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(54) Improvements in and relating to anti-photocopying measures

(57) An article (1) which cannot be photocopied by conventional photocopiers. The article (1) has an area which appears to a user as an area of constant tint when held at arms length. However, the area comprises at least a first (2) and a second (3) region of dots (4, 6). The dots (4) of the first region (2) are above the resolution threshold of a photocopier whilst the dots (6) of the second region (3) are below the resolution threshold of the photocopier. The screen angle, percentage selective coverage and line screen of the dots (4, 6) are varied so that the two regions appear as a single area of tint when held at arms length.

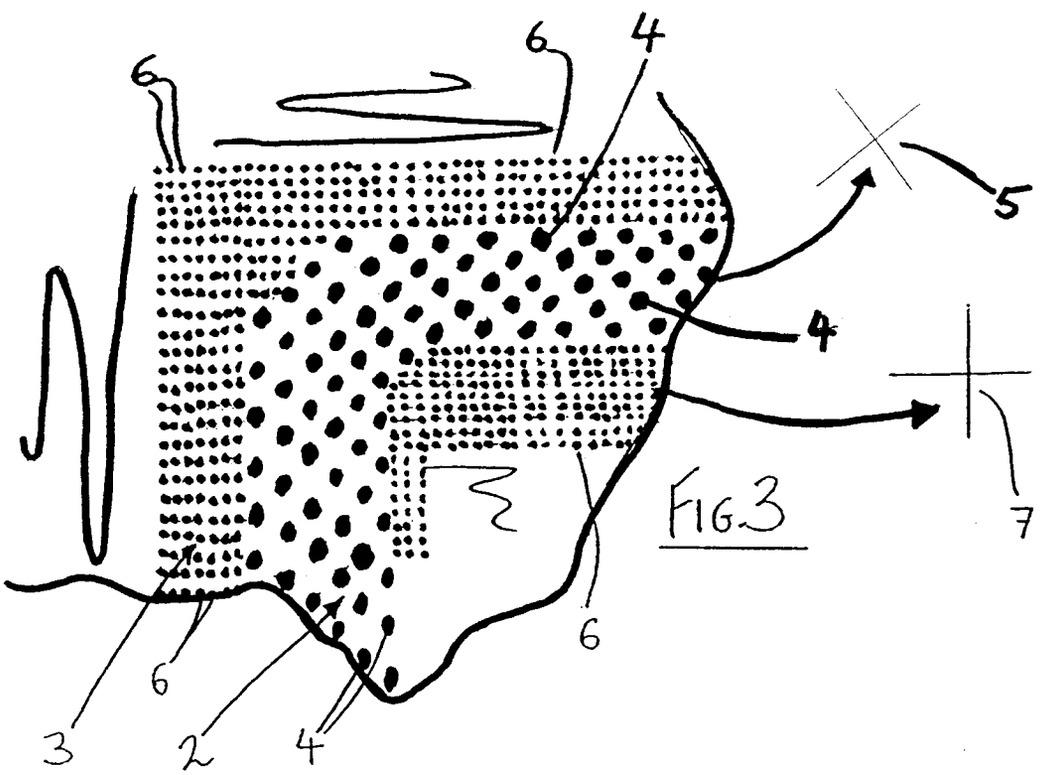

FIG.3

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Description

This invention relates to anti-photocopying measures, and especially, but not exclusively, paper and paper articles that have anti-photocopying security areas provided on them.

For many years now it has been desirable to be able to deter forgery of documents (e.g. banknotes, entrance tickets, vouchers, MOT Certificates, letters from sensitive positions or people, or any other document) using photocopiers (or Xerox machines as they once were). It is usual to provide a discrete region on the article that carries a pattern, typically a seemingly random pattern of blotches or wiggles, which attracts the attention of the human eye so that the casual observer sees the pattern, and not a hidden security marking which is also present, but which does not stand out to the human eye. When this patterned region is photocopied the photocopier is misled by the pattern: it reproduces according to its resolution capacity and the combination of the hidden security marking overlaid with the pattern is strongly reproduced, whereas the masking pattern alone, away from the hidden security marking, is less strongly reproduced. This causes the photocopy to show the security marking prominently.

Some ways of hiding a security marking by overlaying a masking pattern are shown in British patents 1 599 701 and 1 599 702. Some other ways of achieving a security marking involve using special inks which are differentially seen by the photocopier and the human eye. Of course, if different photocopiers use illumination of different frequencies any one sheet of paper (or article) which is "tuned" to show a security marking at one wavelength of illumination may not work so well at a different wavelength of illumination.

According to a first aspect the invention comprises a method of providing an anti-photocopying mark or area on an article such that when the article is photocopied a hidden security marking is visible on the copy, the method comprising providing the mark or area as a tint by having a first region made of dots, and a second region made of dots, and ensuring that the dots of the first region are large enough and dark enough to be above a resolution threshold of a photocopier and that the dots of the second region are below the resolution threshold of the photocopier, so that when photocopied the first region has more prominence to the eye in the copy than it did in the original article, the method comprising ensuring that the dots of the first and second regions are arranged such that when the mark or area is looked at with the naked eye at arms length the mark or area appears at a casual glance to be a plain or flat tint, instead of appearing to be a patterned area.

Providing a security area/marking as a tinted area rather than as a box which appears to the usual eye as a blotchy pattern is more attractive and more acceptable in some areas of use. An area of blotchy pattern on an article, as a security device, can detract substantially from the overall eye appeal of the article. Providing an area of flat tint is less eye-catching, and does not affect the overall visual appearance of the original article so much. This is especially so if the entire surface, or an entire information/presentation panel of the article is so "tinted".

Even if a discrete box is provided on the article as an anti-photocopy measure it is still less obtrusive to have it as a neutral tint box rather than a patterned box.

Preferably the method comprises providing the article with a surface, or display panel, which is substantially entirely covered with the tint (comprising first and second regions).

Preferably the method further comprises applying additional visual markings over the tint (e.g. writing, or pictures, or both). This can help make the difference between the first and second areas even less visible in the original document. Furthermore, because the tint is less eye-catching than a patterned area we can use the tint area to perform information - presenting functions as well as be a security feature (which is difficult/not possible with a heavy pattern).

Preferably the dots of the first and/or second region are uniformly spaced from other similar dots of their region.

Preferably the method comprises using dots in the first region of a different size from those of the second region. The dots of the first region may have a line screen of between 55-75 line screen preferably between 60-70 line screen and, most preferably about 65 line screen (or about 62, 63, 64, 66, 67, 68).

Preferably the dots of the first region cover between 10% to 20% of the area of the first region, most preferably about 13% (or 11, 12, 14, 15 or 16%).

The dots of the second region may have a line screen of between 120-150, preferably between 125 to 135 and most preferably about 130, (or 120, 125, 135 or 140).

Preferably the dots of the second region cover between 6% to 12% of the area of the first region, most preferably about 9% (or 7, 8, 10 or 11%).

Preferably the ratio of line screen of the dots of the first region to those of the second region is about 1:2.

Preferably the ratio of the area of the first region covered by dots (as opposed to the area of space between first region dots) to the area of the second region covered by dots (as opposed to the area of space between second region dots) is about 4:3.

Preferably the screen angle of the first region dots is different from that of the second region dots. Preferably the difference in first and second region dot screen angles is at least 20°, or at least 30°. It may be in the range 30-60°, and most preferably about 45° different.

The screen angle of one of the first or second region dots may be about 90°, and the screen angle of the other of the first or second region dots may be about 45°.

According to a second aspect of the invention we provide a photocopiable article having at least an area

of tint, the tint area comprising one or more first regions of first dots and one or more second regions of second dots, the first and second regions appearing to a casual observer, with the article at arms length, as a plain tint area without any masking pattern being seen, and the first and second regions of dots being such that when the article is photocopied the dots are capable of having one set of dots below the resolution capacity of a photocopier that is used and the other set of dots above the resolution capacity, so that the copy has anti-photocopy indicia made visible on it.

Preferably the article is a sheet of paper. The tint area may extend over a substantial part of the area of the paper, for example over 30% or 50% or more of the area. Preferably the tint area extends over the entire area, or substantially the whole area, of the sheet of paper. The sheet of paper may carry other markings, such as writing/typing.

The article may be an entrance ticket, a voucher, a certificate, a cheque, a letter, or the like. It could be continuous stationery. The invention is also applicable to NCR paper, e.g. the upper sheet, or a lower sheet, or both.

According to another aspect the invention comprises the use of dots of one size and/or spacing and dots of another size and/or spacing, above and below the resolution capacity of a photocopier, to prevent that photocopier from producing a faithful copy of an original article that carries the dots, the dots being arranged such that when the area is viewed by a casual observer at arms length they are not individually readily discernible, instead the dots forming an area which appears to have a tint.

The use of a flat tint areas as an anti-photocopying measure has the advantages previously discussed.

Embodiments of the invention will now be described by way of example only with reference to the accompanying drawings of which:-

Figure 1 shows a sheet of paper in accordance with the invention;

Figure 2 shows a photocopy of the sheet of paper of Figure 1;

Figure 3 shows schematically magnified detail of a security tint given to the paper of Figure 1;

Figure 4 shows an entrance ticket made using the paper of Figure 1;

Figure 5 shows a photocopy of the ticket of Figure 4; and

Figure 6 shows magnified detail of a second security tint given to a second article.

A sheet of "white" paper 1 is shown in Figure 1. Typically it is A4 paper, but it could be any size. It has a pale blue/grey tint on one side of it. The tint is not really very noticeable unless it is placed next to a truly white paper. The tint is caused by the upper surface of the sheet of paper being covered, in its entirety, by small discrete dots. The dots are provided in two kinds of regions best shown in Figure 3: anti-photocopy marking regions 2, and background tint regions 3. The dots of the regions 2 and 3 are different.

The dots, referenced 4, of the anti-photocopying marking regions 2 are of 65 line screen (65 dots per inch in a horizontal row of them) and have 13% of the total area of the regions 2 covered in dot (and 87% space between dots). The dots 4 are discrete dots and have a screen angle of 45° (illustrated by schematic screen angle representation 5 shown on Figure 3). It will be appreciated that the line screen of a matrix of dots is the same in two perpendicular directions - i.e. they have a square pattern matrix.

The dots, reference 6, of the tint regions 3 are of 130 line screen (dots per inch in a horizontal row of them) and have 9% area cover of the total area of the regions 3 (and 91% of the area as space between discrete dots). The dots 6 have a screen angle of 90° (illustrated by schematic screen angle representation 7 shown in Figure 3).

The dots 4 and 6 are printed with the same inks, usually in the same printing operation.

The anti-photocopy marking regions 2 spell out the word "COPY", which is repeated across the surface of the sheet 1.

When the sheet 1 is photocopied by a typical commercially available photocopier (e.g. a Cannon, Xerox, Toshiba (all Trademarks) in colour or black and white) the dots 6 are below the resolution capacity of the photocopier and are not seen by the photocopier, and not copied (or are of such small resolution that the photocopier works imperfectly at that resolution and the dots 6 are not copied properly). The dots 4 are above the resolution capacity of the photocopier and are substantially reproduced. Thus an anti-photocopy security message 8 on the sheet of paper is reproduced when it is photocopied, whereas the background tint is not.

It will be appreciated that a user who holds the sheet 1 close to his eyes and studies it can indeed see (unaided) the anti-photocopy regions 2 and distinguish them from the background tint 3. Indeed he can see the individual dots 4. He can even see the individual dots 6 if his eyesight is good. However, when the sheet 1 is held at normal reading distance, say 40-50, or 60 cm from the readers eyes (or further away) a casual glance at the sheet does not reveal to the reader the different regions 2 and 3: the sheet just looks tinted blue/grey.

Standard typeface, when typed or printed, onto the sheet 1 is legible at a normal reading distance, without the background tint effect of the paper, or the security markings, substantially affecting its legibility. Indeed, with something recognisable for the eye to follow (e.g.

words or letters, or a picture) presented on the sheet the regions 2 may be even less noticeable than they are with a blank sheet. This might be because the eye is distracted.

The sheet 1 can be used for normal letter writing.

It will be appreciated that the regions 2 and 3 between them extend over the entire surface of one side of the sheet 1. They may also extend over the reverse side of the sheet. There may be only one region 2 on any one side of the sheet.

We may provide batches of paper with different hidden security messages/markings on them. For example, a reference number, or a different font lettering, or a different security message, may be provided on different batches of paper. This can enable the source of the paper to be traced in the event of a copy coming to light.

Figures 4 and 5 show an original entrance ticket 10 (e.g. ticket to a sporting event or concert) and a photocopy respectively.

The ticket 10 can be printed on paper similar to that of Figure 1. We may provide the paper and let the customer do their own overprinting 11 (with printing presses, or with laserjet, bubblejet etc printers), or we may provide the finished ticket. When the ticket is copied security markings become visible in the copy.

The feature of different batches of tickets (possibly every ticket) having a different security code revealed when it is copied may be used to trace the source of original tickets. This could be helpful to stop, for example, ticket touts (or more accurately to identify the people who sell the tickets to ticket touts) by looking at a copy of a ticket.

The hidden coding of a batch of tickets need not be easily noticed by a casual observer. Indeed, the anti-photocopying marking can in some cases (e.g. when trying to catch forgers) be made far less noticeable than those shown in the drawings so that the forger might not notice that the copy is not really a faithful copy but has an alteration (e.g. an additional marking, possibly quite a discrete marking) which can be looked for specifically when trying to trace forgeries.

Figure 6 shows a magnified dot pattern of another anti-photocopying marking. The anti-photocopy, large dot, regions are referenced 20, and the background tint, small dot, regions are referenced 21. The same line screen, dot sizes, and screen angles are used as in the arrangement of Figure 3.

It will be appreciated that the dots of the first and second regions can be interchanged, in which case the security marking will appear in a photocopy as white marks on a dark background.

If we want to have a different colour tint to our security marking we find it better to use coloured/tinted paper and print the dots still with black ink.

Claims

1. A photocopiable article having at least an area of tint (2, 3), the tint area comprising one or more first regions (2) of first dots (4) and one or more second regions (3) of second dots (6), the first and second regions (2, 3) appearing to a casual observer, with the article (1) at arms length, as a plain tint area without any masking pattern being seen, and the first and second regions (2, 3) of dots (4, 6) being such that when the article (1) is photocopied the dots (4, 6) are capable of having one sets of dots (6) below the resolution capacity of a photocopier that is used and the other set of dots (4) above the resolution capacity, so that the copy has anti-photocopy indicia made visible on it.

2. A photocopiable article according to claim 1 which is a sheet of paper, a ticket, a voucher, or certificate, a cheque, a letter or the like.

3. A photocopiable article according to claim 1 or claim 2 in which the dots (4, 6) of the first region (2) are of a different size to the dots of the second region (3).

4. A photocopiable article according to any preceding claim in which the ratio of line screen of the dots (4, 6) of the first region (2) to those of the second region (3) is substantially 1:2.

5. A photocopiable article according to any preceding claim in which the ratio of area of the first region (2) covered by dots (4) to the area of the second region (3) covered by dots (6) is substantially 4:3.

6. A photocopiable article according to any preceding claim in which the screen angle of the dots (4) of the first region (2) is different from that of the dots (6) of the second region (3).

7. A method of providing an anti-photocopying mark or area on an article (1) such that when the article (1) is photocopied a hidden security marking is visible on the copy, the method comprising providing the mark or area as a tint by having a first region (2) made of dots (4), and a second region (3) made of dots (6), and ensuring that the dots (4) of the first region (2) are large enough and dark enough to be above a resolution threshold of a photocopier and that the dots (6) of the second region (3) are below the resolution threshold of the photocopier, so that when photocopied the first region has more prominence to the eye in the copy than it did in the original article (1), the method comprising ensuring that the dots (4) of the first (2) and second regions (3) are arranged such that when the mark or area is looked at with the naked eye at arms length the mark or

area appears at a casual glance to be a plain, or flat tint, instead of appearing to be a patterned area.

8. A method of providing an anti-photocopying mark according to claim 7 in which the article (1) is provided with a surface, or display panel, which is substantially entirely covered with tint.

9. A method of providing an anti-photocopying mark according to claim 7 or claim 8 in which additional markings (11) are applied over the tint.

10. The use of dots (4, 6) of one size and/or spacing and dots (4, 6) of another size and/or spacing, above and below the resolution capacity of a photocopier, to prevent that photocopier from producing a faithful copy of an original article that carries the dots (4, 6), the dots (4, 6) being arranged such that when the area is viewed by a casual observer at arms length they are not individually readily discernible, instead the dots (4, 6) forming an area which appears to have a tint.

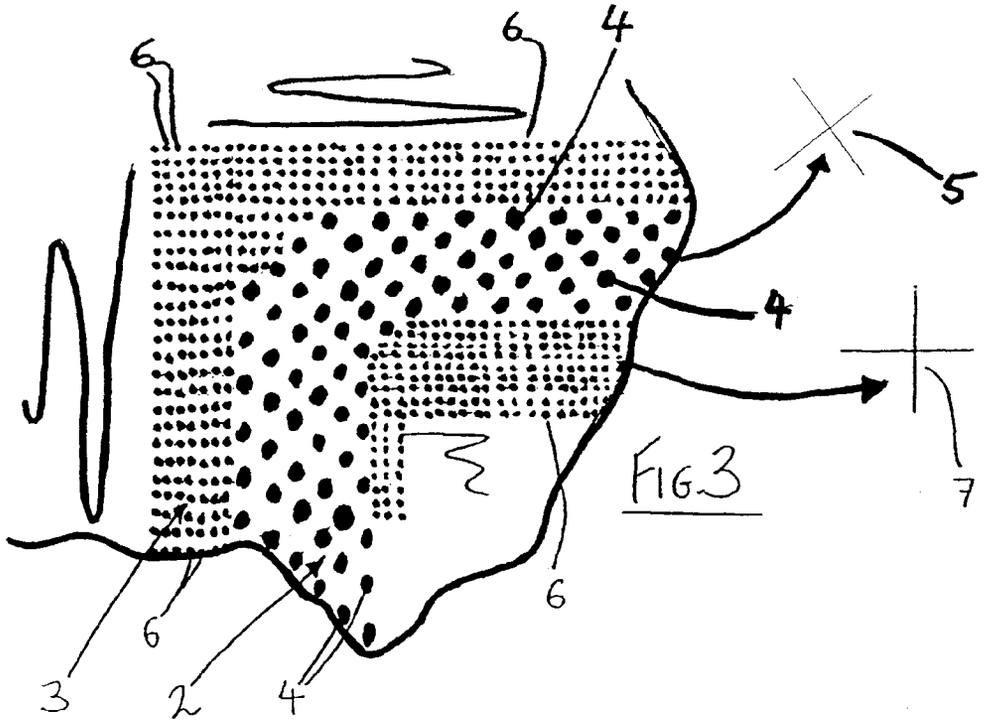


FIG.3

FIG.1

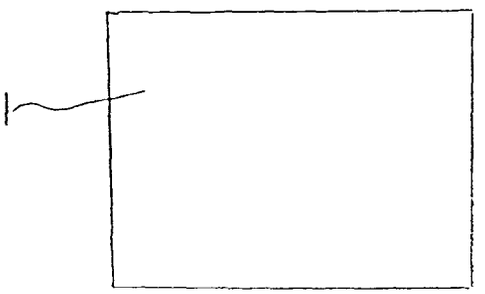
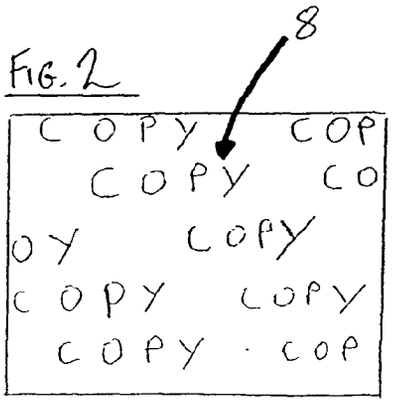


FIG.2



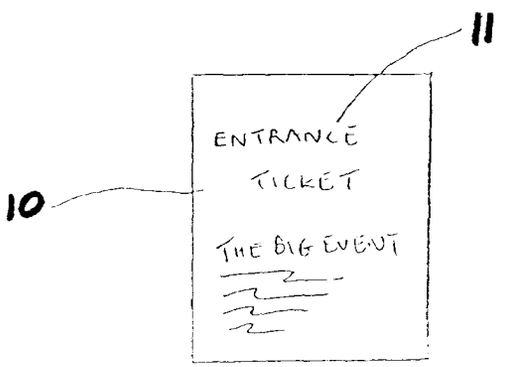


FIG 4

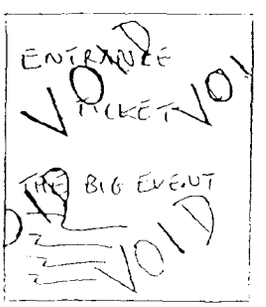


FIG 5

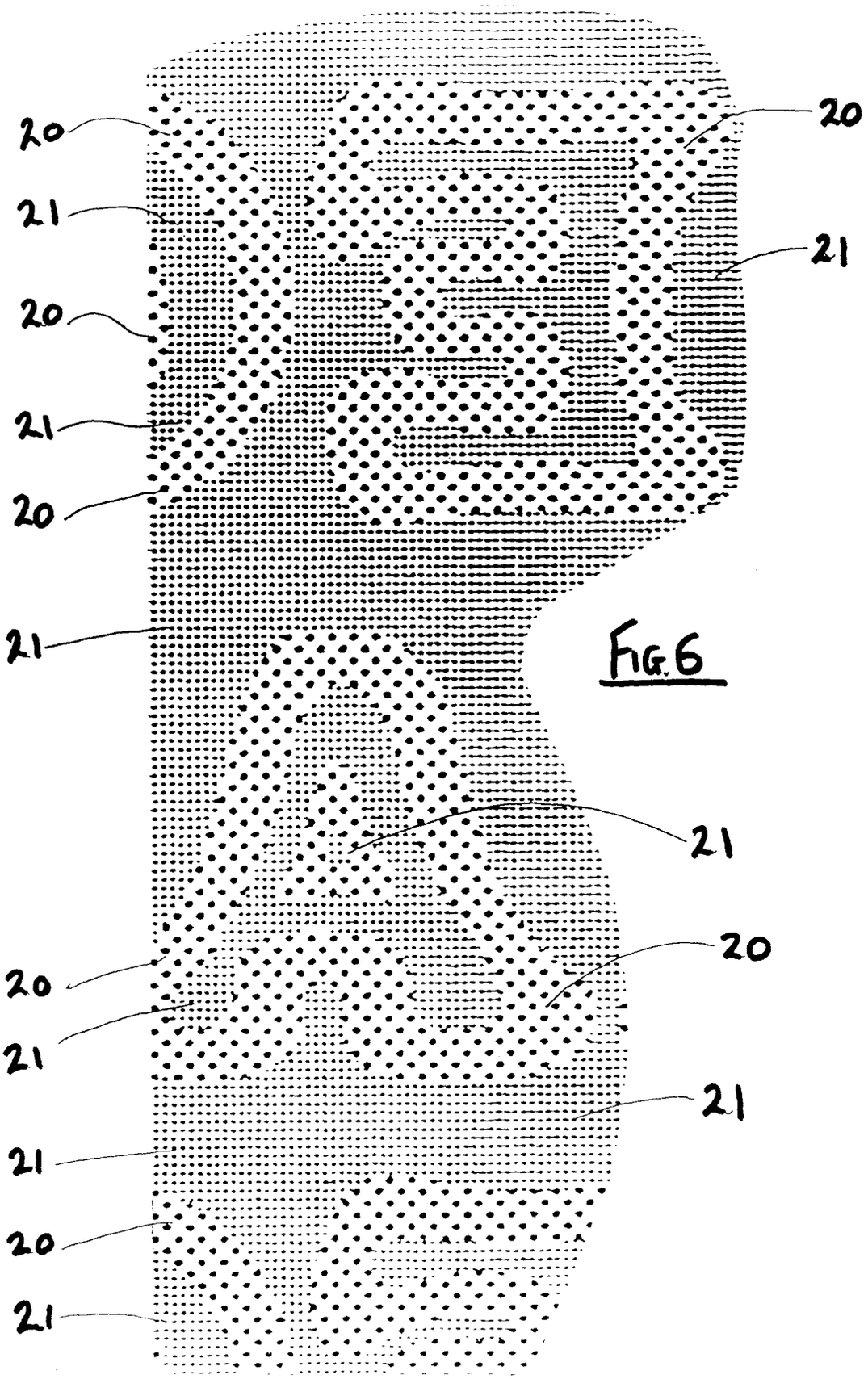


FIG.6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 30 3162

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 5 171 040 A (ORNDORFF) * column 1, line 4 - line 8 * * column 2, line 62 - column 4, line 2 * * claims 1,4; figure 3 * ---	1-10	G03C5/08 G03G21/04 B41M3/14
X	US 4 351 547 A (BROOKS) * the whole document * ---	1-10	
X	US 4 175 774 A (TONGES ET AL.) * column 1, line 7 - line 13 * * column 1, line 22 - line 39 * * column 2, line 12 - line 27 * * claims 1-3; figure 3 * ---	1-10	
X	EP 0 522 827 A (STANDARD REGISTER) * column 1, line 12 - line 16 * * column 5, line 25 - line 26 * * column 6, line 24 - line 35 * * column 7, line 4 - line 18 * * claims 8-18; figure 3 * -----	1-10	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
G03C G03G B41M B42D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23 July 1997	Magrizos, S

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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