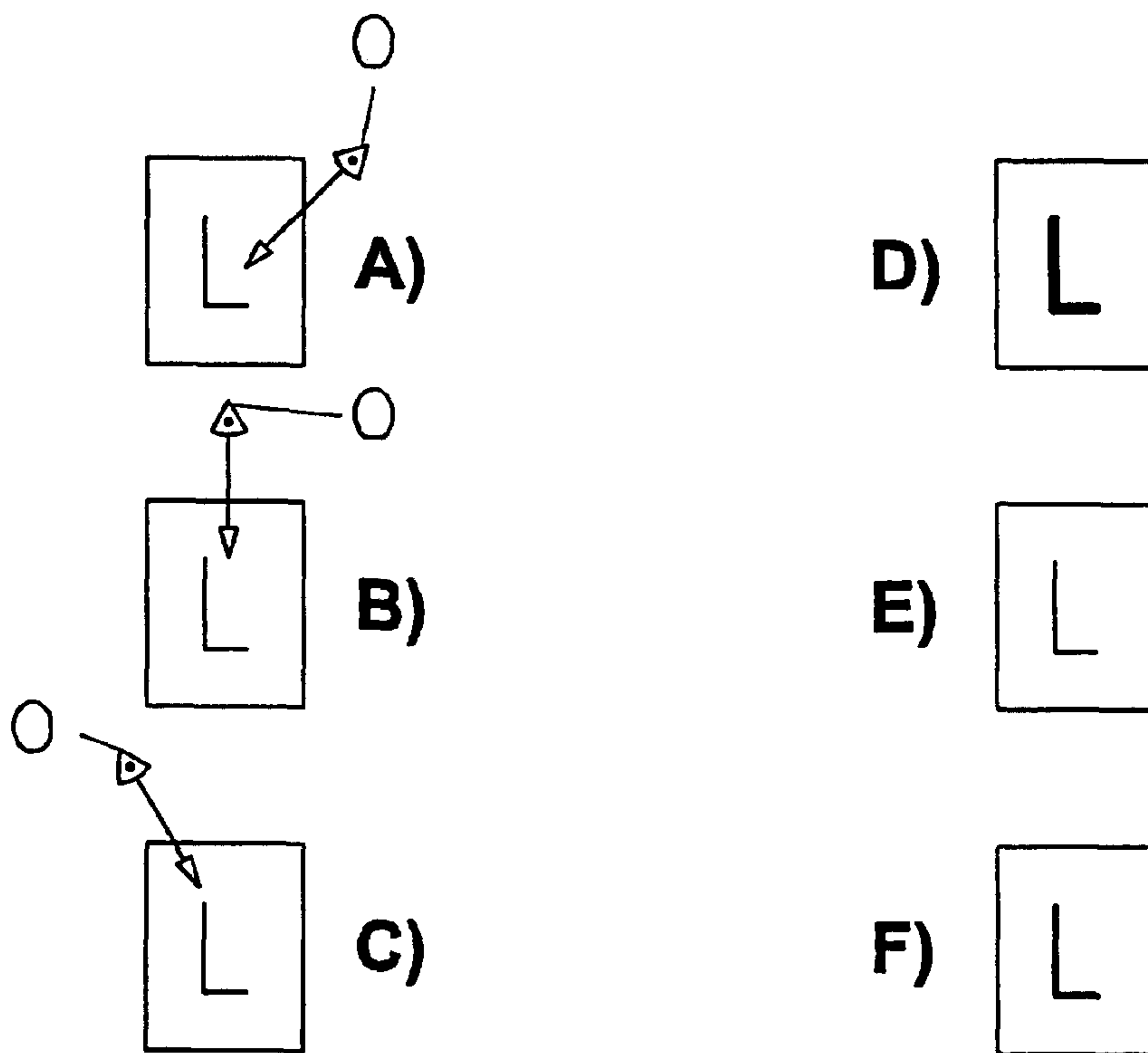




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 (71) Demandeur/Applicant:  
BOEGLI-GRAVURES S.A., CH  
 (72) Inventeur/Inventor:  
BOEGLI, CHARLES, CH  
 (74) Agent: FETHERSTONHAUGH & CO.

(54) Titre : DISPOSITIF POUR GAUFRER ET/OU GLACER UN MATERIAU PLAT  
 (54) Title: DEVICE FOR EMBOSSED AND/OR SATIN-FINISHING A FLAT MATERIAL



(57) **Abrégé/Abstract:**

The invention relates to a device for embossing and/or satin-finishing a flat material, comprising at least two embossing rolls that are linked with a drive and that can be driven individually or jointly. The rolls can be elastically pressed against each other and the pyramidal teeth of the rolls have a flattened tip. In order to produce an embossed structure with variable optical effects the teeth (T2) of at least one of the rolls are adapted to provide the flat material, especially the metallized packaging foil, with a sign (L) whose aspect varies depending on the visual angle of the viewer (O) and/or kind and/or location of the source of light (LS). These teeth (T2) have, for example, a height that is inferior to that of the remaining teeth (T1). The inventive device allows not only production of special effects by embossing but also production of security features that are especially forgery-proof.

## Abstract

The invention relates to a device for embossing and/or satin-finishing a flat material, comprising at least two embossing rolls that are linked with a drive and that can be driven individually or jointly. The rolls can be elastically pressed against each other and the pyramidal teeth of the rolls have a flattened tip. In order to produce an embossed structure with variable optical effects the teeth (T2) of at least one of the rolls are adapted to provide the flat material, especially the metallized packaging foil, with a sign (L) whose aspect varies depending on the visual angle of the viewer (O) and/or kind and/or location of the source of light (LS). These teeth (T2) have, for example, a height that is inferior to that of the remaining teeth (T1). The inventive device allows not only production of special effects by embossing but also production of security features that are especially forgery-proof.

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**DEVICE FOR EMBOSSING AND/OR SATINIZING FLAT MATERIALS**

[The present invention refers to a device for embossing and/or satinizing flat materials, more particularly packaging foils, and to packaging foils produced with the device.] A device of this kind is e.g. known from EP-B-925 911 to the applicant of the present invention. The device for satinizing a foil disclosed in this reference, which is based on the knowledge from earlier patents of the same applicant, comprises two embossing rolls that are arranged in a mutually displaceable manner such that a self-stabilizing effect is obtained when the teeth of the embossing rolls interpenetrate, thereby providing a high processing speed, on one hand, and a high precision, on the other hand. First of all, this allows a uniform satinizing, and with a corresponding machining of the teeth, a highly precise embossing of foils is provided.

EP-A2-0 194 042 discloses an embossed object on the substrate of which first and second optically non-diffractive relief elements defining first and second patterns are embossed, the patterns having a uniform reflectivity and their appearance varying with the viewing angle. The specification discloses line patterns only, and no satinizing is intended.

This advanced prior art with regard to the quality of the embossing and satinizing has led to the desire and the need and thus to the object of the present invention to provide an embossing device that allows to emboss the flat material with signs including optical effects depending on the viewing position and/or the light source, thereby also allowing to produce security features that are very difficult to copy. In addition to the sign, the packaging foil produced in the device should also be satinized.

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The first object is attained with a device according to claim 1. Further advantages and characteristics are defined in the dependent claims. A packaging foil embossed in a device of this kind is defined in claim 10.

The invention will be explained in more detail hereinafter with reference to drawings of exemplary embodiments.

- 10 Fig. 1           schematically shows a developed view of a conventional tothing of a satinizing roll,
- Fig. 2           shows the stable position of engagement of conventional toothings of two satinizing rolls,
- 15 Fig. 3           shows a conventional tothing on an enlarged scale,
- Fig. 4           shows a tothing of the invention on the same scale as in Fig. 3,
- 20 Fig. 5           shows the stable position of engagement of the toothings of two satinizing rolls of the invention,
- 25 Figs. 6A-6F show the effect of a special embossing of the invention by way of an exemplary sign, and
- Fig. 7           shows a possible disposition of several embossed signs.
- 30

As to the fundamental structure of an embossing device, reference will be made to US-A-5 007 271 to the applicant of the present invention. A foil band is passed between two toothed embossing rolls of which one is fixedly supported

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and driven while the other one is freely rotatably  
journalled on an axle and is capable of being resiliently  
pressed against the driven roll with an adjustable pressure  
by spring force or by pneumatic or other means.

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In the device of the prior art, e.g. according to EP-B-925  
911, both embossing rolls are provided with a superficial  
toothing of the same kind which is schematically shown in  
Fig. 1 in a developed view, and which comprises pyramidal  
10 teeth that are arranged in rows extending in the  
circumferential direction, i.e. in the direction of rotation  
indicated by the arrow, and perpendicularly thereto in the  
axial direction. According to Fig. 2, the tips of the teeth  
are flattened, i.e. shortened in practice by at least 2%,  
15 preferably by up to 25% of the theoretical geometrical tooth  
height. Furthermore, the edges of the pyramidal teeth resp.  
of the truncated pyramids are preferably chamfered. Instead  
of pyramidal teeth, it is also possible to use conical resp.  
frustoconical teeth.

20

In the preferred embodiment according to the above-mentioned  
reference, the rolls have a relative axial play of at least  
half the tooth pitch, preferably of three quarters of the  
tooth pitch, thereby allowing a mutual displacement of the  
25 rolls into a stable position.

While these embossing rolls of the prior art are provided  
with toothings of the same kind, it has been found that  
providing at least one roll with teeth of a different  
30 design, more particularly with respect to the tooth height  
and the tooth surface, allows producing embossed structures  
that may be defined as shadow patterns, where the intensity  
of the signs embossed within the satinized background varies  
according to the viewing angle of the observer and/or the

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direction and the kind of the lighting, thereby producing a shadow-like effect.

It is obvious that the geometrical center lines of the  
5 teeth, i.e. the grid, must be equidistant as a  
synchronization or self-synchronization is otherwise  
impossible. For technical reasons, it is furthermore  
advantageous to use teeth having the same horizontal  
projection, so that the variations relate either to the  
10 tooth height or to the design of the tooth flanks and/or  
edges and/or to a surface design such as a roughened,  
corrugated, or patterned surface, or a combination of two or  
of all parameters.

15 In the embodiment of Fig. 4, two teeth T1 are shown which  
are designed as the teeth according to Figs. 1 to 3, and all  
of which have the same geometrical dimensions and produce a  
normal satinizing, as well as the teeth T2 on the left of  
Fig. 4, having e.g. a smaller tooth height, or alternatively  
20 different tooth flanks or surfaces. In the known embossing  
process, the teeth are completely eroded in the locations  
where the signs are to be produced.

In principle, the teeth T2 of different height, shape, or  
25 surface than teeth T1 may be arranged in any way, but the  
teeth T2 are advantageously arranged in a specific manner to  
produce patterns, letters, or other signs. Fig. 4 shows a  
simple arrangement forming e.g. the letter L. By arranging  
the teeth T2 in such a configuration, the letter is produced  
30 such that according to the viewing angle, a higher or lower  
contrast, resp. a higher or lower intensity is obtained;  
while it is assumed here that the lighting source is  
constant and stationary. Alternatively, the position and/or  
the wavelength of the lighting source may be varied while  
35 the observer always sees the sign from the same angle, or

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both the viewing angle and the light source may change. The result always remains the same, i.e. the appearance of the sign changes as one or both or all parameters vary.

5 In Figs. 6A, B, C, the respective observer is designated by an "O", the arrow indicating the viewing angle and the observer looking at a satinized foil with a shadow-embossed L from the top right, from the top and from the left, respectively, in positions 6A, B, C, and the contrast being  
10 high according to 6D, low according to 6E and medium high according to 6F, while a constant lighting is assumed.

Fig. 7 shows by way of example how it is possible to arrange groups of signs in order to combine different features or to  
15 produce certain codes. Fig. 7 illustrates that from a given viewing angle and under an illumination LS from a given location, depending on its position, the letter "L" appears faint at the top and on the right (M), very faint at the top right (N), medium strong at the bottom and on the left (P),  
20 and very strong at the bottom left (Q). As explained with reference to Fig. 6, the appearance of a sign changes as the viewing angle is varied, but also when the position, the illuminating mode, the brightness and the wavelength of the lighting source changes.

25 For the sake of simplicity, the same letter "L" has also been used in Fig. 7, while it is understood that letters or numbers of any kind may be concerned. This procedure is very useful in the production of codes resp. security  
30 features, and it is also possible to use a sequence of numbers that changes.

Thus, these special effects on packaging bands, foils or boxes can be produced in a very large variety, and it is  
35 possible to produce them for any viewing angle and for a

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variation of the viewing angle and/or of the lighting source. These effects, depending on the viewing angle resp. on the lighting conditions or on the wavelength of the light, are a result of the design of the teeth. Thus, for example, variations in the arrangement resp. in the design of the tooth flanks and/or edges also produce effects depending on the viewing angle and the lighting conditions because the dimensions of the teeth are very small, so that variations in the shape or in the design of the surfaces of the teeth producing the signs will result in optical effects depending on the angular position due to different light reflections or diffractions on the embossed object.

Such signs may be provided on packaging materials for tobacco products, cigarettes, foods, chocolates, drugs or the like. Such packaging bands or foils are preponderantly composed of aluminum or preponderantly of easily foldable paper. Lately, for environmental reasons, the embossed materials have been modified in the sense that the embossed media such as metallized paper, amongst others, are highly fibrous while the thickness of the metallized layer has simultaneously been reduced, thereby substantially deteriorating the favorable folding behavior. This may also be the case if a synthetic substrate is used instead of paper, or if the metallized layer is replaced by a synthetic coating having similar properties. Today, multilayered foils with a paper substrate and a metal layer, and foils provided with a thin vapor-deposited metallic layer are distinguished.

So far, the embossed structures with the mentioned optical effects have been discussed in the context of a roll system including two embossing rolls. In order to take into account the above-described developments of the embossed materials, resp. their reduced metallization -- thereby

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enlarging both the field of applications and the manufacturing possibilities of such embossed structures with optical effects -- a device for the treatment of flat materials as described in previously unpublished  
5 International Patent Application PCT/00/023299 is advantageously used. In this device, the second embossing roll is followed by at least another embossing roll cooperating with the first or preceding embossing roll in order to produce substantially the same pattern in a  
10 subsequent embossing. This device may be modified such that instead of embossing the same pattern, the above-mentioned embossed structure with optical effects is produced in the subsequent embossing process by providing the additional roll, or one or several ones of the at least three embossing  
15 rolls, with teeth having different geometrical dimensions and/or differently designed surfaces.

It is also mentioned in the cited reference that the embossing rolls may be synchronized to each other by  
20 synchronizing means. Likewise, the present invention is not limited to embossing rolls of which one is journalled such as to be capable of an excursion in the longitudinal direction of the axis and/or in the direction of the contact pressure and/or in the passing direction of the embossed  
25 material in order to provide a self-synchronization. Furthermore, a respective tooth of one roll need not necessarily engage between four adjacent teeth of the other roll, as in Fig. 3, which illustrates the case of the so-called pinup-pinup configuration where the teeth of all  
30 rolls face outwards. On the contrary, in the embossing procedures of the invention, it may be useful to positively synchronize the embossing rolls, thereby also allowing to use a so-called pinup-pindown configuration where the teeth of one roll point out outwards and the teeth of a cooperating  
35 roll point out inwards.

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The above devices allow to produce not only changing optical effects through embossing, but also security features that are highly forgery-proof and generally visible by the eye.  
5 Such security features may e.g. be used for expensive drugs, electronic goods or in the tobacco industry.

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**Claims**

1. Device for embossing and/or satinizing flat materials, comprising at least two embossing rolls that are connected  
5 to a driving system and capable of being driven individually or in common, the rolls being adapted to be resiliently applied against each other, and the pyramidal or conical teeth of the rolls having flattened tips, characterized in that the teeth (T2) of at least one roll are shaped such as  
10 to produce embossed signs (L) in the corresponding locations of the passing flat material whose appearance changes according to the viewing angle of the observer (O) and/or the kind and/or the position of the lighting source (LS).
- 15 2. Device according to claim 1, characterized in that the other teeth (T2), which produce the changing signs (L), have a different geometrical shape and/or surface than the teeth (T1) producing the satinizing.
- 20 3. Device according to claim 2, characterized in that the other teeth (T2) have a smaller height than the remaining teeth (T1).
4. Device according to claim 2 or 3, characterized in  
25 that the other teeth (T2) have differently shaped flanks or edges than the remaining teeth (T1).
5. Device according to one of claims 2 to 4, characterized in that the surface of the flattened portion  
30 of the other teeth (T2) is structured.
6. Device according to one of claims 1 to 5, characterized in that it comprises two embossing rolls.

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7. Device according to one of claims 1 to 5,  
characterized in that it comprises two embossing rolls and  
the second embossing roll is followed by at least another  
embossing roll cooperating with the first or preceding  
5 embossing roll in order to produce the signs of changing  
appearance in a subsequent embossing process, the other  
teeth (T2) being provided on one or on several ones of the  
rolls.
- 10 8. Device according to one of claims 1 to 7,  
characterized in that the embossing rolls are mutually  
synchronized by synchronizing means.
- 15 9. Device according to one of claims 1 to 8,  
characterized in that at least one of the undriven rolls is  
journalled as to be capable of an excursion in the  
longitudinal direction of the axis and/or in the direction  
of the contact pressure and/or in the passing direction of  
the embossed material.
- 20 10. Metallized and/or reflecting packaging foil produced  
in a device according to one of claims 1 to 9, characterised  
in that it is satinized and provided on the satinized  
background with a sign (L) whose intensity changes according  
25 to the viewing angle (O) and/or the kind and/or the position  
of the lighting source (LS).
- 30 11. Foil according to claim 10, characterized in that it  
comprises at least one group of signs (L) having the same  
appearance individually, in pairs or in groups.

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Fetherstonhaugh & Co.  
Ottawa, Canada  
Patent Agents

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FIG. 1

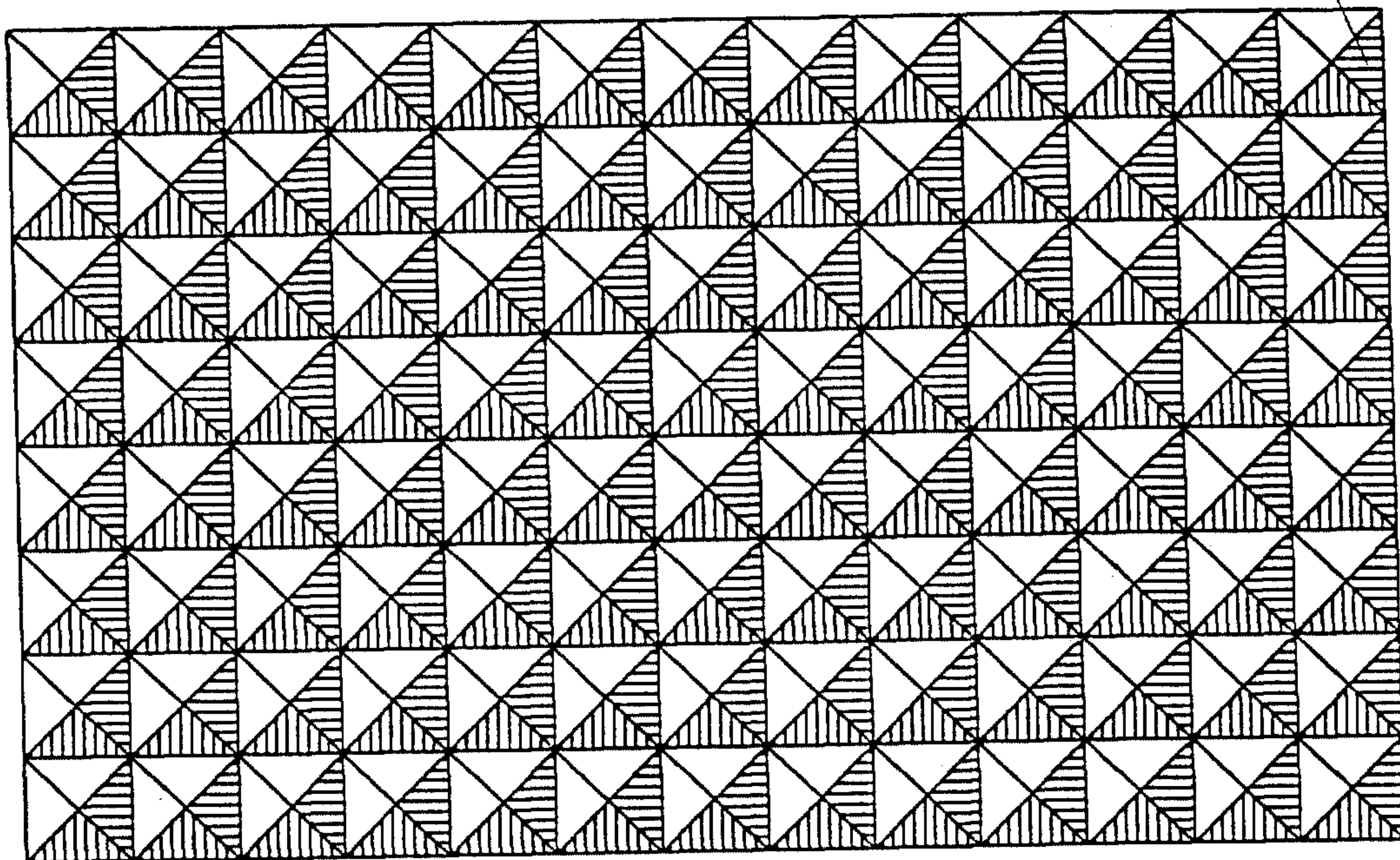


FIG. 2

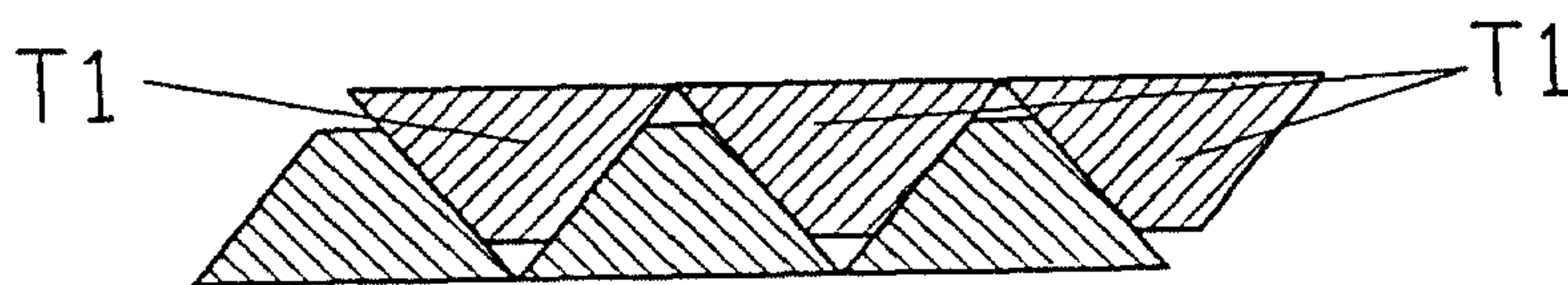
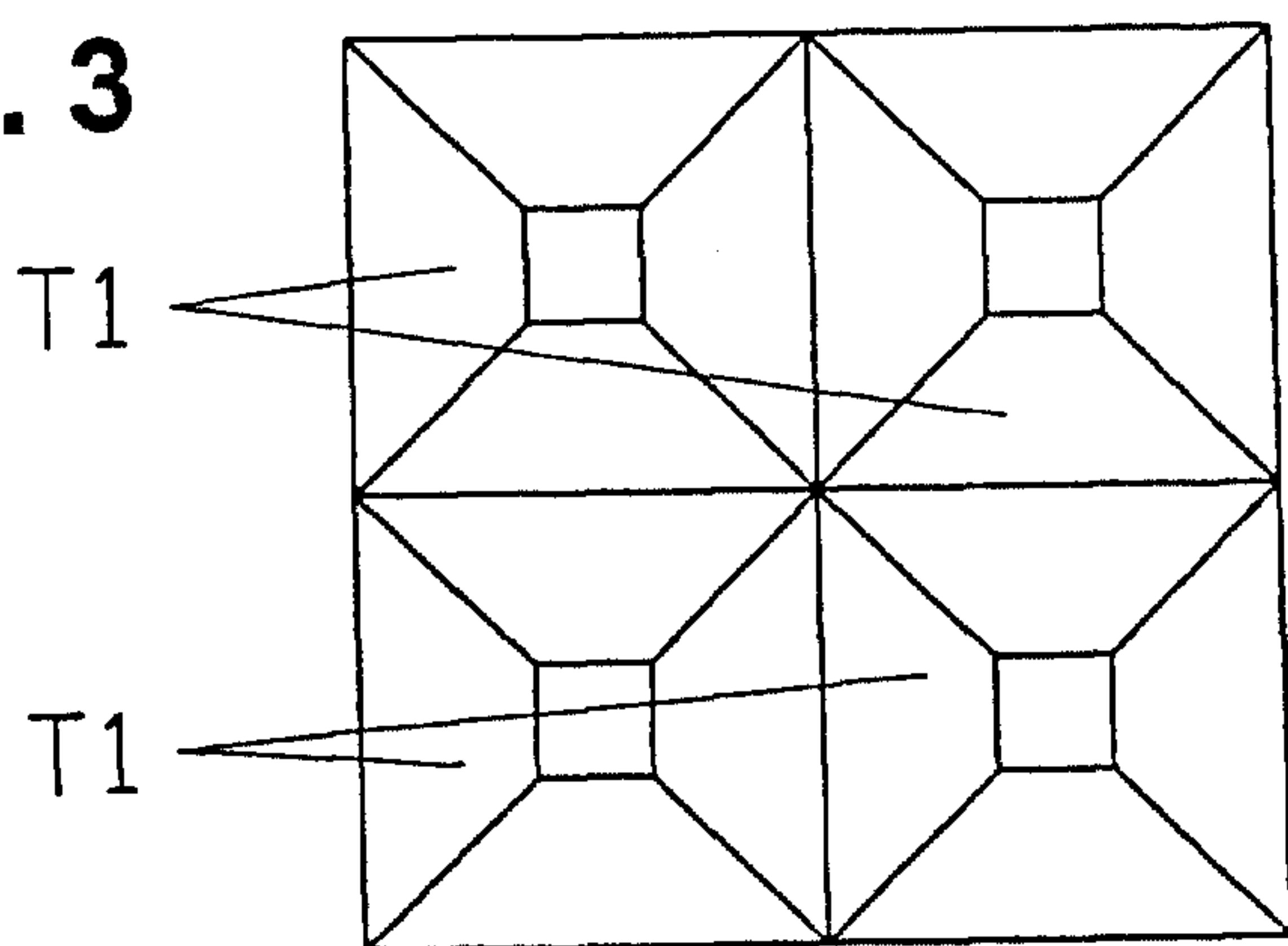


FIG. 3



T2

FIG. 4

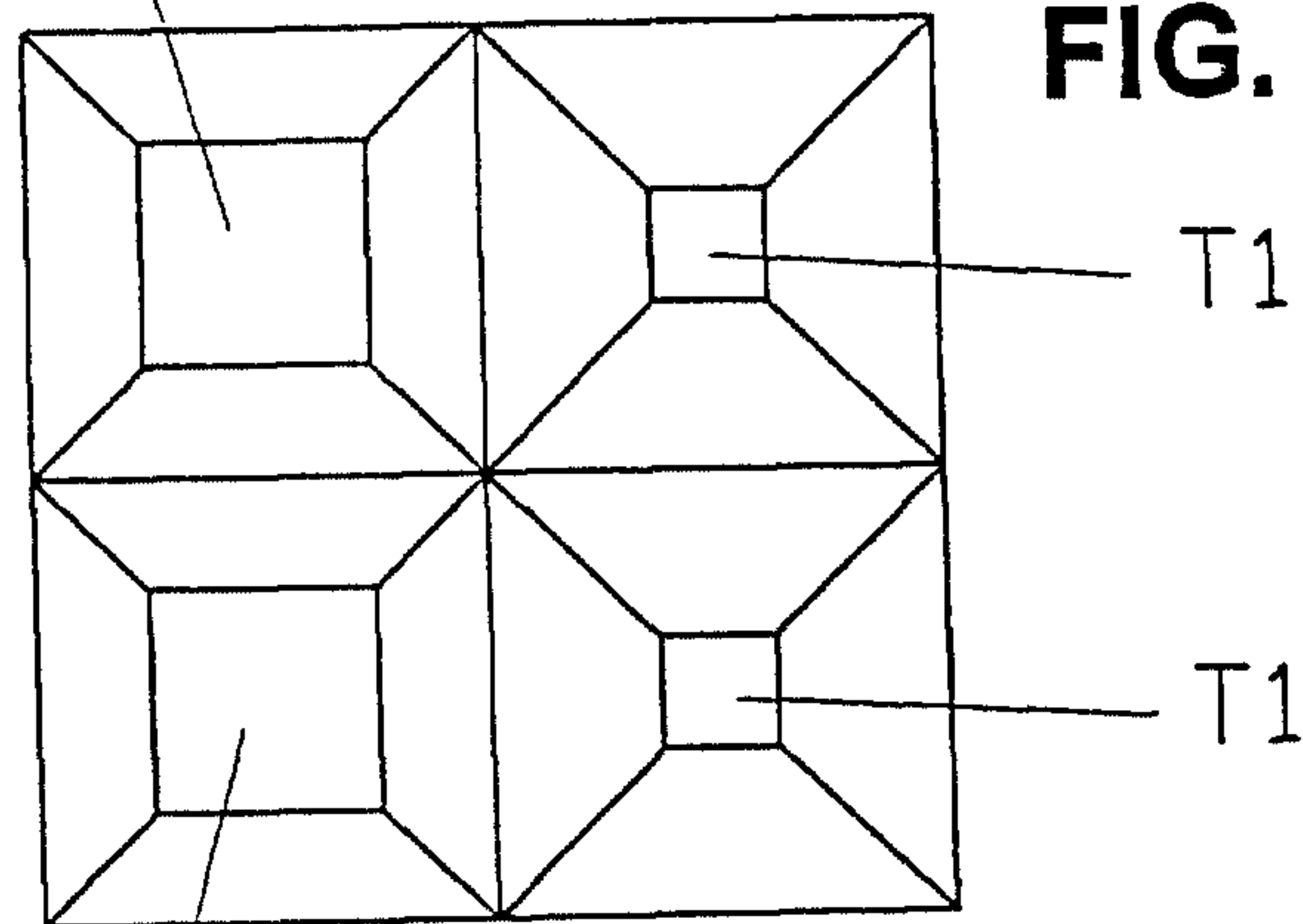
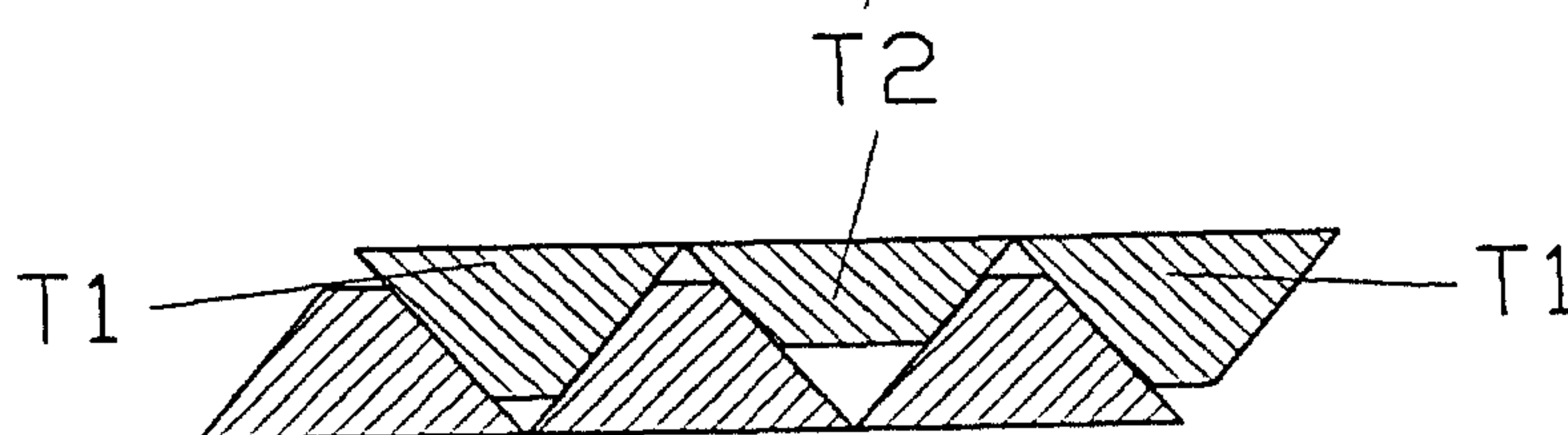


FIG. 5



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FIG. 6

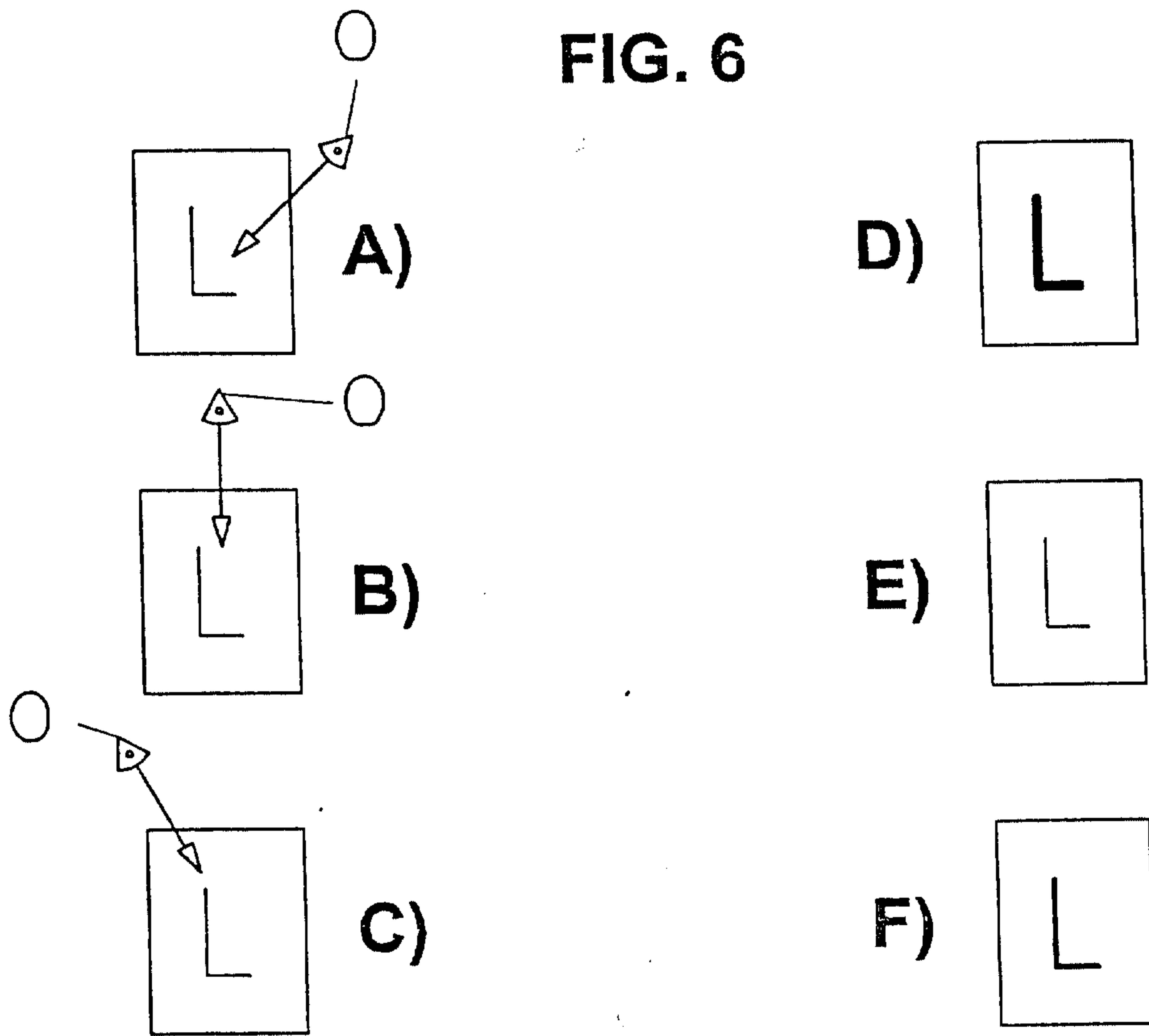


FIG. 7

