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Method and system for identifying one or more objects

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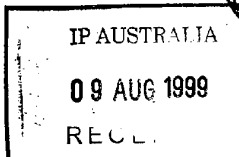
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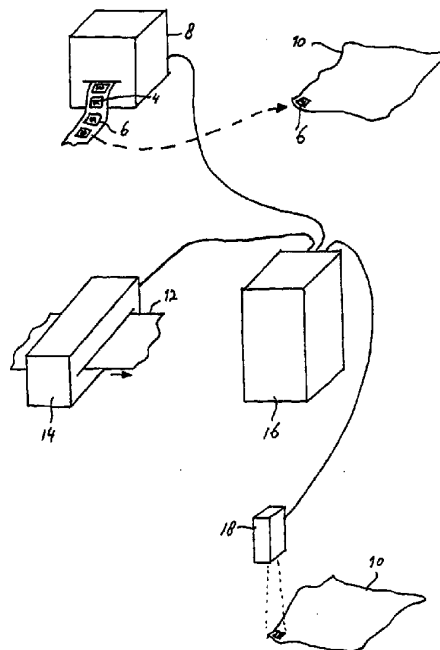
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(54) Title: METHOD AND SYSTEM FOR IDENTIFYING ONE OR MORE OBJECTS

(57) Abstract

In a method and system for identifying one or more objects, a two-dimensional, optically readable pattern and an identification code are generated. The pattern and the identification code are paired in one-to-one correspondence by means of a predetermined algorithm and are arbitrary. A two-dimensional representation of the pattern is provided on the object or on a pattern support connected thereto. The identification code is stored together with associated identification information. In order to identify the object, the representation of the pattern thereof is optically scanned and the associated identification code determined, by means of which the identification information can be determined.



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Title: Method and system for identifying one or more objects.

The present invention relates to a method for
5 identifying one or more objects.

The invention also relates to a system for implementing the method.

In prior art, such a method is known for identifying the an object by means of a barcode or a dotcode, in which the
10 code in the form of regular, machine-readable pattern of bars or dots, respectively, can have been provided directly on a surface of the object or can also have been provided on a support affixed to the object. The barcode and the dotcode are structured for many applications according to
15 internationally accepted standards, each represent an alphanumeric identification code and are often issued centrally to prevent one and the same code being used for the identification of different objects.

The barcode is a one-dimensional code which has a
20 limited length and hence offers a limited number of mutually different identification codes. The dotcode is a two-dimensional code which, per unit of surface, offers a greater, but still essentially limited number of mutually different identification codes. A drawback with using a

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barcode and a dotcode is consequently that, because of the quantity of identification codes thereby to be formed, which quantity is limited within reasonable dimensions, they are unsuitable for mutually differently characterizing large quantities of objects on which the surface for the application of the barcode or dotcode is relatively small.

Another drawback is that one is generally dependent upon an external body for the issuing of a new barcode or dotcode, in which case there will be a considerable, in many cases unacceptable time delay and some desired codes may turn out to be unavailable.

From document US-A-5 354 097, it is known per se to use a unique pattern of overlying individual fibres embedded in a transparent material, for demonstrating the authenticity of an object by making use of the unique three-dimensional characteristics of a fibre pattern of this kind through optical scanning from one or more different directions. From the aforementioned document it is not known to use the fibre pattern embedded in a transparent material as a means for identifying objects.

Moreover, the stiffness needed for the required dimensional stability would render the fibre pattern embedded in a transparent material unusable for many applications, for example the identification of flexible objects such as textiles. In addition, an optical scanning of the fibre pattern, especially in the case of flexible objects, is particularly awkward to conduct, since under these circumstances the fibre pattern could only be reliably positioned relative to an optical scanning device with great difficulty. Owing to the required depth of field, furthermore, the fibre pattern can only be scanned at a relatively short distance.

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GB-A-2 221 870 discloses providing an object with an arbitrary three dimensional radiation scattering structure derived from a master member, the radiation scattering structure causing an incident, coherent beam of radiation to
5 scatter in a random manner generating a speckle pattern. The authenticity of the object is verified by comparing the speckle pattern with a reference.

FR-A-2 576 696 discloses providing an object with an arbitrary two-dimensional thread-like structure for
10 demonstrating the authenticity of the object. On the basis of the structure a code is generated characterizing the structure. In use, the authenticity of the object is verified by comparing the code with a new code obtained by scanning the structure anew.

15 The reference to any prior art in this specification is not, and should not be taken as, an acknowledgment or any form of suggestion that that prior art forms part of the common general knowledge in Australia.

The invention aims to address or ameliorate one or more
20 of the aforementioned drawbacks, or at least largely eliminate them.

The present invention provides a method for identifying one or more objects, comprising the following steps:

generating a two-dimensional, optically readable
25 arbitrary pattern and an identification code, the pattern and the identification code being paired in one-to-one correspondence by means of a predetermined algorithm;

providing a two-dimensional representation of the pattern on the or each object, or on a pattern support to be
30 connected to the or each object;

storing the identification code and associated identification information;

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optically scanning the representation of the pattern of the or each object;

determining the associated identification code; and

identifying the or each object on the basis of the
5 identification information associated with the identification code.

The present invention further provides a system for identifying one or more objects, comprising:

means for generating a two-dimensional, optically
10 readable arbitrary pattern and an identification code, the pattern and the identification code being paired in one-to-one correspondence by means of a predetermined algorithm;

means for providing a two-dimensional representation of the pattern on the or each object, or on a label to be
15 connected to the or each object;

means for storing the identification code and associated identification information;

means for optically scanning the representation of the pattern of the or each object;

20 means for determining the associated identification code; and

means for identifying the or each object on the basis of the identification information associated with the identification code.

25 The present invention further provides a method for identifying an object, comprising:

generating a representative two-dimensional, optically readable pattern, by optically scanning at least an irregularly arranged body having an arbitrary three-
30 dimensional shape, and an identification code, the pattern and the identification code being paired in one-to-one correspondence by a predetermined algorithm and the pattern

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is arbitrary;

providing a two-dimensional representation of the pattern on the object, or on a pattern support to be connected to the object;

5 storing the identification code and associated identification information;

optically scanning the representation of the pattern of the object;

determining the associated identification code; and

10 identifying the object on the basis of the identification information associated with the identification code.

The present invention further provides a method for identifying an object, comprising:

15 generating a representative two-dimensional, optically readable pattern, by optically scanning a number of arbitrarily arranged individual fibres, and an identification code, the pattern and the identification code being paired in one-to-one correspondence by a predetermined
20 algorithm and the pattern is arbitrary;

providing a two-dimensional representation of the pattern on the object, or on a pattern support to be connected to the object;

25 storing the identification code and associated identification information;

optically scanning the representation of the pattern of the object;

determining the associated identification code; and

30 identifying the object on the basis of the identification information associated with the identification code.

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The present invention further provides a method for identifying an object, comprising:

generating a representative two-dimensional, optically readable pattern, by generating an arbitrary identification
5 code and determining the associated pattern with the aid of an algorithm, the pattern and the identification code being paired in one-to-one correspondence by a predetermined algorithm and the pattern is arbitrary;

providing a two-dimensional representation of the
10 pattern on the object or on a pattern support to be connected to the object;

storing the identification code and associated identification information;

optically scanning the representation of the pattern of
15 the object;

determining the associated identification code; and

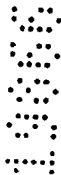
identifying the object on the basis of the
identification information associated with the
identification code.

20 The present invention also provides a system for identifying an object comprising:

an identification code generator, the code generator capable of generating an identification code; an optical pattern generator, the optical pattern generator capable of
25 generating a representative two-dimensional, optically readable pattern, the pattern and the identification code being paired in one-to-one correspondence by means of a predetermined algorithm;

a two-dimensional representation of the pattern on an
30 object, or on a label to be connected to the object;

a storage mechanism capable of storing the identification code and associated identification ,



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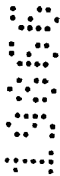
information;

an optical scanner capable of scanning the representation of the pattern of the object;

a determination mechanism capable of determining the
5 associated identification code; and

an identifier capable of identifying the object on the basis of the identification information associated with the identification code, wherein the pattern is arbitrary, the optical pattern generator is an optical scanning device and
10 the code generator is a data-processing system adapted for converting the optical information obtained during scanning into an identification code.

By giving the pattern a perfectly arbitrary shape in a suitable manner and by deriving, on the basis of the
15 obtained shape, a, for example, alphanumeric



identification code by means of a predetermined algorithm, the pattern and the identification code being paired in one-to-one correspondence, it becomes possible to identify objects without the need for outsourcing, using a pattern
5 provided thereon or connected thereto, with a practically negligible chance of a like pattern or a like identification code being generated elsewhere.

Of course, it is not necessary to start off from an arbitrary two-dimensional pattern and to derive an
10 identification code from this by means of an algorithm. An arbitrary identification code can also form the starting point, an algorithm being used to generate a two-dimensional pattern. The only points of importance are that the two-dimensional pattern or the identification code are
15 completely arbitrary and that there is a one-to-one correspondence between them.

The identification code can be stored in a file and can be coupled with associated identification information, such as data relating to the producer of the object and/or
20 the owner thereof, and any other relevant information. A two-dimensional representation of the generated pattern is provided on the object to be identified, or on a pattern support to be attached thereto. In identifying the object, the two-dimensional representation of the pattern is
25 optically scanned, on the basis of which the associated identification code is determined. The identification code gives access, in turn, to the identification information which is coupled thereto.

Given a suitable choice of the arbitrary two-dimensional pattern, the two-dimensional representation can be
30 particularly small, more particularly considerably smaller than the usual barcodes and dotcodes, yet still has the same possible quantity of different identification codes. The two-dimensional representation will nevertheless be
35 easy to read from a relatively large distance (in the order of a few metres) using a camera.

In a preferred embodiment of the method according to the invention, the step of generating the arbitrary two-dimensional pattern comprises the step of optically

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scanning one or more irregularly arranged bodies having an arbitrary three-dimensional shape, especially the optical scanning of a number of arbitrarily arranged individual fibres from a predetermined direction.

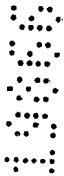
- 5 Fibres of this type can form part, for example, of an authenticity mark as described in US-A-5 354 097, and the two-dimensional representation derived from the authenticity mark of an object, document or the like can be provided on one or more other objects, documents or the like which have
10 to be identifiable as belonging with the object, document or the like being provided with the authenticity mark.

Embodiments of the invention are explained in greater detail below with reference to the appended drawings, in which:

15

Fig.1 shows, on a much enlarged scale, a portion of a sheet of material containing arbitrarily arranged individual fibres;

- 20 Fig. 2 shows a representation of a portion of the pattern



formed by the fibres shown in Fig. 1;

Fig. 3 shows a diagrammatic representation of a system according to an embodiment of the invention; and

Fig. 4 shows an object being provided with a representation of an arbitrary two-dimensional pattern.

In the various figures, identical reference numerals relate to identical components or components having a similar function.

Fig. 1 shows a portion of a sheet of material, for example a non-woven material having arbitrarily arranged overlying fibres 2, seen from a specific direction. By optically scanning at least one region 4 of the sheet of material, a two-dimensional representation of the pattern formed by the fibres 2 in the region 4 is obtained, as is shown in Fig. 2. By choosing a suitable algorithm, for which reference is made here to US-A-5 354 097, an identification code can be derived from the representation according to Fig. 2.

It is assumed that the representation according to Fig. 2 is used, on a preferably much reduced scale, to identify articles of washing in a laundry. As illustrated in Fig. 3, the representation is provided on a flexible sticker 6, using a printer 8 of sufficiently high resolution, and provided with a flexible protective layer. The sticker 6 is subsequently affixed to an article of washing 10, as illustrated in Fig. 4. Different articles of washing can have identical stickers, for example if owned by the same person.

The representation has been generated at an earlier stage with the aid of a sheet of material 12 comprising arbitrarily arranged individual fibres, as is shown in Fig. 1. Fig. 3 illustrates how a representation of essentially the whole sheet is scanned with a photo scanning device 14 having a resolution of, for example, 4,800-7,200 dpi (dots per inch), after which the scanning information is read into a computer 16 and stored in a memory. The computer 16 is designed for arbitrarily selecting a rectangular or

differently shaped portion of the stored representation, the possible enlargement thereof, and printing the aforementioned portion onto the sticker 6 at a resolution of, for example, 300-600 dpi. Following this, the

5 identification code belonging with the aforementioned portion is determined and registered in the computer 16, in association with other relevant data regarding the article of washing 10 to be identified, such as the owner thereof.

As further illustrated by Fig. 3, at the end of the
10 washing process each article of washing 10 can be easily identified by optically scanning the sticker 6 attached thereto, using a digital camera 18 of sufficient resolution. If the representation is rectangular in shape, as shown in Fig. 2, a rotational correction of the image
15 recorded with the camera can easily be effected in the computer 16 linked to the camera 18, thereby increasing the reliability of the system. On the basis of the recorded representation, the corresponding identification code is determined in the computer 16 and the article of washing 10
20 can be routed to a desired destination either manually or with automatic means.

The pictorial information obtained with the scanning device 14 does not need to be fed to the computer 16 as soon as it has been generated, but can also be
25 registered on a well-known data carrier for later use in the computer 16. The pictorial information can thus be generated wholly independently from the manufacture and issue of the stickers 6, using the sheet of material 12.

It will be clear that the selection of a specific
30 portion of the representation of the sheet of material 12 in the memory of the computer 16 in order to generate a representation can only be carried out once, owing to the desired uniqueness of the identification code. The sheet of material can therefore supply only a limited, albeit very
35 large quantity of identification codes.

Instead of optically scanning essentially all of the sheet of material beforehand, storing the representation obtained thereby and the arbitrary selection of a portion of this representation for generating a representa-

tion of a pattern, the pattern can also, of course, be generated directly by optically scanning an arbitrary portion of the sheet of material and converting this into a two-dimensional representation.

5 In another possible application, a container is sealed using a seal in which a three-dimensional mark is recorded, as is described in US-A-5 354 097. The three-dimensional mark is optically scanned for generating a two-dimensional representation, which is provided on a number
10 of labels, stickers or the like. These labels, stickers or the like are subsequently affixed to the goods present in the container, so that all goods are herewith assigned to the container and the corresponding unique sealing.

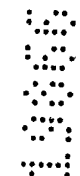
 In yet another possible application, a banker's
15 card or the like is provided with a three-dimensional mark as described in US-A-5 354 097. The three-dimensional mark is optically scanned for the generation of a two-dimensional representation, which is provided on a cheque which is intended to be paid out to the owner of the
20 banker's card. A positive identification of the cheque is thus possible when this is presented to a bank together with the banker's card.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Method for identifying one or more objects, comprising the following steps:
 - 5 generating a two-dimensional, optically readable arbitrary pattern and an identification code, the pattern and the identification code being paired in one-to-one correspondence by means of a predetermined algorithm;
providing a two-dimensional representation of the
10 pattern on the or each object, or on a pattern support to be connected to the or each object;
storing the identification code and associated identification information;
optically scanning the representation of the pattern of
15 the or each object;
determining the associated identification code; and
identifying the or each object on the basis of the identification information associated with the identification code.
 - 20
2. Method according to claim 1, characterized in that the step of generating the arbitrary two-dimensional pattern comprises the step of optically scanning one or more irregularly arranged bodies having an arbitrary three-
25 dimensional shape.
3. Method according to claim 1 or 2, characterized in that the step of generating the arbitrary two-dimensional pattern comprises the step of optically scanning a number of
30 arbitrarily arranged individual fibres.
4. Method according to claim 3, characterized in that the



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optical scanning of the arbitrarily arranged individual fibres is effected from a predetermined direction.

5. Method according to claim 3 or 4, characterized in that
5 the step of generating the arbitrary two-dimensional pattern comprises the step of optically scanning a portion of a sheet of material containing arbitrarily arranged individual fibres.

10 6. Method according to claim 3 or 4, characterized in that the step of generating the arbitrary two-dimensional pattern comprises the following steps:

optically scanning a sheet of material containing
arbitrarily arranged individual fibres, the geometric
15 configurations of the fibres being scanned;

storing a two-dimensional representation of the
geometric configurations of the fibres of the sheet of
material; and

20 selecting a predetermined region of the representation.

7. Method according to claim 1, characterized in that the
step of generating the arbitrary two-dimensional pattern
comprises the steps of generating an arbitrary
identification code and determining the associated pattern
25 with the aid of the said algorithm.

8. System for identifying one or more objects, comprising:
means for generating a two-dimensional, optically
readable arbitrary pattern and an identification code, the
30 pattern and the identification code being paired in one-to-one correspondence by means of a predetermined algorithm;
means for providing a two-dimensional representation of

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the pattern on the or each object, or on a label to be connected to the or each object;

means for storing the identification code and associated identification information;

5 means for optically scanning the representation of the pattern of the or each object;

means for determining the associated identification code; and

10 means for identifying the or each object on the basis of the identification information associated with the identification code.

9. System according to claim 8, characterized in that the means for generating a two-dimensional, optically readable
15 pattern and an identification code comprise an optical scanning device and a data-processing system which is adapted for converting the optical information obtained during the scanning into an identification code.

20 10. System according to claim 9, characterized in that the means for generating a two-dimensional, optically readable pattern and an identification code further comprises a sheet of material containing arbitrarily arranged individual fibres.

25 11. Object, or support attached thereto, intended for use in the method of any one of claims 1 to 7 or system of any one of claims 8 to 10, and provided with a representation, provided on a surface thereof, of an arbitrary two-
30 dimensional pattern.

12. A method for identifying an object, comprising:

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generating a representative two-dimensional, optically readable pattern, by optically scanning at least an irregularly arranged body having an arbitrary three-dimensional shape, and an identification code, the pattern
5 and the identification code being paired in one-to-one correspondence by a predetermined algorithm and the pattern is arbitrary;

providing a two-dimensional representation of the pattern on the object, or on a pattern support to be
10 connected to the object;

storing the identification code and associated identification information;

optically scanning the representation of the pattern of the object;

15 determining the associated identification code; and

identifying the object on the basis of the identification information associated with the identification code.

20 13. A method for identifying an object, comprising:

generating a representative two-dimensional, optically readable pattern, by optically scanning a number of arbitrarily arranged individual fibres, and an identification code, the pattern and the identification code
25 being paired in one-to-one correspondence by a predetermined algorithm and the pattern is arbitrary;

providing a two-dimensional representation of the pattern on the object, or on a pattern support to be connected to the object;

30 storing the identification code and associated identification information;

optically scanning the representation of the pattern of

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the object;

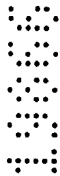
determining the associated identification code; and

identifying the object on the basis of the
identification information associated with the
5 identification code.

14. The method of claim 13, wherein the optical scanning of
the arbitrarily arranged individual fibres is effected from
a predetermined direction.

10

15. The method of claim 13, wherein the arbitrary two-
dimensional pattern is generated by optically scanning a
portion of a sheet of material containing arbitrarily
arranged individual fibres.

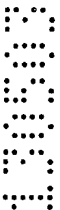


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16. The method of claim 13 for generating the arbitrary
two-dimensional pattern further comprises:

optically scanning the geometric configurations of
fibres the of a sheet of material containing arbitrarily
20 arranged individual fibres;

storing a two-dimensional representation of the
geometric configurations of the fibres of the sheet of
material; and



selecting a predetermined region of the representation.

25

17. A method for identifying an object, comprising:

generating a representative two-dimensional, optically
readable pattern, by generating an arbitrary identification
code and determining the associated pattern with the aid of
30 an algorithm, the pattern and the identification code being
paired in one-to-one correspondence by a predetermined
algorithm and the pattern is arbitrary;

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providing a two-dimensional representation of the pattern on the object or on a pattern support to be connected to the object;

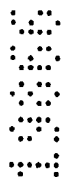
storing the identification code and associated
5 identification information;

optically scanning the representation of the pattern of the object;

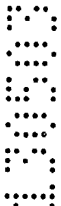
determining the associated identification code; and

identifying the object on the basis of the
10 identification information associated with the identification code.

18. A system for identifying an object comprising:



an identification code generator, the code generator
15 capable of generating an identification code; an optical pattern generator, the optical pattern generator capable of generating a representative two-dimensional, optically readable pattern, the pattern and the identification code being paired in one-to-one correspondence by means of a
20 predetermined algorithm;



a two-dimensional representation of the pattern on an object, or on a label to be connected to the object;

a storage mechanism capable of storing the identification code and associated identification
25 information;

an optical scanner capable of scanning the representation of the pattern of the object;

a determination mechanism capable of determining the associated identification code; and

30 an identifier capable of identifying the object on the basis of the identification information associated with the identification code, wherein the pattern is arbitrary, the

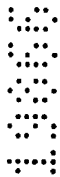
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optical pattern generator is an optical scanning device and the code generator is a data-processing system adapted for converting the optical information obtained during scanning into an identification code.

5

19. The system of claim 18, wherein the code generator comprises a sheet of material containing arbitrarily arranged individual fibres.

10 20. The method of claim 14, wherein the arbitrary two-dimensional pattern is generated by optically scanning a portion of a sheet of material containing arbitrarily arranged individual fibres.

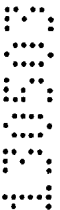


15 21. The method of claim 14, wherein generating the arbitrary two-dimensional pattern further comprises:

optically scanning the geometric configurations of the of a sheet of material containing arbitrarily arranged individual fibres;

20 storing a two-dimensional representation of the geometric configurations of the fibres of the sheet of material; and

selecting a predetermined region of the representation.



25 22. A method for identifying one or more objects substantially as hereinbefore described with reference to the accompanying drawings.

23. A system for identifying one or more objects
30 substantially as hereinbefore described with reference to the accompanying drawings.

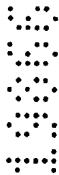
- 15 -

24. An object, or support attached thereto, provided with a
representation on a surface thereof of an arbitrary two-
dimensional pattern substantially as hereinbefore described
5 with reference to the accompanying drawings.

DATED this 13th day of May, 2003

Unicate B.V.

10 by DAVIES COLLISON CAVE
Patent Attorneys for the Applicant



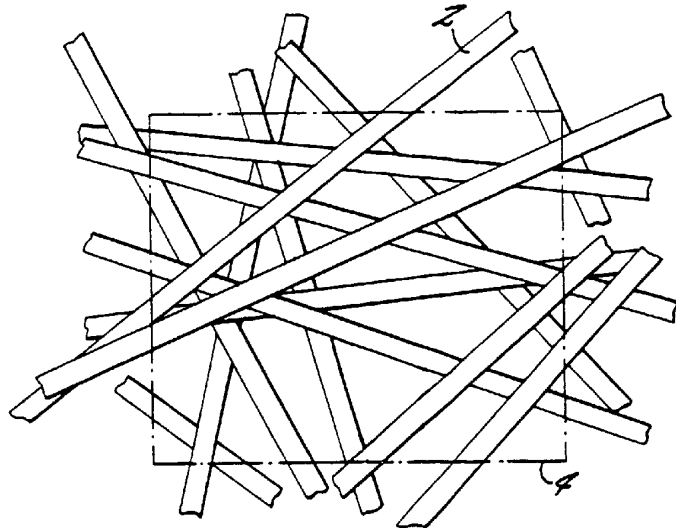


FIG. 1.

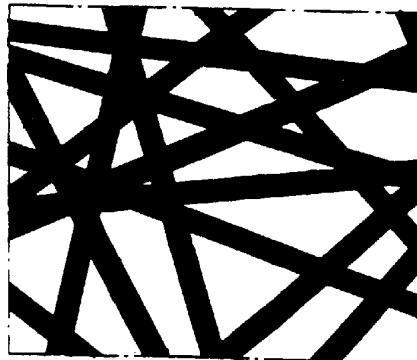


FIG. 2.

