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D E C I S I O N
of 31 January 1995

Case Number: T 1038/93 - 3.4.1

Application Number: 81104817.2

Publication Number: 0067898

IPC: G07D 7/00

Language of the proceedings: EN

Title of invention:
System for identifying currency note

Patentee:
KABUSHIKI KAISHA TOSHIBA

Opponent:
GAO Gesellschaft für Automation und Organisation mbH

Headword:
-

Relevant legal provisions:
EPC Art. -

Keyword:
"Inventive step (no)"

Decisions cited:
-

Catchword:
-



Case Number: T 1038/93 - 3.4.1

D E C I S I O N
of the Technical Board of Appeal 3.4.1
of 31 January 1995

Appellant:
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office dated 20 September 1993
revoking European patent No. 0 067 898 pursuant to
Article 102(1) EPC.

Composition of the Board:

Chairman: G. D. Paterson
Members: H. J. Reich
R. K. Shukla

Summary of Facts and Submissions

- I. The Appellant is owner of European patent No. 0 067 898.
- II. The patent was revoked by a decision of the Opposition Division on an opposition by the Respondent, on the ground that the subject-matter of Claim 1 filed on 24 July 1992 was lacking an inventive step having regard to document

D6: DE-A-3 040 963

and a skilled person's general knowledge. The Opposition Division took the view that it would be obvious to use in the printed matter identification system disclosed in document D6, instead of a sensor which produces a summed signal for one line, a line sensor which senses a plurality of picture elements within one line, since these sensors had become widely used and are readily available. Furthermore, it would be clear to a skilled person that the data of the printed pattern is essential for authenticity, in contrast to the data relating to the margin around the printed pattern, so that he will try to use data only from within the printed pattern in order to identify the printed matter. The transition from a blank margin area to the printed pattern area of the printed matter would be noticeable in practice.

- III. The Appellant (Patentee) lodged an appeal against this decision.
- IV. In a communication annexed to a summons to oral proceedings the parties were informed of facts on which the Board based its provisional view that Claim 1 in the wording as filed with the grounds of appeal on 25 January 1994, did not satisfy Article 123(2) EPC, and

that its subject-matter even when amended to contain only the originally disclosed features - might possibly be regarded as an obvious use of a generally known technique of localising a contour of a pattern in a picture by differentiating scanned pattern data - such as for instance derivable from document:

D7: H. Kazmierczak: "Erfassung und maschinelle Verarbeitung von Bilddaten", Grundlagen und Anwendungen, Springer-Verlag, 1980, pages 2 and 48,

cited by the Respondent in reply to the grounds of appeal, - in the pattern edge detecting means of the printed matter identification system disclosed in document D6. Moreover, a further amended Claim 1 which would specify that during scanning of one line in X-direction the line sensor outputs a variety of intensity values, each corresponding to the light reflected from an individual picture element out of a series of neighbouring picture elements in X-direction, appeared to comprise only an obvious adaptation measure.

V. Oral proceedings were held on 31 January 1995, at the end of which the Appellant (Patentee) requested that the decision under appeal be set aside and that the patent be maintained on the basis of a new Claim 1 filed during the oral proceedings. The Respondent (Opponent) requested that the appeal be dismissed.

VI. Claim 1 filed during the oral proceedings reads as follows:

- "1. A printed matter identification system, comprising:
1. transport means for moving a printed matter (11) in a first direction (Y),
 2. scanning means (12, 13, 14) comprising:

- 2.1 a light beam source (13) for emitting a light beam directed to the printed matter (11) and scanning successive lines of the printed matter (11) in a direction (X) perpendicular to the first direction (Y),
- 2.2 a line sensor (14) receiving the reflected light beam and converting said reflected light beam into a scanned pattern data corresponding to at least a portion of the moving printed matter,
3. a printed matter edge sensor (20) producing an output upon detecting the edge of the printed matter and located transversely to the motion axis (Y),
4. standard data generating means (28; 55) for generating standard pattern data corresponding to a standard pattern of standard printed matters,
5. identification means, comprising:
 - 5.1 storage means (30; 47) for retaining the scanned pattern data generated from said line sensor (14),
 - 5.2 memory means (28; 55) for storing the standard pattern data,
 - 5.3 comparison means (27; 52, 53) for comparing the scanned pattern data from the storage means (30; 47) with the stored standard data from the memory means (28; 55) in synchronism with the printed matter edge sensor (20), and producing an output signal,
 - 5.4 processing means (49, 51) analyzing said output signal and calculating the similarity between the printed pattern of the printed matter and the standard pattern from the scanned pattern data of

the printed matter being checked and the standard pattern data,

6. pattern edge detecting means (45) detecting the printed pattern edge of the printed matter (11) in the first direction (Y) to obtain two pattern edge data components corresponding to leading and trailing pattern edges of the printed matter (11),
 7. summing means (42) for summing the picture element signals in each of the scanned pattern data signals for successive scanning lines and outputting the sums corresponding to the successive scanning lines, respectively, to the storage means (47), whereby a detected pattern D(I) formed by the sums and related to the first direction (Y) is stored in said storage means (47), and
 8. detected pattern sampling means (48) which samples the detected pattern to obtain data for a predetermined number of sampling points from each of the detected pattern edges, wherein:
 9. said processing means (49, 51) performs the calculation of the similarity of the sampled data corresponding to a leading area immediately after detection of the leading area, while performing a calculation of the similarity of the sampled data corresponding to a trailing area,
- characterized in that
10. said pattern edge detecting means detect leading and trailing pattern edges of the printed matter by differentiating the scanned pattern data, said leading area and said trailing area being sampled from the leading pattern edge of the printed pattern and sampled from the trailing pattern edge, respectively."

Claims 2 to 4 as filed on 17 January 1992 are dependent on Claim 1.

VII. In support of his request, the Appellant made essentially the following submissions:

(a) Printed matter such as banknotes become wrinkled when used over a long period of time, and thereby decreases in size. Furthermore, when such printed matter is cut, the cutting position may be displaced so that the position of the printed area is displaced from the edge. Both effects lead to the result that in a comparison step with a standard pattern the printed pattern is erroneously recognised as a different pattern. The invention solves this problem by using the edge of the printed pattern area instead of the edge of the printed matter as a reference point in the comparison step, as claimed in the characterising part of Claim 1.

(b) Moreover, the detection of leading and trailing pattern edges of the printed matter by differentiating the scanned pattern data is not obvious to a skilled person. Document D6, page 19 (printed) discloses that the reference values Q_s and Q_e are generated to indicate the start and end of the printed pattern area, when the scanned signal amplitude surpasses a given threshold value. The explicit teaching in document D6 that various methods for producing the Q_s and Q_e signals may be applied, is directly followed by the statement to use the beginning and end of the banknote itself as reference points for the comparison. Hence, a skilled person is taught to develop the conventional system in a direction which leads away from the present invention.

VIII. The above submissions were contested by the Respondent who argued essentially as follows:

- (a) The fact that problems in identifying banknotes arise from displacement of the printed **pattern** with respect to the edges of the banknote is generally known in the art. The solution of this problem which involves correlating an area which is defined by the start and the end of a printed pattern area with a reference area, is already known from document D6, in particular Figure 4 with the corresponding description. Moreover, also document US-A-4 179 685 (D4), column 5, lines 9 to 11, discloses detection of the leading edge of a graphic image on a currency as a reference point for the comparison in the identifying step.
- (b) Since banknotes get dirty in use, the difference in light intensity reflected from the blank margin and from the printed pattern area of a banknote decreases with time. This effect leads a skilled person to look for a more sensitive technique which allows to sense the beginning and end of the printed area more precisely. Therefore, it would be obvious to make use of the generally known image improvement by differentiating the local image intensity distribution such as disclosed in document D7, page 48.
- (c) In item 3 of Claim 1 the wording "printed matter edge sensor (20)" has replaced the wording "bill edge sensor (20)" of Claim 1 as granted. Such a generalisation contravenes Article 123(3) EPC.

IX. At the conclusion of the oral proceedings, the decision was announced that the appeal is dismissed.

Reasons for the Decision

1. *Inventive step*

1.1 From the closest prior art according to document D6, there is known in the wording of Claim 1:

"A printed matter identification system, comprising:

1. transport means (see D6, 56a, 56b in Figure 5A) for moving a printed matter (i.e. a banknote) (54) in a first direction

2. scanning means comprising:

2.1 a light beam source (52 in Figure 5A) for emitting a light beam (51) directed to the printed matter and scanning successive lines of the printed matter in a direction perpendicular to the first direction (see scanned zone 53),

2.2 a line sensor (59) receiving the reflected light beam (58) and converting said reflected light beam into a scanned pattern data corresponding to at least a portion of the moving printed matter (D6, page 22, lines 25 to 29),

3. a printed matter edge sensor (57 in Figure 5A) producing an output upon detecting the edge of the printed matter (page 22, lines 22 to 25) and located transversely to the motion axis,

4. standard data generating means (70 in Figure 5B) for generating standard pattern data corresponding to a standard pattern of standard printed matters (page 24, lines 1 to 7), and

5. identification means, comprising:
 - 5.1 storage means (65 in Figure 5B) for retaining the scanned pattern data generated from said line sensor (page 23, lines 6 to 10),
 - 5.2 memory means (70) for storing the standard pattern data,
 - 5.3 comparison means (71 to 79) for comparing the scanned pattern data from the storage means with the stored standard data from the memory means in synchronism with the printed matter edge sensor and producing an output signal (page 24, lines 16 to page 26, line 2),
 - 5.4 processing means (69, 80) analyzing said output signal and calculating the similarity between the printed pattern of the printed matter and the standard pattern, from the scanned pattern data of the printed matter being checked and the standard pattern data (page 26, lines 2 to 16),
6. pattern edge detecting means (63 in Figure 5B) detecting the printed pattern edge of the printed matter in the first direction to obtain pattern edge data components (Q_s , Q_e ; page 23, lines 4 to 6) corresponding to leading and trailing pattern edges of the printed matter (page 19, lines 2 to 4),
7. Summing means for summing the picture element signals in each of the scanned pattern data signals for successive scanning lines (the summing means are implicit in document D6 since the photo sensor 59 integrally measures the reflected light from the total scanning line, and provides an output signal which represents the sum of the picture element signals of the scanned

pattern data signal of a scanning line) and outputting the sums ($D(t)$ in Figure 5B) corresponding to the successive scanning lines, respectively to the storage means (via 61, 64 and 65 in Figure 5B) whereby a detected pattern formed by the sums and related to the first direction is stored in said storage means (page 23, lines 6 to 14),

8. detected pattern sampling means (67 in Figure 5B in combination with the conversion of $D(t)$ into $D(I)$ according to Figure 4) which samples the detected pattern $D(t)$ to obtain data for a predetermined number of sampling points from each of the detected pattern edges (see Figure 4: sampling points $DF(J)$ from pattern edge Q_s and sampling points $DB(L)$ from pattern edge Q_e), wherein:
9. said processing means (69, 80 in Figure 5B) performs the calculation of the similarity of the sampled data corresponding to a leading area (i.e. the area from which samples $DF(J)$ for $J = 1$ to 50 are taken) immediately after detection of the leading area (i.e. during TS_1 in Figure 4; page 19, last four lines and page 24, line 1 to page 26, line 16), while performing a calculation of the similarity of the sampled data corresponding to a trailing area (i.e. the area from which samples $DB(L)$ for $L = 1$ to 50 are taken), characterized in that:
10. said pattern edge detecting means (63 in figure 5B) detect leading and trailing pattern edges of the printed matter (Q_s , Q_e ; page 19 lines 2 to 4)....., said leading area and said trailing area being sampled from the leading pattern edge of the printed pattern and sampled from the trailing pattern edge, respectively (see sampling parameters $J = 1$ to 50 for the leading area in Figure 4 which start from leading patten edge Q_s

and sampling parameters $L = 1$ to 50 for the trailing area which start from trailing patten edge Q_e and run in opposite direction)."

1.2 Starting from the closest prior art according to document D6, the objective problem underlying the present invention is to provide a printed matter identification system which permits the identification of the printed matter with higher accuracy; see the patent in suit, column 1, line 64 to column 2, line 2. In the Board's view, insufficient accuracy of identification would be noticeable during use of a conventional system, and improving such accuracy would be a routine task for a skilled person. Hence, the formulation of the objective problem does not contribute to an inventive step underlying the subject-matter of Claim 1. Disturbing influences caused by disfigurements of the edge and margin portions of the printed matter, for example currency notes, are already avoided by the conventional system (see in particular features 6 and 10 in para. 1.1 above). For this reason, the corresponding advantages put forward by the Appellant in paragraph VII-(a) above cannot be integrated into the formulation of the objective problem.

1.3 The subject-matter of Claim 1 is distinguished from the closest prior art according to document D6 in that the leading and trailing pattern edges of the printed matter are detected

"by differentiating the scanned pattern data".

According to the claimed invention, it is the presence of this feature which solves the above-stated objective problem.

1.4 A person skilled in identification systems for banknotes, in the Board's view, can be expected to be aware that identification failures of authentic banknotes are primarily caused by mismatch between the detected pattern data and the stored pattern data. Hence, in the event of failure the skilled person will control whether the reference points on the banknotes for the comparison of detected and stored standard pattern - i.e. the leading and trailing pattern edges Q_s and Q_e - can be detected in a reproducible way. Since a simple measurement of the distance between Q_s and Q_e which corresponds to the length of the printed pattern in the first (transport) direction, allows to experimentally control the reproducibility of the reference point detection, any unacceptable measuring error can easily be found by a routine test. In the Board's view, a skilled person would realise that such error is due to an intensity gradient of the light reflected from the banknote which is too small for a reliable triggering of the conventional threshold value S_1 at one and the same location; see document D6, page 19, lines 4 to 7. The skilled person would realise that a low intensity gradient has the effect that the given tolerance region of the threshold value produces a relatively large scanning region wherein triggering may occur. Therefore, it will be obvious to a skilled person that the identification accuracy can be improved by amplifying the contrast - i.e. increasing the intensity gradient - in the detected image of the printed matter in order to make the detection of the leading and trailing pattern edges more reliable.

1.5 A skilled person is regarded as able to recognise that any inclusion of the blank margin of the banknote in the area to be compared with the standard pattern - such as proposed in document D6 page 19, lines 9 to 11 (see also para. VIII-(b) above) - would reduce the identification

accuracy. Hence, in the Board's view, the suggestion in document D6 to use the banknote **edge** as a reference point for comparison with the standard pattern, would not impede a skilled person to look for a method which allows to generate a sharper image of the printed pattern in order to solve the objective problem.

- 1.6 Document D7, at page 48, lines 7 and 8 from the bottom of the page, explicitly states that a differentiation of the local intensity distribution improves the image quality. This differentiation technique provides a solution to a general technical problem. In the Board's view, a skilled person seeking to solve the above objective problem has a technical motive to consider this method, and **would** apply it in the system disclosed in document D6 in order to detect the leading and trailing pattern edges of the printed matter more precisely without needing to be inventive.
- 1.7 For the above reasons the Board considers that the subject-matter of Claim 1 is the result of an obvious use of the differentiation-technique of scanned pattern data disclosed in document D7 in the printed matter identification system of document D6. Therefore, in the Board's judgment, Claim 1 lacks an inventive step within the meaning of Article 56 EPC.
2. In view of this conclusion, it is not necessary to decide whether the amendment of the term "bill edge sensor" into "printed matter edge sensor" satisfies Article 123(3) EPC (paragraph VIII-(c) above).

Order

For these reasons it is decided that:

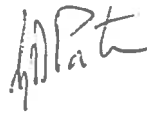
The appeal is dismissed.

The Registrar:



M. Beer

The Chairman:



G. D. Paterson

Re 13.03.95

R/W 16.3.95

