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(54) **Process and apparatus used for photo setting a master for the production of stamps.**

(57) The invention relates to a process for producing by photo setting a master for the production of stamps or the like of a suitably test like image set along generally straight base line whereby the image is geometrically transformed via a substantially curved mirror surface (12) of a transparent rod like body. Said mirror surface (12) is forming an inclined angle in relation to said image, so that the master will comprise the corresponding image in a distorted curved form. According to the invention the image in the form of one or several character lines set on an at least partially transparent material is applied at a transparent part (11) of the circumference of the said body and suitably along support line extending around the body. The character line is illuminated from the outside and the distorted image reflected through said body via the suitably conical mirror surface (12) towards the end plane (14) of said body is reproduced, whereafter said reproduction is treated with photometric methods to form a master for the production of stamps or alike.

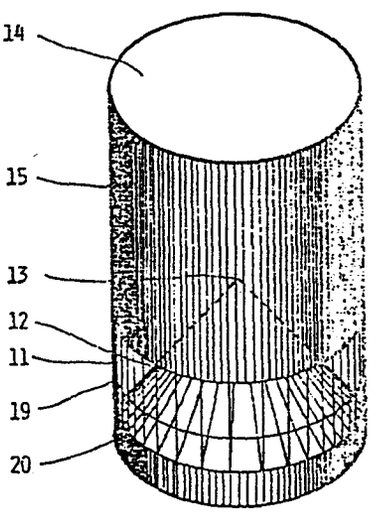

FIG 2

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Process and apparatus used for photo setting a master for the production of stamps.

The invention relates to a process for producing by photo setting a master for the production of stamps or the like of a suitably text like image set along generally straight base line whereby the image is geometrically transformed via a substantially curved mirror surface of a transparent rod like body, said mirror surface forming an inclined angle in relation to said image, so that the master will comprise the corresponding image in a distorted curved form. The invention also relates to an apparatus for carrying out the image transformation process.

Generally the invention gives a method for processing an image in connection with graphical reproduction into an image having a desired and preferably curved form which deviates from the basic form of the image.

In the graphical industry it is known to set text lines with a machine in order to provide means with which the text can be duplicated. Such means are for example clichés which are used either as such in printing presses to reproduce the configuration reflected by the cliché or which are used as masters and/or counter punches for the casting of stamps or the like.

The setting machines can be mechanical so that one with the aid of the typewriting keyboard mechanically or in some other way controls the mounting of character lines along a more or less straight base line. These character lines are formed as lines of separate elements comprising character types with a printing surface the plane of which is distinct from the base plane of the line so that it is possible to produce clichés against this line for example with the aid of casting. The produced clichés are then used for printing the character

lines in a printing press or the like. The above mentioned setting-up procedure can of course be performed also manually which often is necessary when special effects are desired.

In order to make the setting procedure quicker photometrical methods for providing said clichés have also been used. This so called photo-setting is based on the principle that material which is sensitive e.g. to light beams is illuminated in such a way that the difference between the plane of the printing surface and the base plane at the illumination appears as illuminated and non-illuminated parts, respectively, whereafter suitable treatment such as a chemical, electrical or electrochemical treatment results in that the planes of illuminated and non-illuminated will lie on different levels. In order to carry out the photo-setting master is required which provides illumination in a form which corresponds to the characters which are desired to be set. When character lines are set this is achieved for example by illuminating the photo sensitive material through a rotating cylinder having separate characters throwing a shadow onto the photo sensitive material whereby the illumination bit by bit enters through a cylinder part selected by a control system. The control can be provided manually or for example with a computer. The photo setting can also be made on the basis of an image with shaded parts of an arbitrary configuration whereby the cliché reproduces the parts of the image in unchanged form.

In order to carry out the above mentioned processes a quantity of diffrerent equipment has been developed. Since normal graphical production either starts from existing pictures or from a need to produce character lines such as texts with letters that lie on a straight base line the known equipment is directed to achieving specifically such clichés. Special interest has been directed to the development of rather complicated control systems especially to keep the base lines of the text straight.

In the advertising field and in the graphical industry and especially in the production of stamps there is, however, sometimes a need to create character lines the base line of which is not straight but arched. The production of text lines with a circular base line is especially complicated. So far it has been necessary in these situations to use manual setting i.e. normal letter types have been mounted in circular frames and keyed on therein. No mechanical type setting machine has so far been produced which could set texts on a base line having an arbitrary curvature.

By using the photo setting process in such a situation it is, however, possible to simultaneously set also text lines on a curved base line provided that they appear in an original image. The problem in this case is that also this original image has to be produced in some way. Heretofore the picture has either been produced by hand by applying transfer lettering on the arcuate base line or the text itself has been drawn directly on the original image. Both procedures thus require manual work which is always time consuming and often inexact.

One disadvantage in using existing letter types or transfer lettering is that these generally are configured for setting on a straight base line so that the letters for example on a circular base line optically give the impression that they are thinner towards the edges. Since the best form of the characters in the optical sense are in correlation with the geometrical form of the base line, which form can be almost arbitrary, it hardly seems feasible to produce special types or transfer lettering for each separate base line form. The need for special styles of letters multiplies the quantity of special characters.

The above mentioned problems exist also in the cases where letters are drawn by hand with the aid of a stencil or the like. At free hand drawing it is of course possible to adapt

the optical form of the characters to the geometrical form of the base line but this is even more time consuming without guaranteeing the quality of the end result.

Trials have also been made to solve the problem with curved character series by writing the characters on strips of diverse materials which are laterally flexible but it has proved difficult to achieve curved configurations in this way which would give an even colouring over the complete curved area. Moreover, the bending always poses a problem when it is a question of adapting the bending repeatedly to a certain decided form.

It has also been proposed to use digital treatment of the optical reproduction of a character series but so far such a procedure has not been possible to make in a simple way. The procedure demands that the surface of the image is read in separate steps and transformed in a digital form, that the so digitalized information of the image surface is treated electronically to provide the desired transformation according to previously decided geometrical principles, and that the so treated digital information is retransformed into optical information in the form of the desired image. All these steps demand special advanced equipment and even if the transformation process as such is relatively simple to perform electronically the transformation between optical and digital information always requires complicated and sensitive equipment especially in cases when one desires an exact and precisely finished image.

To solve the problems of setting characters on base lines of an arbitrary form which deviated from the straight line the process and the apparatus according to the application have been invented, the special characteristics of the invention being disclosed by the appended claims.

According to the invention the problem with the distortion of the geometrical configuration of the character lines is solved by applying at a transparent part of the circumference of the said body and suitably along support line extending around the body the image in the form of one or several character lines set on an at least partially transparent material, after which the character line is illuminated from the outside, and the distorted image reflected through said body via the suitably conical mirror surface towards the end plane of said body is reproduced. According to the invention said reproduction is further treated with photometric methods to form a master for the production of stamps or alike.

The invention applies to the principle of applying the image adjacent to a surface and reflecting the original image via a reflecting surface which is biased to the image surface onto viewing plane whereby the reflecting surface is formed so that it corresponds to the desired form of the image in such a way that the radius for the intersectional lines between the reflecting surface and planes parallel to the viewing plane stand in desired relationship to the distance from said planes to the viewing plane.

This arrangement makes the transformation of the image possible without having recourse to any complicated adaptions of descriptive geometry. The reflecting surface is a mirror surface which preferably consists of the reflecting inner surface surface in a transparent body. The kind of transformation in each partial area of the mirror depends on the curve radius of the reflecting surface within this area as well as of the angle of the mirror surface in relation to the image surface and the viewing plan. Thus it is possible to achieve with the invention different kinds of transformations. In the following will be illustrated especially embodiments wherein the transformation takes place from images especially of a straight and longish character but also other embodiments will be evident to those skilled in the art.

The invention is described below especially with a prismatic embodiment whereby the image surface preferably corresponds to a first window in the prism and the viewing plane corresponds to second window whereas the remaining outer surfaces of the prism preferably are not transparent. As prismatic embodiments is here to be understood subsatntially rodlike prisms with the reflecting area applied to one end of the rod. As an especially preferred special case for the production of circular images a conical mirror is provided against the second window whereby the apparatus preferably is formed as a prismatic body of circular cross section.

In the following the invention is described with reference to the appended drawings wherein

Fig. 1 is an explanatory sketch of a prismatic block in accordance with the invention.

Fig. 2 is a perspective view of a cylindrical embodyment of prism according to the invention.

Fig. 3 is a cross section of a prism according to fig. 2.

Fig. 4 illustrates an example of a character line set on a straight base line.

Fig. 5 illustrates the same character line as in fig. 4 treated with the process according to the invention.

Fig. 6 illustrates an example of treated charater line wherein the original characters are figures of a decorative design.

The invention is now to its principle described with reference to the general prismatic block according to fig. 1. The block comprises an outer surface of which a part, limited for example by the line 2, at the same time forms a first window surface 3. The block further comprises a mirror surface 4 and a second window surface 5. The intersectional line 6 of the

mirror surface 4 with the first window surface 3 is curved, and the intersectional line 7 with the second window surface 5 likewise. At a cross section of the prismatic body in a direction perpendicular to the first window surface 3 the cross section forms a triangel, wherein the intersection with the window surfaces forms shorter sides 8, 9 and the intersection with the mirror surface forms the longest side 10.

The original image is at least partly transparent so that it can be illuminated from the outside towards the window surface 3 and thus illuminated can be seen through window 5.In accordance with the invention the image to be transformed is placed adjacent to window surface 3 and preferably directly in contact with the same. Thereafter the image is illuminated from the outside and the distorted image which can be seen via the reflecting surface 4 through the second window surface 5 is reproduced e.g. by photographing, photo setting or in some other way. In order to obtain completely exact reproduction it is important that the illumination is quite even. With uneven illumination one can obtain special effect and accentuate certain parts of the image.

The form of the mirror surface 4 can be characterized by its intersectional lines 6, 7, 7' with the planes for the window surface 3 and planes 5' parallel with a viewing plane which preferably consists of window surface 5. When the reflecting surface 4 and thus also its intersectional line 7' with plane 5' is curved in relation to window surface 3 a distorted mirror image of the original image applied on the window surface 3 can be seen through the window 5. The mirror image is a non-real inverted image the transformation or distortion of which depends on the form of the reflecting surface 4 in relation to the window surface 3 and the viewing plane. In the illustrated case where the curve radius r for the reflecting surface 4 in the mirror point "O, O'" is smaller than the the radius of the window 3, the image is distorted so that the parts "A" of the image which are mirrored closer to the the intersectional line 6 of the mirror with the window 3 is re-

produced as larger ("A'"), while those image parts "a" which are mirrored further away from the window 3 (and in Fig. 1 thus higher up ("O'") is mirrored on the mirror surface 4 which here is more curved than in the lower part of the mirror 4) is reproduced as smaller ("a'") and closer to the intersectional line 7. This leads to a transformed image which is curved in relation to the original image.

The transformation of the image depends on the curve radius of the mirror surface 4 within each partial area as well as of the angle α between the mirror surface 4 and the viewing plane which in Fig. 1 is depicted equal to the window 5. In case the angle α always is the same a continous image is obtained while the changing of the angle in certain cases may lead to discontinuity in the transformed image. An angle of about 45° between the mirror surface and the viewing plane have proved especially advantageous for avoiding discontinuities.

If the original image is a straight line in a plane parallel with the viewing plane 5 said line is reproduced in accordance with the illustrated embodiment in the viewing plane 5 as curved in a direction towards the intersectional line 7. This fact leads to a special embodiment of the invention with which embodiment it is possible to transform a straight line into a circle and a linear image into a circular one. This embodiment is illustrated by Fig. 2 and its cross section in Fig 3. The said embodiment is characterized in that the first contact window 3 is formed of the outer surface 11 of a transparent cylinder, whereby the mirror surface 4 is formed of a conical surface 12 situated inside the cylinder surface 11 and having its top 13 directed towards the viewing plane 5, which in the illustrated case is a plane perpendicular to the cylinder wall 11. The top angle of the mirror cone 12 is about 80 to 100°, preferably close to 90°.

The embodiment of the invention which is depicted in Figs 2 and 3 is suitably produced from a rod of transparent material, whereby the viewing plane 5 is formed by one end face 14 of the rod while the other end face comprises an inwards tapering conical surface 12. As a protection against undesired reflexes the cylinder wall includes a preferably dark non-transparent surface structure in the areas which do not form the window 11. An apparatus of the above described kind may easily be produced by turning and polishing from a variety of transparent materials such as e.g. acrylic plastic.

The process according to the invention will now be more closely described with a reference to the embodiment exemplified by Figs 2 and 3. A series of characters on a substantially straight base line, such as a text intended for a circular stamp, is applied on a partly transparent material such as paper. The paper strip is is wound around the cylinder wall 11 with the character series against the window 5. In order to facilitate centering the paper strip may be provided with guiding marks 16 marking a base line wheras the cylinder wall 11 is provided with corresponding guiding marks such as guide lines 19 to facilitate the placing of the base line parallel with the viewing plane 5. The positioning is further facilitated if the prismatic body is provided with an extension 20 which does not take part in the the optical transformation but provides a support for the character strip as it is placed against the cylinder wall 11. This extension 20 is preferably made of non-transparent material in order to avoid extra reflexions upon the reflecting cone surface 12.

When the paper strip is evenly illuminated from outside the character series on the paper strip is mirrored inversly and distorted via the conical mirror surface 12 towards the viewing plane 5. In a direction straight through the viewing plane 5 the transformed image of the character series is seen as circular image which then can be reproduced e.g. through photographing with the focusing adjusted for a distance corresponding to the height of the cylinder.

The characteristics of the transformation can be seen in Figs 4 to 6. The character series in Fig. 4 has been transformed into the circular character series of Fig. 5 with the aid of the invention. Thereby the form of the characters has been slightly changed so that a orientation towards the center has taken place. This orientation provides a further advantage of the invention since this orientation modifies the the characters so that they assume the optically correct form in the circular connection. Fig 6 on the other hand shows that the invention can be applied to the simple transformation of any kind, whereby the characters always become optically corrected.

In the corresponding way not only circular transformations can be obtained but also figures of another more or less arbitrary kind can be made. To this end the form of the reflecting cone can be varied or the viewing plane can be laterally tapered towards one edge. Thus it is for example possible to produce an elliptical form with the aid of the invention.

By using the above described transformations it is thus possible to obtain an image which reproduces an arbitrary series of characters transformed into another almost arbitrary form depending on the form of the prism or mirror used. The image thus obtained can then be treated in the desired way for the production for example of clichès, enlargements, etc. for use in the production of stamps.

Claims

1. Process for producing by photo setting a master for the production of stamps or the like of a suitably text like image (A, a, 17) set along generally straight base line (16) whereby the image is geometrically transformed via a substantially curved mirror surface (4, 12) of a transparent rod like body, said mirror surface (4, 12) forming an inclined angle in relation to said image, so that the master will comprise the corresponding image (A', a', 18) in a distorted curved form, c h a r a c t e r i z e d in that the image in the form of one or several character lines (A, a, 17) set on an at least partially transparent material is applied at a transparent part (3, 11) of the circumference of the said body and suitably along support line extending around the body, in that the character line (17) is illuminated from the outside, in that the distorted image (A', a', 18) reflected through said body via the suitably conical mirror surface (4, 12) towards the end plane (5, 14) of said body is reproduced, and in that said reproduction is treated with photometric methods to form a master for the production of stamps or alike.

2. Process according to claim 1 for the transformation of text, c h a r a c t e r i z e d in that the text (17) is applied turned the right way round directly into contact with a first window (3, 11) and the distorted and mirror-inverted image (A', a', 18) which can be seen through a second window (5, 14) is photographed for further treatment by photo setting to form casting moulds for stamps.

3. Apparatus for the transformation of images (17) set along a suitably straight base line (16) on an at least partly transparent material, whereby the image is transformed into a distorted form via a reflecting surface having an inclined angle in relation to a first window (3, 11), c h a r a c t e r i z e d in that the apparatus comprises a rod like transparent body one end surface of which comprises a curved re-

flecting surface (12), in that said first contact window (3, 11) is provided on the rod like body in front of the curved mirror surface (12) and suitably extends along the periphery of the body and at which window (3, 11) the image (17) to be transformed is applied, and in that the other end surface of the rod like body comprises cross surface having a second window (5, 14), through which the distorted image (18) is reproduced to be processed into a master for photo setting.

4. Apparatus according to claim 3 c h a r a c t e r i z e d in that the curve radiuses (r) of the reflecting surface (4, 12) in the transverse plane (5') perpendicular to the longitudinal axis of said rod varies as a function of the distance to said second window (5, 14), while the inclination (α) of the reflecting surface in relation to said transverse plane (5') suitably is constant and less than 90°.

5. Apparatus according to claim 4 c h a r a c t e r i z e d in that said first window (3, 11) comprises a curved surface whereby the first window surface (3, 11) and/or the reflecting surface (4, 12) in said apparatus at least partly are formed by one or several combined surfaces of revolution or parts of the same.

6. Apparatus according to any of the claims 3...5 c h a r a c t e r i z e d in that the curved reflecting surface (4, 12) consists of at least one cone segment, suitably of two opposite cone segments.

7. Apparatus according to claim 5 or 6 c h a r a c t e r i z e d in that the transparent rod is a cylinder the wall of which in part forms said first window (11) and one cross sectional surface of which forms said second window (14), while the other end surface at least partly is formed as a cone (12) having its top (13) directed towards the interior of the rod, the surface of the cone (12) forming said curved reflecting surface (4).

8. Apparatus according to claim 7 c h a r a c t e r i z e d in that the top angle of the conical surface (12) is between 80 to 100°, preferably close to 90°.

9. Apparatus according to any of claims 3...8 c h a r a c - t e r i z e d in that said first window (3, 11) comprises means (19, 20) for centering and/or orientation of the image to be transformed.

10. Apparatus according to any of claims 3...9 c h a r a c - t e r i z e d in that said first window (3, 11) is limited in a direction towards the cross sectional end surface of said rod and suitably to that part which lies outside the area between the intersectional line (6) of the cone surface (12) and the cylinder wall (11) and a plane straight through the peak (13) of said cone (12), by a non-transparent surface structure and preferably in the opposite direction by a suitably non-transparent extension (20) which does not take part in the optical transformation.

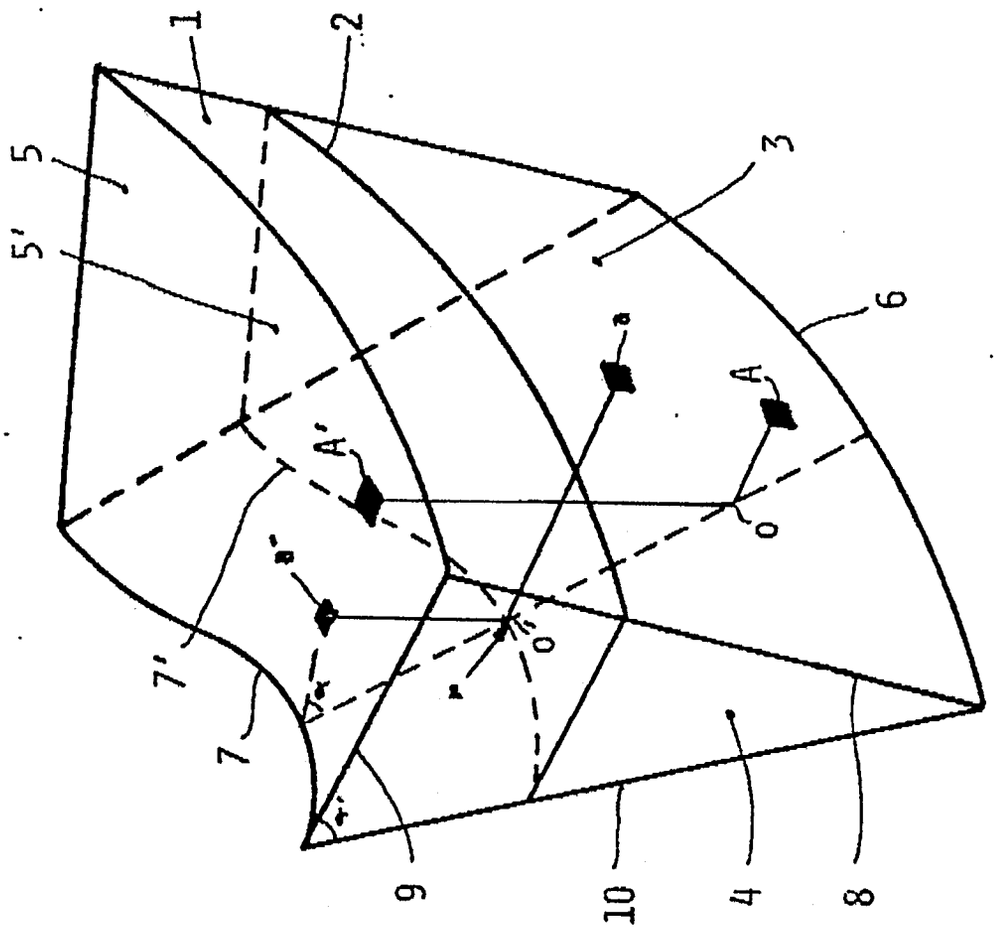

FIG 1

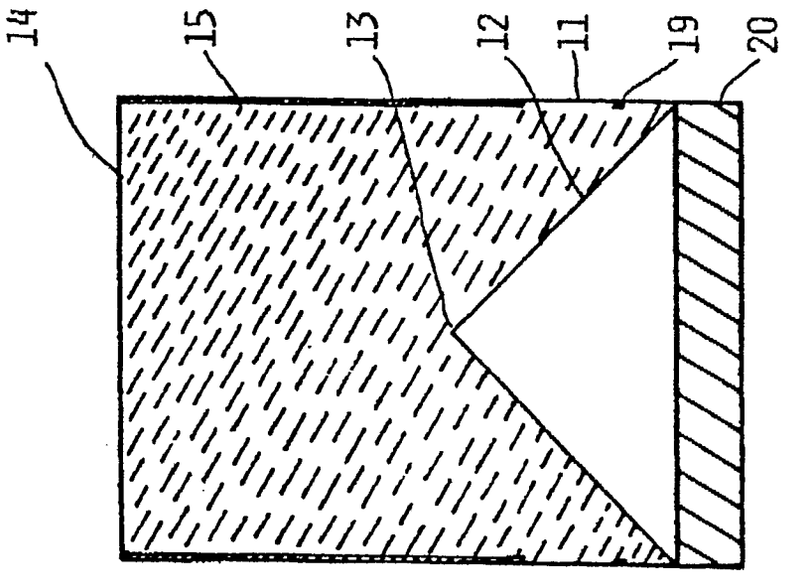

FIG 3

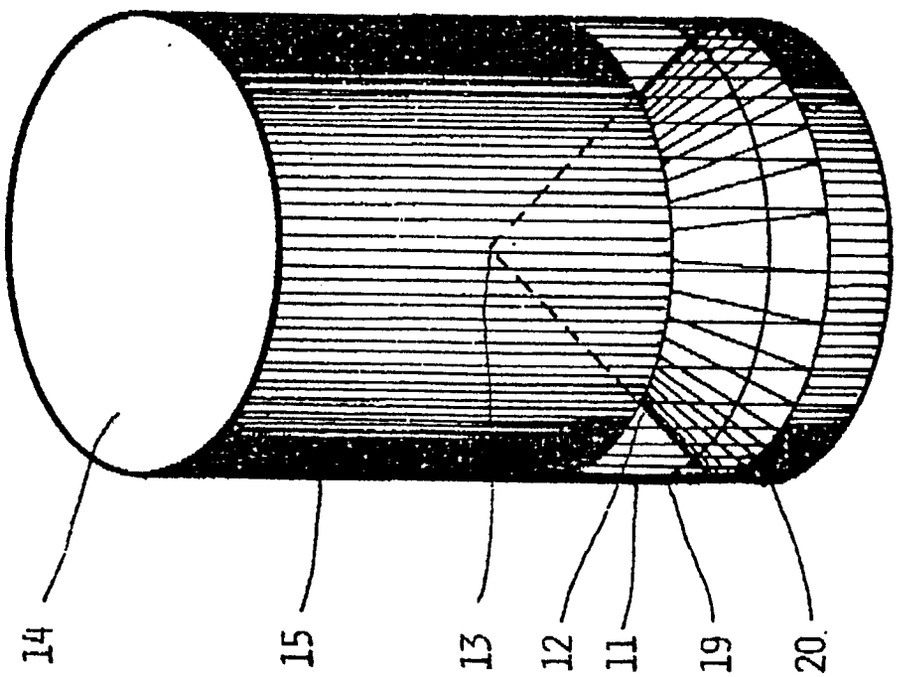

FIG 2

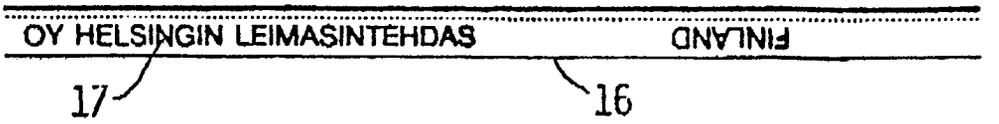

FIG 4

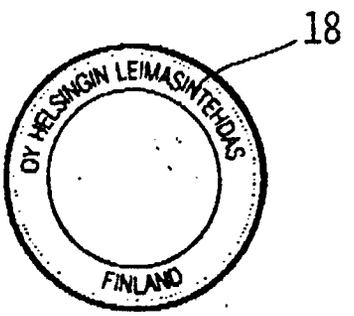

FIG 5

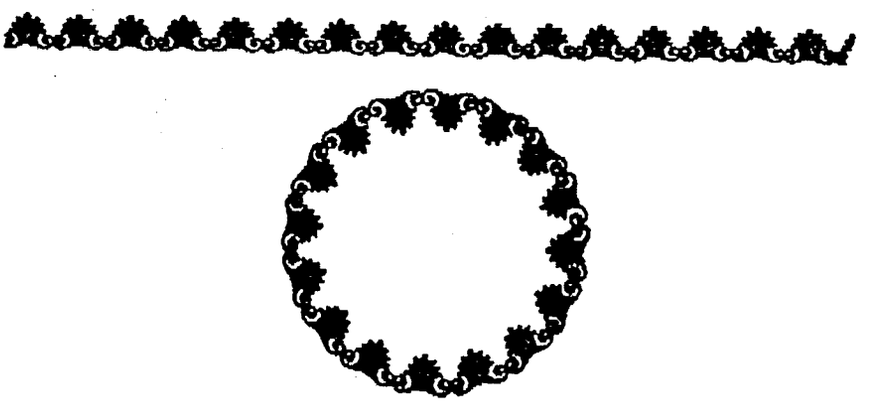

FIG 6