(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
1 April 2004 (01.04.2004)

PCT

(10) International Publication Number
WO 2004/027693 A2

(51) International Patent Classification[7]: G06K 9/00

(21) International Application Number:
PCT/HU2003/000069

(22) International Filing Date:
1 September 2003 (01.09.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
P 0202922 3 September 2002 (03.09.2002) HU

(71) Applicant and
(72) Inventor: **MOLNÁR, András** [HU/HU]; Síp u. 6, H-1075 Budapest (HU).

(74) Agent: **RÓNASZÉKI, Tibor**; Victor Hugo u. 6-8, H-1132 Budapest (HU).

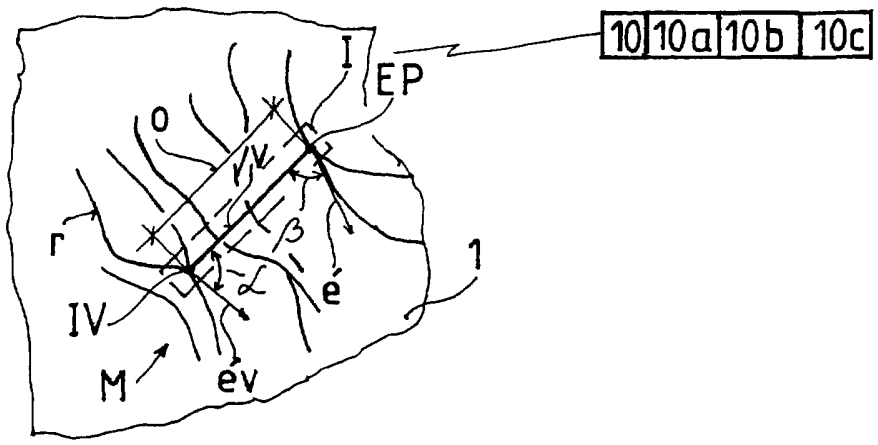
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: PROCEDURE FOR THE ANALYSIS AND COMPARISON OF DERMATOGLYPHIC PATTERNS



(57) Abstract: The subject of the invention relates to a procedure for the analysis and comparison of dermatoglyphic patterns during which basic symbol groups are created that include geometric characteristics from the information-carrying elements of the master patterns of various persons, e.g. minutiae points, and from the sum total of the individual basic symbol groups a comparison set is made, then from the information-carrying details of the pattern to be examined an examined symbol group is made that contains geometric characteristics equivalent to the geometric characteristics determined for the information-carrying elements of the master patterns, following this with the help of a comparison device the examined symbol group of the comparison set, and the result of the analysisi is put inot a ranking order, an order of degree of relationship.nalysis is put into a ranking order, an order of degree of relationship.

WO 2004/027693 A2

Procedure for the analysis and comparison of dermatoglyphic patterns

The subject of the invention elates to a procedure for the analysis and comparison of dermatoglyphic patterns during which basic symbol groups are created that include geometric characteristics from the information-carrying elements of the master patterns of various persons, e.g. minutiae points, and from the sum total of the individual basic symbol groups a comparison set is made, then from the information-carrying details of the pattern to be examined an examined symbol group is made that contains geometric characteristics equivalent to the geometric characteristics determined for the information-carrying elements of the master patterns, following this with the help of a comparison device the examined symbol group of the pattern under examination is compared with the basic symbol group of the comparison set, and the result of the analysis is put into a ranking order, an order of degree of relationship.

At the scenes of crimes the law-enforcement organisations record numerous marks, among these finger and palm-prints, as according to experience some of these originate from the perpetrator or perpetrators. Several solutions have become known for the examination of finger and palm-prints the most simple of which is the examination of prints from the scenes of crimes and those taken from criminals captured in the past by a specialist. Manual examination, however, requires a great deal of practice and expertise and is also slow.

Recently information technology devices have also been used in the interest of faster evaluation of dermatoglyphic patterns. The essence of such procedures is that the finger and palm prints of captured criminals, as master patterns, are stored as files containing a large amount of data that can be evaluated by computing devices, and the patterns that are to be compared are compared with these data stored earlier. The basis of the comparison in most cases is formed by the positions of the so-called "minutiae points" as compared to each other. Such evaluation methods can also be found in the procedures contained in patent specifications registration numbers US 4,896,363 and EP 343.508.

Patent specification registration number HU 212.149 relates to such a procedure in which master patterns stored earlier and prints recorded at the scenes of crimes are compared to each other in several steps, and finally a list of probable perpetrators is created from the similarity results.

Another comparison procedure is also the subject of international publication document WO 01/06445. The essence of this is that all the minutiae points of dermatoglyphic patterns are associated with geometric characteristics, such as angle of direction, distance and other data, then the comparison is carried out step by step per minutiae point on the basis of this data.

The disadvantage of the known solutions, however, is that even with the help of devices of large capacity the individual comparison of the minutiae points of prints taken at crime scenes and the minutiae points of the master patterns is a lengthy process, which is unfavourable from the point of view of the fast identification of the perpetrator.

Another disadvantage is that during the evaluation numerous relationships are found that exist only in the case of single minutiae point pairs, but not in the case of all the other point pairs under examination. The filtering out of this takes up further time and energy, essentially without any actual result.

In summary the general fault of the known comparison procedures is that the time devoted to the examination is lengthy, and the find probability does not reach the desired level in many cases.

So my aim with the invention was to overcome the deficiencies of the known procedures and to create a method that significantly shortens the evaluation duration and the result reliability is greater than that attainable with traditional methods.

The basis of the idea behind the invention was formed by the recognition that if the geometric information used for the characterisation of the minutiae points is used as a structural factor when establishing the database that forms the basis of the evaluation and

using these characteristics we set up a muti-embedded data network, then the task becomes solvable.

In accordance with the set aim a procedure according to the invention for the analysis and comparison of dermatoglyphic patterns, – during which basic symbol groups are created that include geometric characteristics from the information-carrying elements of the master patterns of various persons, e.g. minutiae points, and from the sum total of the individual basic symbol groups a comparison set is made, then from the information-carrying details of the pattern to be examined an examined symbol group is made that contains geometric characteristics equivalent to the geometric characteristics determined for the information-carrying elements of the master patterns, following this with the help of a comparison device the examined symbol group of the pattern under examination is compared with the basic symbol group of the comparison set, and the result of the analysis is put into a ranking order, an order of degree of relationship, – which is based on the principle that during the creation of the comparison set identification codes are associated with the individual related dermatoglyphic patterns, and we also make the basic symbol groups conform to the identification codes, then after determining the number of geometric characteristics and their types we create an examination mask and following this we select element pairs from the information-carrying elements of the master patterns, and so the basic symbol groups are created by evaluating the element pairs on the basis of the examination mask, grouping the basic symbol groups according to identical primary geometric characteristics we create primarily separated part-sets, then the basic symbol groups placed in primarily separated part-sets with the same primary geometric characteristics are grouped according to secondary geometric characteristics and through this secondarily separated part-sets are created, repeating this separation cycle a number of times that equals the number of geometric characteristics from the basic symbol groups completely separate part sets are formed that have identical geometric characteristics, every one of these part-sets completely separated from the basic symbol group with the same geometric characteristics is given an address code, and the comparison set is made up of the sum total of these individual address codes, following this during the analysis firstly in a way that is known in itself we determine the information-carrying details of the pattern to be examined, then also in the known way examined element pairs are extracted from the

information-carrying details, following this after evaluation of the individual examined element pairs on the basis of the examination mask an examined symbol group is created that contains the geometric characteristics belonging to the given examined element pair, and from the examined symbol group examination codes are created, then with the help of a comparison device the matching address codes are determined after comparison after one another of the examination codes and the individual address codes of the comparison set, and finally a result list is set up after comparing the identification codes of the basic symbol groups located in the identified part-sets completely separated by the selected address codes.

A further criterion of the procedure according to the invention may be that when preparing the examination mask three or more geometric characteristics are used, and as a primary geometric characteristic a direction characteristic is given, as a secondary geometric characteristic a distance characteristic and as a tertiary geometric characteristic a position characteristic is given.

In an advantageous embodiment of the procedure the direction characteristic used as the primary geometric characteristic is determined from the value of the angle of direction between the direction line connecting the analysed information-carrying element belonging to the basic symbol group of the master pattern and a neighbouring information-carrying element, and the tangent associated with the analysed information-carrying element of the pattern belonging to the analysed information-carrying element.

In another version of the invention the distance characteristic used as a secondary geometric characteristic is determined from the value of the spacing between the analysed information-carrying element belonging to the basic symbol group of the master pattern and a neighbouring information-carrying element.

In a still further different version of the procedure the position characteristic used as a tertiary geometric characteristic is determined from the direction angle value between the direction line of the analysed information-carrying element belonging to the basic symbol group of the master pattern and a neighbouring information-carrying element and the

tangent associated with the neighbouring information-carrying element of the pattern belonging to the neighbouring information-carrying element.

The most important advantage of the procedure according to the invention is that with its help the various dermatoglyphic patterns recorded at the scenes of events – even with the assistance of the usually applied computing devices – can be compared more quickly and simply with the master patterns stored in the databases.

Another advantage is that the usual geometric-information comparison as a consequence of the novel solution used in the procedure becomes a much more easily controllable address code search, due to which it becomes possible to quickly examine the complete set of data, so there is no need to make special restrictions and exclusions, and it is even possible to take any geometric distortions into consideration, which at the end of the day makes the result of the comparison even more precise.

The advantage deriving from the above is that the precision of the find list appearing as the result of the procedure, in other words the probability of identification is no worse than that that can be expected in the case of traditional procedures even in spite of the greater speed of examination of the procedure.

Another advantage to be listed is that the data files can also be put together, integrated from storage units with small capacity that are possibly physically separated from each other. As a consequence the system can be gradually and continuously extended without the precision of the procedure being reduced.

As an economic advantage it has to be mentioned that the new procedure can be carried out even with the help of the examination and comparison equipment, as well as the computer networks traditionally used, so its investment cost is very favourable. Also the significant increase in the analysis speed makes it possible for several analyses to be carried out using the same system at the same time. This then improves the speed of identification of the perpetrator as well as the probability of solving crimes and capturing the perpetrator.

In the following we present the invention in detail on the basis of a drawing. On the drawing

Figure 1 is a picture of the dermatoglyphic pattern used in the procedure according to the invention,
Figure 2 is the block chart of the structure of the comparison set used in relation with the procedure,
Figure 3 is the picture of the pattern to be examined.

Figure 1 shows an enlarged detail of the dermatoglyphic pattern 1 according to a print taken from the index finger of a person. It can be observed that the master pattern "M" appearing on the dermatoglyphic pattern contains several minutiae points, each two of which forms an element pair "EP". In this case the marked element pair "EP" is formed by the analysed information-carrying element "IV" and the neighbouring information-carrying element "I". The given element pair "EP" has the direction characteristic 10a belonging to the basic symbol group 10, the distance characteristic 10b and the position characteristic 10c, as determinant geometric characteristics.

In this version of the procedure the direction characteristic 10a is given by the direction angle "α" between the direction line "v" connecting the analysed information-carrying element "IV" and the neighbouring information-carrying element "I" and the tangent "év" of the pattern "r" that bears the information-carrying element "IV" and that belongs to the analysed information-carrying element "IV".

The distance characteristic 10b is the length of the section of the direction line "v" between the analysed information-carrying element "IV" and the neighbouring information-carrying element "I". The position characteristic 10c is given by the direction angle "β" between the direction line "v" positioned between the analysed information-carrying element "IV" and the neighbouring information-carrying element "I" and the tangent "é" of the pattern "r" that bears the neighbouring information-carrying element "I" and that belongs to the neighbouring information-carrying element "I".

Every single "EP" element pair includes a basic symbol group 20, a basic symbol group 30 including a direction characteristic 10a, a distance characteristic 10b and a position characteristic 10c with content equal to that of the basic symbol group 10 – shown on figure 2 – which in essence forms the basis of the procedure.

Figure 2 shows the outline picture of the comparison set 100 to be used in the procedure. It can be observed that each of dermatoglyphic pattern 1, dermatoglyphic pattern 2 and dermatoglyphic pattern 3 has an identification code 1a, identification code 2a and identification code 3a, which in essence contain the identification data of the person providing the dermatoglyphic pattern 1, 2, 3. Also associated to this identification code 1a are the basic symbol group 10 and basic symbol group 20 belonging to the dermatoglyphic pattern 1, while the basic symbol group 30 is associated with the identification code 2a that identifies the dermatoglyphic pattern 2. For the sake of simplicity we show the set up and structure of the comparison set 100 only with the help of the basic symbol group 10, the basic symbol group 20 and the basic symbol group 30.

It can be observed that the basic symbol group 10 containing the direction characteristic 10a, distance characteristic 10b and position characteristic 10c, the basic symbol group 20 containing the direction characteristic 20a, distance characteristic 20b and position characteristic 20c and the basic symbol group 30 including the direction characteristic 30a, distance characteristic 30b and position characteristic 30c are grouped in the primarily separated part-set 101i on the basis of the value of the primary geometric characteristic of the basic symbol group 10, the basic symbol group 20 and the basic symbol group 30, in other words on the basis of the value of the direction characteristics 10a, 20a, and 30a. In the secondarily separated part-set 102i groups according to the distance characteristics 10b, 20b and 30b appearing according to their secondary geometric characteristic can be observed, while in the completely separated part-set 10Xi grouping according to the tertiary geometric characteristics, that is the position characteristics 10c, 20c, and 30c can be observed, in this way only those basic symbol groups appear together in the completely separated part-set 10Xi the primary, secondary and tertiary geometric characteristics of which are always the same.

Every one of these completely separated part-sets 10Xi containing such basic symbol groups receives an address code "C1", "C2" and "C3" each, which represent the geometric characteristics of the basic symbol groups 10, 20 or 30 appearing in the given completely separated part-set 10Xi. The sum total of the address code "C1", address code "C2" and address code "C3" forms the comparison set 100, which can therefore be treated as an address list.

The pattern to be examined 4 can be observed on figure 3, which is a fingerprint taken from the scene of a crime. In the pattern to be examined 4 the examined element pair "VEP1", the examined element pair "VEP2" and the examined element pair "VEP3" can be grouped, of which the examined element pair "VEP1" has an examined symbol group 41 identified with the examination code 41a, the examined element pair "VEP2" has an examined symbol group 42 identified with the examination code 42a, while the examined element pair "VEP3" has an examined symbol group 43 identified with the examination code 43a. The examined symbol group 41, the examined symbol group 42 and the examined symbol group 43 contain the same primary, secondary and tertiary geometric characteristic values that were presented in connection with figure 1. The examination code 41a, examination code 42a and examination code 43a conform in structure and formation to the address codes "C1", "C2" and "C3" forming the comparison set 100.

In the following we present the procedure according to the invention in connection with examples.

Example 1:

During the procedure according to the invention first we created the comparison set 100 in the following way. In the case of all the available dermatoglyphic patterns 1, 2, 3 we recorded the analysed information-carrying elements "IV" and coupling them each with neighbouring information-carrying elements "I" we created element pairs "EP". Then we determined what examination mask we would be using during the later comparison examinations. In the case of this procedure example the mask was put together from primary, secondary and tertiary geometric characteristics, where the primary geometric characteristic was provided by the direction characteristic 10a of the element pair "EP", the

secondary geometric characteristic by the distance characteristic 10b of the element pair "EP", while the tertiary geometric characteristic was provided by the position characteristic 10c of the element pair "EP". Following setting up the examination mask to be used we determined all the geometric characteristics of the individual element pairs "EP", and in this way we created such basic symbol groups 10, 20 and 30 in which the direction characteristic 10a, 20a, 30a, the distance characteristic 10b, 20b, 30b and the position characteristic 10c, 20c, 30c were always present.

Following this the individual basic symbol groups 10, 20, 30 and the related dermatoglyphic patterns forming their basis were given in order identification codes 1a, 2a, 3a, in this way we created a conformity in which the basic symbol groups belonging to all the element pairs "EP" of the dermatoglyphic patterns formed from every single finger of a determined person are linked to the same 1a, or 1b or 1c identification code given to the given person.

Following this the basic symbol group 10, the basic symbol group 20 and the basic symbol group 30 were grouped on the basis of their primary geometric characteristic, that is their direction characteristic 10a, 20a, 30a, then on the basis of their secondary geometric characteristic, that is their distance characteristic 10b, 20b, 30b, then finally on the basis of their tertiary geometric characteristic, that is their position characteristic 10c, 20c, 30c, then with the help of this selection we arranged them in the completely separated part-sets 10Xi. In this procedure example this meant that in an individual completely separated part-set 10Xi there were the basic symbol group 10 containing the direction characteristic 10a, the distance characteristic 10b and the position characteristic 10c, as well as further symbol groups containing a direction characteristic, distance characteristic and position characteristic the same as them. This means that all those basic symbol groups in which, for example, the direction angle "α" giving the direction characteristic of the analysed information-carrying element was 21°, the distance of separation "o" of the direction line "v" giving the distance characteristic was 4 units and the direction angle "β" providing the position characteristic of the analysed information-carrying element "IV" was 85° were all placed in the same completely separated part-set 10Xi, irrespective of what identification code they were associated with.

On the basis of the complete selection according to the examination mask the various basic symbol groups 10, 20, 30 belonging to the same completely separated part-set 10Xi were given the same address code "C1", address code "C2", address code "C3" identifying the completely separated part set 10Xi, and finally the comparison set was built up of these address codes "C1", "C2", "C3".

After making the comparison set 100 when the task was to identify a pattern to be examined 4, then on the pattern to be examined 4 – in a way known in itself – we marked the minutiae points, after which we marked on them the examined element pairs "VEP1", "VEP2" and "VEP3", and in the case of the individual examined element pairs "VEP1", "VEP2" and "VEP3" we determined the geometric characteristics appearing in the examination mask.

After determining the geometric characteristics we established the examined symbol group 41, the examined symbol group 42 and the examined symbol group 43, to which we associated in order the examination code 41a, the examination code 42a and the examination code 43a.

The structure of the examination codes 41a, 42a and 43a conformed with the structure of the address codes "C1", "C2" and "C3", so during the examination in essence we compared the examination codes 41a, 42a and 43a with the address codes "C1", "C2" and "C3" in the comparison device – which is in a favourable case a powerful and fast computer. In the case that an examination code 42a conformed with an address code "C3", then every single basic symbol group 10, 20, 30 of the completely separate part-set 10Xi belonging to the address code "C3" was selected, and we called up the 1a, 2a, 3a identification codes associated with the basic symbol group 10, 20, 30 and made a list out of them. In the case of each and every find we set up a list, which list we then compared with each other. During the comparison we examined which identification code 1a, 2a, 3a appears in the most lists. Finally by putting the person associated with the code that appeared the most in the first place we set up a result list in which in reducing frequency of

appearance those persons appear which may be associated with one of the selected identification codes 1a, 2a, 3a.

Example 2:

We proceeded in the same way as in the procedure presented in the previous example with the difference that on the basis of the appropriate restriction only the first ten person were placed on the list.

Example 3:

We proceeded in the same way as in the procedure presented in the previous example with the difference that we gave an instruction to the comparison device on the basis of which during the comparison of the examination codes 41a, 42a, 43a and the address codes "C1", "C2", "C3" it was not only to select the conforming address codes "C1", "C2", "C3", but also those which differed from the examination codes 41a, 42a, 43a to a determined degree. The results list was made as a result of operations carried out on a set extended in this way.

The procedure according to the invention can be used to advantage for the analysis, comparison and identification of dermatoglyphic patterns, especially in connection with the solving of crimes, and in connection with the determination of the perpetrator, and also in other areas, in authentication and identification systems as well.

List of references

1 dermatoglyphic pattern	1a identification code
2 dermatoglyphic pattern	2a identification code
3 dermatoglyphic pattern	3a identification code
4 pattern to be examined	"VEP1" examined element pair "VEP2" examined element pair "VEP3" examined element pair 41 examined symbol group 41a examination code 42 examined symbol group 42a examination code 43 examined symbol group 43a examination code
100 comparison set	"C1" address code "C2" address code "C3" address code 10 basic symbol group 10a direction characteristic 10b distance characteristic 10c position characteristic 20 basic symbol group 20a direction characteristic 20b distance characteristic 20c position characteristic 30 basic symbol group 30a direction characteristic 30b distance characteristic 30c position characteristic 101i primarily separated part-set 102i secondarily separated part-set 10Xi completely separated part-set
"M" master pattern	"IV" analysed information-carrying element "év" tangent "I" neighbouring information-carrying element "é" tangent "EP" element pair "o" distance of separation "r" pattern "v" direction line "α" direction angle "β" direction angle

Claims

1. Procedure for the analysis and comparison of dermatoglyphic patterns during which basic symbol groups are created that include geometric characteristics from the information-carrying elements of the master patterns of various persons, e.g. minutiae points, and from the sum total of the individual basic symbol groups a comparison set is made, then from the information-carrying details of the pattern to be examined an examined symbol group is made that contains geometric characteristics equivalent to the geometric characteristics determined for the information-carrying elements of the master patterns, following this with the help of a comparison device the examined symbol group of the pattern under examination is compared with the basic symbol group of the comparison set, and the result of the analysis is put into a ranking order, an order of degree of relationship **characterised by** that during the creation of the comparison set (100) identification codes (1a, 2a, 3a) are associated with the individual related dermatoglyphic patterns (1, 2, 3), and we also make the basic symbol groups (10, 20, 30) conform to the identification codes (1a, 2a, 3a), then after determining the number of geometric characteristics and their types we create an examination mask and following this we select element pairs (EP) from the information-carrying elements (IV, I) of the master patterns (M), and so the basic symbol groups (10, 20, 30) are created by evaluating the element pairs (EP) on the basis of the examination mask, grouping the basic symbol groups (10, 20, 30) according to identical primary geometric characteristics we create primarily separated part-sets (101i), then the basic symbol groups (10, 20, 30) placed in primarily separated part-sets (101i) with the same primary geometric characteristics are grouped according to secondary geometric characteristics and through this secondarily separated part-sets (102i) are created, repeating this separation cycle a number of times that equals the number of geometric characteristics from the basic symbol groups (10, 20, 30) completely separate part sets (10Xi) are formed that have identical geometric characteristics, every one of these part-sets (10Xi) completely separated from the basic symbol group with the same geometric characteristics is given an address code (C2, C2, C3) and the comparison set (100) is made up of the sum total of these individual address codes (C2, C2, C3), following

this during the analysis firstly in a way that is known in itself we determine the information-carrying details of the pattern to be examined (4), then also in a way known in itself examined element pairs (VEP1, VEP2, VEP3) are designated from the information-carrying details, following this after evaluation of the individual examined element pairs (VEP1, VEP2, VEP3) on the basis of the examination mask an examined symbol group (41, 42, 43) is created that contains the geometric characteristics belonging to the given examined element pair (VEP1, VEP2, VEP3), and from the examined symbol group (41, 42, 43) examination codes (41a, 42a, 43a) are created, then with the help of the comparison device the matching address codes (C2, C2, C3) are determined after comparison after one another of the examination codes (41a, 42a, 43a) and the individual address codes (C2, C2, C3) of the comparison set (100), and finally a result list is set up after comparing the identification codes (1a, 2a, 3a) of the basic symbol groups (10, 20, 30) situated in the identified part-sets (10Xi) completely separated by the selected address codes (C2, C2, C3).

2. The procedure according to claim 1 **characterised by** that when preparing the examination mask three or more geometric characteristics are used, and as a primary geometric characteristic a direction characteristic (10a, 20a, 30a) is given, as a secondary geometric characteristic a distance characteristic (10b, 20b, 30b) and as a tertiary geometric characteristic a position characteristic (10c, 20c, 30c) is given.

3. The procedure according to claim 2 **characterised by** that the direction characteristic (10a) used as the primary geometric characteristic is determined from the value of the angle of direction (α) between the direction line (v) connecting the analysed information-carrying element (IV) belonging to the basic symbol group (10) of the master pattern (M) and a neighbouring information-carrying element (I), and the tangent (év) associated with the analysed information-carrying element (IV) of the pattern (r) belonging to the analysed information-carrying element (IV).

4. The procedure according to claim 2 or 3 **characterised by** that the distance characteristic (10b) used as a secondary geometric characteristic is determined from the value of the spacing (o) between the analysed information-carrying element (IV) belonging

to the basic symbol group (10) of the master pattern (M) and a neighbouring information-carrying element (I).

5. The procedure according to any of claims 2–4 **characterised by** that the position characteristic (10c) used as a tertiary geometric characteristic is determined from the direction angle (β) value between the direction line (v) of the analysed information-carrying element (IV) belonging to the basic symbol group (10) of the master pattern (M) and a neighbouring information-carrying element (I) and the tangent (é) associated with the neighbouring information-carrying element (I) of the pattern (r) belonging to the neighbouring information-carrying element (I).

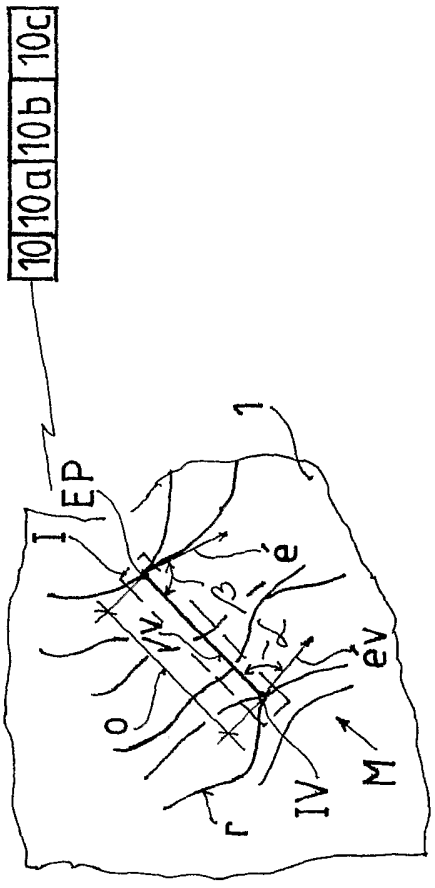


Fig. 1

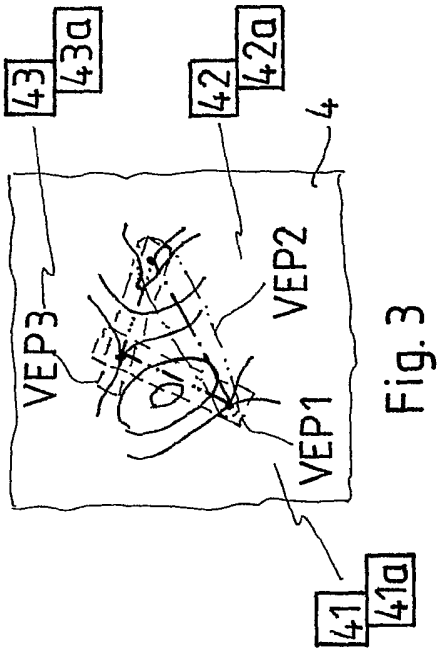


Fig. 3

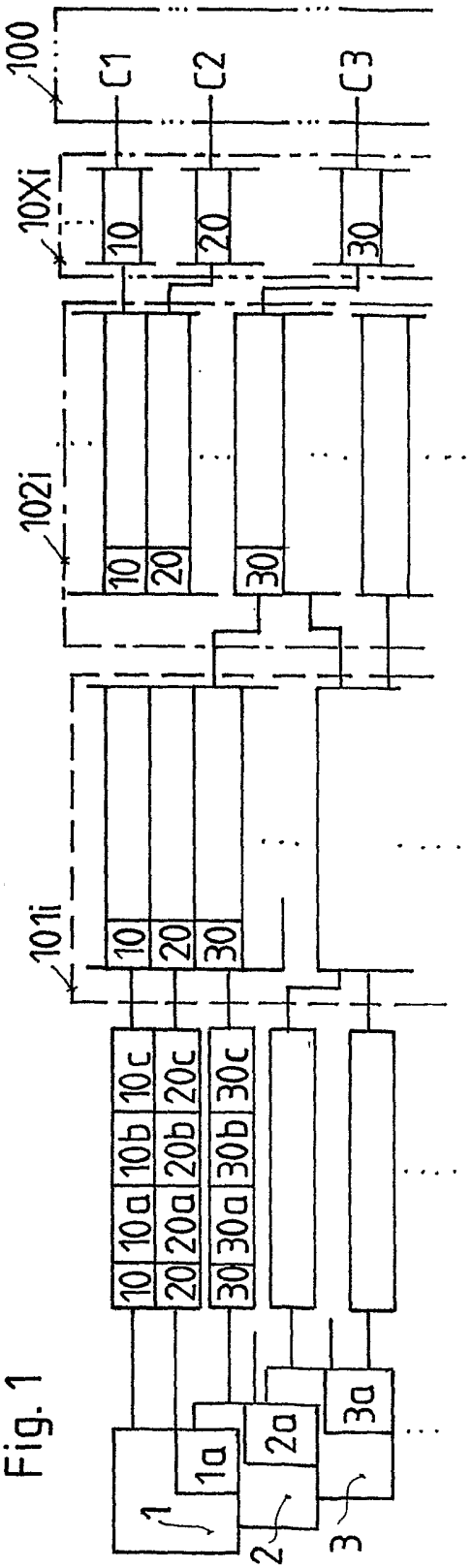


Fig. 2