 10 bearing a repeat design 11, has its ends secured by a suitable rubber cement in an air tight seam 12, thus forming an endless or cylindrical rubber negative, the size of which, when unextended, is less than the article to be etched or ornamented. The edges of this negative are secured between clamping blocks of a suitable frame. This frame consists of a glass cylinder 13 having tightly fitting metal or rubber annular rings 14 and 15 in its opposite ends. These rings have cut out annular rabbets within which fit smaller rings 16 on their outer surfaces. The ring 16 is removed from ring 14 and, while one edge of the negative band is held stretched,

is replaced, clamping the edge between the rings 14 and 16. The other edge of the band is then clamped to the ring 15 in a similar way. The normal position of the band is shown in Fig. 6.

Through the ring 15 pass two tubes 17 and 18, with stop cocks 19 and 20, the first tube being connected to a source (not shown) of compressed air or, preferably, of a compressed inert gas and the other to a suction device (not shown), or both may be connected to a circulating supply of an inert cooling fluid. When the stop cock 20 is opened and the cock 19 closed, air will be withdrawn from the annular space between the glass cylinder 13 and the rubber negative 10 and the latter will be drawn outwardly as shown in Fig. 7. The goblet 21 or other article carrying a sensitive coating on that portion of its surface to be ornamented is then placed within the casing as shown in the same figure and stop cock 19 opened while 20 is closed.

Even if the tube 17 were open to the air, the contraction of the rubber negative band 11 would ordinarily cause it to contact closely with the surface of the goblet, but in order to insure uniform close contact throughout, the tube 17 is preferably connected to a source of compressed air, and this is necessary if the article to be marked has concavities in its surface or if the article has portions of somewhat smaller diameter than the normal diameter of the band 11.

Since the exposures are made under rather high light and heat conditions, the rubber, if continuously exposed, tends to deteriorate rapidly. For this reason I prefer to use an inert fluid rather than air and to circulate this through the space between the rubber negative and the glass cylinder. This fluid may be an inert gas or a liquid such as water.

The whole device containing the article 21 is then rotated at a uniform rate before a light source for as long a time as may be required for the exposure, depending on the intensity of the light and sensitivity of the particular coating on the article 21. The light passes through the glass which is unobstructed and through the negative producing a print on the sensitized surface.

It is to be understood that the description and formulae herein given are by way of example and that I consider as included within my invention not only all of the subject matter herein disclosed but also all modifications and equivalents thereof that fall within the reasonable scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A method of making upon a thin sheet of translucent, elastic rubber an image strongly adherent thereto and capable of contracting and expanding therewith that comprises holding said rubber sheet with its surface smooth, applying a metallic resist material to said sheet, applying a photographic layer to said resist material, forming a stencil relief image in the photographic layer, treating the material with a solvent for the resist material which removes such resist material where exposed through the photographically formed stencil, then applying to the rubber areas thus laid bare a stain capable of adhering to the rubber and capable of contracting and expanding therewith, and then removing the remaining portions of the resist and photographic layers.

2. A method of making an image upon a thin sheet of translucent, elastic rubber carrying a layer of metallic resist material and a sensitive photographic layer thereon that comprises forming photographically a stencil image in the last named layer and laying bare portions of the resist layer, submitting the surface to a chemical agent which attacks the resist layer and not the photographic layer, whereby the portions of the resist layer laid bare through the photographically formed stencil are removed, submitting the surface to a dye in a solvent for rubber whereby there is formed on the portions of the rubber surface laid bare through the resist and photographic layer an image firmly adherent to said surface and freely expansible and contractible with such surface and then removing the remaining portions of the resist and photographic layers.

3. A method of making an image upon a thin sheet of translucent, elastic rubber carrying a removable layer of a metal foil and a sensitive photographic layer thereon, that comprises forming photographically a stencil image in the last named layer, laying bare portions of the metal foil, submitting the surface to a chemical agent which attacks the foil but not the photographic layer nor the rubber whereby the portions of foil laid bare through the photographically formed stencil are removed, submitting the surface to a solution including dye, rubber and a volatile solvent for rubber whereby there is formed on the portions of the rubber surface laid bare through the foil and photographic layers a dye image firmly adherent to the rubber and freely distortable with the rubber, and then removing the remaining portions of the foil and photographic layers.

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