Case Number: T 0497/05 - 3.5.04
Application Number: 00122983.0
Publication Number: 1079629
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Language of the proceedings: EN

Title of invention:
Encoding apparatus, decoding apparatus, encoding method, and picture processing apparatus

Applicant:
MITSUBISHI DENKI KABUSHIKI KAISHA

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 123(2)

Relevant legal provisions (EPC 1973):
EPC Art. 84

Keyword:
"Amendments - added subject-matter (main request: yes)"
"Claims - support by description (first auxiliary request: no)"
"Claims - support by description (second auxiliary request: yes)"

Decisions cited:
-

Catchword:
-
Case Number: T 0497/05 - 3.5.04

DECISION of the Technical Board of Appeal 3.5.04 of 25 June 2009

Appellant: MITSUBISHI DENKI KABUSHIKI KAISHA
7-3, Marunouchi 2-chome
Chiyoda-ku
Tokyo 100-8310 (JP)

Representative: Pfenning, Meinig & Partner GbR
Patent- und Rechtsanwälte
Theresienhöhe 13
D-80339 München (DE)


Composition of the Board:

Chairman: F. Edlinger
Members: A. Dumont
T. Karamanli
Summary of Facts and Submissions

I. The appeal is directed against the decision by the examining division to refuse European patent application 00122983.0, published as EP 1 079 629 A1.

II. The application was refused on the ground that the subject-matter of the independent claims according to the requests then on file lacked support by the description (Article 84 EPC 1973). The examining division further found that claims 1 and 11 according to the second auxiliary request then on file in addition also infringed Article 123(2) EPC.

III. The applicant appealed and with the statement of grounds of appeal filed several sets of amended independent claims 1, 6, 11 and 13.

IV. In a communication sent in preparation for the oral proceedings the board drew attention to remaining deficiencies and informed the appellant that oral proceedings concerning the three cases T 1149/05, T 0497/05 and T 1558/07 (the parent application and two divisional applications, respectively) would be held jointly on three consecutive days.

V. With a letter dated 25 May 2009 the appellant filed a set of amended claims 1, 2, 6, 7 and 11 to 14 of a new main request.

VI. Oral proceedings were held on 23, 24 and 25 June 2009 jointly in the three cases T 1149/05, T 0497/05 and T 1558/07. The debate on the present case took place on 24 June 2009, and the decision was given on 25 June.
2009. In the oral proceedings the appellant filed *inter alia* a first and a second auxiliary request comprising claims 1 to 44.

VII. Before the closure of the debate the appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the main request comprising claims 1, 2, 6, 7 and 11 to 14 filed with the letter dated 25 May 2009 and the dependent claims 3 to 5, 8 to 10 and 15 to 44 filed with the letter dated 18 September 2003, and a description to be adapted.

Alternatively, the appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the first auxiliary request comprising claims 1 to 44 filed in the oral proceedings, and a description to be adapted.

Alternatively, the appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the second auxiliary request comprising claims 1 to 44 filed in the oral proceedings, and a description to be adapted.

VIII. Claim 1 according to the main request reads as follows:

"An encoding apparatus (400), comprising:

a picture element memory (1) for receiving and storing a value of an encoding picture element to be encoded, and for outputting values of encoded picture elements adjacent to the encoding picture element as values of reference picture elements;"
a mode determinator (2) for determining one of a specific encoding mode and an encoding mode other than the specific encoding mode from a plurality of predefined encoding modes for the encoding picture element;

a first encoding section (101) for predicting the value of the encoding picture element, determining a prediction result whether the prediction is correct or not, encoding the value of the encoding picture element based on the prediction result of the determination, and for outputting a codeword representing the encoding picture element under the determined specific encoding mode;

a second encoding section (102) for predicting the value of the encoding picture element, encoding the value of the encoding picture element, and for outputting a codeword representing the encoding picture element under the encoding mode other than the specific encoding mode; and

an encoding controller (11) for selectively operating the first encoding section and the second encoding section based on a determined encoding mode of the mode determinator (2)

wherein the first encoding section (101) comprises:

a first predictor (3) for calculating a prediction value of the encoding picture element based on the values of the reference picture elements;

a first prediction error calculator (30) for calculating a difference between the value of the
encoding picture element and the prediction value calculated by the first predictor (3) as a prediction error;
a zero determinator (4) for determining whether the prediction error calculated by the first prediction error calculator (30) is zero indicating that the prediction is correct, and for outputting a prediction result of the determination;
a first encoder (5) for receiving and encoding the prediction result of the determination output from the zero determinator (4), and for outputting the codeword representing whether the prediction result of the zero determinator is correct or not; and
a second encoder (6) for encoding the prediction error calculated by the first prediction error calculator (30) into the codeword using a first error-to-symbol converter (36) for receiving the prediction error and converting the prediction error into a sequence of binary symbols and comprising a first conversion table not including the prediction error value zero when the prediction error is not zero for the encoding picture element, a second probability estimator (26) for receiving the sequence of binary symbols and estimating an occurrence probability of one of the binary symbols, and a second codeword allotter (16) for encoding the sequence of binary symbols, said second encoder outputting the codeword representing the encoding picture element,

wherein the second encoding section (102) comprises:
a second predictor (7) for calculating a prediction value of the encoding picture element based on the values of the reference picture elements, a second prediction error calculator (31) for calculating
difference between the value of the encoding picture element and the prediction value calculated by the second predictor (7) as a prediction error; and a third encoder (8) for encoding the prediction error calculated by the second prediction error calculator (31) into the codeword and using a second error-to-symbol converter (38) for receiving the prediction error and converting the prediction error into a sequence of binary symbols and comprising a second conversion table including the prediction error value zero, a third probability estimator (28) for receiving the sequence of binary symbols and estimating an occurrence probability of one of the binary symbols, and a third codeword allotter (18) for encoding the sequence of binary symbols, said third encoder outputting the codeword representing the encoding picture element, and

wherein the mode determinator (2) receives the values of the reference picture elements output from said picture element memory and the prediction result of the determination output from said zero determinator (4), and determines the encoding mode based on the prediction results of the determination and whether all the values of the reference picture elements have the same value."

IX. Claim 1 according to the first auxiliary request reads as follows:

"An encoding apparatus (400), comprising:

a picture element memory (1) for receiving and storing a value of an encoding picture element to be encoded,
and for outputting values of encoded picture elements adjacent to the encoding picture element as values of reference picture elements;

a mode determinator (2) for determining one of a specific encoding mode and an encoding mode other than the specific encoding mode from a plurality of predefined encoding modes for the encoding picture element;

a first encoding section (101) for predicting the value of the encoding picture element, determining a prediction result whether the prediction is correct or not, encoding the value of the encoding picture element based on the prediction result of the determination, and for outputting a codeword representing the encoding picture element under the determined specific encoding mode;

a second encoding section (102) for predicting the value of the encoding picture element, encoding the value of the encoding picture element, and for outputting a codeword representing the encoding picture element under the encoding mode other than the specific encoding mode; and

an encoding controller (11) for selectively operating the first encoding section and the second encoding section based on a determined encoding mode of the mode determinator (2)
wherein the first encoding section (101) comprises:
a first predictor (3) for calculating a prediction value of the encoding picture element based on the values of the reference picture elements;
a first prediction error calculator (30) for calculating a difference between the value of the encoding picture element and the prediction value calculated by the first predictor (3) as a prediction error;
a zero determinator (4) for determining whether the prediction error calculated by the first prediction error calculator (30) is zero indicating that the prediction is correct, and for outputting a prediction result of the determination;
a first encoder (5) for receiving and encoding the prediction result of the determination output from the zero determinator (4), and for outputting the codeword representing whether the prediction result of the zero determinator is correct or not; and
a second encoder (6) for encoding the prediction error calculated by the first prediction error calculator (30) into the codeword using a first error-to-symbol converter (36) for receiving the prediction error and converting the prediction error into a sequence of binary symbols and comprising a first conversion table not including the prediction error value zero when the prediction error is not zero for the encoding picture element, a second probability estimator (26) for receiving the sequence of binary symbols and estimating an occurrence probability of one of the binary symbols, and a second codeword allotter (16) for encoding the sequence of binary symbols, said second encoder outputting the codeword representing the encoding picture element,
wherein the second encoding section (102) comprises:
a second predictor (7) for calculating a prediction
value of the encoding picture element based on the
values of the reference picture elements,
a second prediction error calculator (31) for
calculating difference between the value of the
encoding picture element and the prediction value
calculated by the second predictor (7) as a prediction
error; and
a third encoder (8) for encoding the prediction error
calculated by the second prediction error calculator
(31) into the codeword and using a second error-to-
symbol converter (38) for receiving the prediction
error and converting the prediction error into a
sequence of binary symbols and comprising a second
conversion table including the prediction error value
zero, a third probability estimator (28) for receiving
the sequence of binary symbols and estimating an
occurrence probability of one of the binary symbols,
and a third codeword allotter (18) for encoding the
sequence of binary symbols, said third encoder
outputting the codeword representing the encoding
picture element, and

wherein the mode determinator (2) receives the values
of the reference picture elements output from said
picture element memory and the prediction result of the
determination output from said zero determinator (4),
and selects an encoding mode between the specific
encoding mode (Mode A) used by the first encoding
section (101) and the encoding mode (Mode B) other than
the specific encoding mode used by the second encoding
section (102) such that the specific encoding mode
(Mode A) is continued when the determinator (4) determines that the prediction has proved to be correct, when the determinator (4) determines that the prediction has proved to be incorrect the encoding picture element is coded in the specific encoding mode (Mode A) and then the encoding mode (Mode B) other than the specific encoding mode is set, the specific encoding mode (Mode A) is selected when the value of adjacent reference picture elements are the same and the encoding mode (Mode B) other than the specific encoding mode is continued when the values of the reference picture elements are not the same."

X. The independent claims according to the second auxiliary request read as follows:

"1. An encoding apparatus (400), comprising:

a picture element memory (1) for receiving and storing a value of an encoding picture element to be encoded, and for outputting values of encoded picture elements adjacent to the encoding picture element as values of reference picture elements;

a mode determinator (2) for determining one of a specific encoding mode and an encoding mode other than the specific encoding mode from a plurality of predefined encoding modes for the encoding picture element;

a first encoding section (101) for predicting the value of the encoding picture element, determining a prediction result whether the prediction is correct or not, encoding the value of the encoding picture element
based on the prediction result of the determination, and for outputting a codeword representing the encoding picture element under the determined specific encoding mode;

a second encoding section (102) for predicting the value of the encoding picture element, encoding the value of the encoding picture element, and for outputting a codeword representing the encoding picture element under the encoding mode other than the specific encoding mode; and

an encoding controller (11) for selectively operating the first encoding section and the second encoding section based on a determined encoding mode of the mode determinator (2)

wherein the first encoding section (101) comprises:

a first predictor (3) for calculating a prediction value of the encoding picture element based on the values of the reference picture elements;

a first prediction error calculator (30) for calculating a difference between the value of the encoding picture element and the prediction value calculated by the first predictor (3) as a prediction error;

a zero determinator (4) for determining whether the prediction error calculated by the first prediction error calculator (30) is zero indicating that the prediction is correct, and for outputting a prediction result of the determination;

a first encoder (5) for receiving and encoding the prediction result of the determination output from the zero determinator (4), the first encoder (5) comprising
a first probability estimator (25) for receiving the result of the determination output from the determinator (4) as a sequence of binary symbols and estimating an occurrence probability of one of the binary symbols, and a first codeword allotter (15) for encoding the sequence of binary symbols into a codeword and for outputting said codeword, a second encoder (6) for encoding the prediction error calculated by the first prediction error calculator (30) into the codeword using a first error-to-symbol converter (36) for receiving the prediction error and converting the prediction error into a sequence of binary symbols and comprising a first conversion table not including the prediction error value zero when the prediction error is not zero for the encoding picture element, a second probability estimator (26) for receiving the sequence of binary symbols and estimating an occurrence probability of one of the binary symbols, and a second codeword allotter (16) for encoding the sequence of binary symbols, said second encoder outputting the codeword representing the encoding picture element,

wherein the second encoding section (102) comprises: a second predictor (7) for calculating a prediction value of the encoding picture element based on the values of the reference picture elements, a second prediction error calculator (31) for calculating a difference between the value of the encoding picture element and the prediction value calculated by the second predictor (7) as a prediction error; and a third encoder (8) for encoding the prediction error calculated by the second prediction error calculator
(31) into the codeword and using a second error-to-symbol converter (38) for receiving the prediction error and converting the prediction error into a sequence of binary symbols and comprising a second conversion table including the prediction error value zero, a third probability estimator (28) for receiving the sequence of binary symbols and estimating an occurrence probability of one of the binary symbols, and a third codeword allotter (18) for encoding the sequence of binary symbols, said third encoder outputting the codeword representing the encoding picture element, and

wherein the mode determinator (2) receives the values of the reference picture elements output from said picture element memory and the prediction result of the determination output from said zero determinator (4), and selects an encoding mode between the specific encoding mode (Mode A) used by the first encoding section (101) and the encoding mode (Mode B) other than the specific encoding mode used by the second encoding section (102) such that the specific encoding mode (Mode A) is continued when the determinator (4) determines that the prediction has proved to be correct, when the determinator (4) determines that the prediction has proved to be incorrect the encoding picture element is coded in the specific encoding mode (Mode A) and then the encoding mode (Mode B) other than the specific encoding mode is set, the specific encoding mode (Mode A) is selected when the value of adjacent reference picture elements are the same and the encoding mode (Mode B) other than the specific encoding mode is continued when the values of the reference picture elements are not the same."
"6. A decoding apparatus (500), comprising:

a picture element memory (41) for storing the value of a decoding picture element to be decoded, and outputting the values of the decoded picture elements adjacent to a decoding picture element as values of reference picture elements;

a mode determinator (42) for determining one of a specific decoding mode and a decoding mode other than the specific decoding mode from a plurality of predefined decoding modes for the decoding picture element;

a first decoding section (201) for receiving a codeword, predicting a value of the decoding picture element, determining a prediction result whether the prediction is correct or not, and for decoding the codeword into the value of the decoding picture element based on the prediction result of the determination under the determined specific decoding mode;

a second decoding section (202) for receiving a codeword representing the decoding picture element, predicting the value of the decoding picture element, decoding the codeword under the decoding mode other than the specific encoding mode; and

a decoding controller (43) for selectively operating the first decoding section and the second decoding section based on a determined decoding mode of the mode determinator (42),
wherein the first decoding section (201) comprises:
a first predictor (3) for calculating a prediction value of the decoding picture element based on the values of the reference picture elements;
a first decoder (45) for decoding the codeword representing the decoding picture element, the first decoder (45) having a first symbol restoring device (55) for receiving the codeword and decoding the codeword into a sequence of binary symbols and a first probability estimator (75) for estimating an occurrence probability of one of the binary symbols, and wherein the first decoder outputs one of the binary symbols as a result of determination indicating whether a prediction error is zero;
a second decoder (46) for decoding the codeword representing the decoding picture element having the prediction error not zero into the prediction error not zero having a second symbol restoring device (56) for receiving the codeword and decoding the codeword into a sequence of binary symbols, a second probability estimator (76) for receiving the binary symbols and estimating an occurrence probability of one of the binary symbols, and a first symbol-to-error converter (86), comprising a first conversion table not including the prediction error value zero, for receiving the sequence of binary symbols and converting the sequence of binary symbols into the prediction error;
a first decoding picture element calculator (32) for calculating the value of the decoding picture element based on the prediction value of the decoding picture element calculated by the first predictor (3), and the prediction error obtained by the second decoder (46),
wherein the second decoding section (202) comprises:

- a second predictor (7) for calculating a prediction value of the decoding picture element based on the value of the reference picture element;

- a third decoder (48) for decoding the codeword representing the decoding picture element into the prediction error having a third symbol restoring device (58) for receiving the codeword and decoding the codeword into a sequence of binary symbols, a third probability estimator (78) for receiving the binary symbols and estimating an occurrence probability of one of the binary symbols, and a second symbol-to error converter (88) comprising a second conversion table including the prediction error value zero, for receiving the sequence of binary symbols and converting the sequence of binary symbols into the prediction error;

- a second decoding picture element calculator (33) for calculating the value of the decoding picture element based on the prediction value of the decoding picture element calculated by the second predictor (7) and the prediction error obtained by the third decoder (48), and

wherein the mode determinator receives the values of the reference picture elements output from said picture element memory and the prediction result of the determination decoded by said first decoder, and selects a decoding mode between the specific decoding mode used by the first decoding section (201) and the decoding mode other than the specific decoding mode used by the second decoding section (202), such that the specific decoding mode (Mode A) is continued when the prediction result of determination determines that
the prediction has proved to be correct, when the prediction result determines that the prediction has proved to be incorrect the decoding picture element is decoded in the specific decoding mode (Mode A) and then the decoding mode (Mode B) other than the specific decoding mode is set, the specific decoding mode (Mode A) is selected when the values of adjacent reference picture elements are the same and the decoding mode other than the specific decoding mode is continued when the values of adjacent reference picture elements are not the same."

"11. An encoding method comprising:

an outputting step of receiving and storing a value of an encoding picture element to be encoded, and outputting values of encoded picture elements adjacent to the encoding picture element as values of reference picture elements;

a mode deciding step of determining one of a specific encoding mode and an encoding mode other than the specific encoding mode from a plurality of predefined encoding modes for the encoding picture element;

a first main encoding step of predicting the value of the encoding picture element, determining a prediction result whether the prediction is correct or not, encoding the value of the encoding picture element based on a prediction result of determination, and outputting a codeword representing the encoding picture element under the determined specific encoding mode;
a second main encoding step of predicting the value of
the encoding picture element, encoding the value of the
encoding picture element, and outputting a codeword
representing the encoding picture element under the
encoding mode other than the specific encoding mode;
and

an encoding controlling step of selectively operating
the first main encoding step and the second main
encoding step based on a determined encoding mode of
the mode deciding step,

wherein the first main encoding step comprises:
a first predicting step of calculating a prediction
value of the encoding picture element based on the
values of the reference picture elements;
a first prediction error calculating step of
calculating a difference between the value of the
encoding picture element and the prediction value
calculated by the first predicting step as a prediction
error;
a zero determination step of determining whether the
prediction error calculated by the first prediction
error calculating step is zero indicating that the
prediction is correct, and outputting a prediction
result of the determination;
a first encoding step of receiving and encoding the
prediction result of the determination output by the
zero determination step, the first encoding step
comprising a first probability estimating step of
receiving the result of the determination output by the
determination step as a sequence of binary symbols and
estimating an occurrence probability of one of the
binary symbols and a first codeword allotting step of
encoding the sequence of binary symbols into a codeword and outputting said codeword,

a second encoding step of encoding the prediction error calculated by the first prediction error calculating step into the code word using a first error-to-symbol converting step of receiving the prediction error and converting the prediction error into a sequence of binary symbols, and using a first conversion table not including the prediction error value zero when the prediction error is not zero for the encoding picture element, a second probability estimating step of receiving the sequence of binary symbols and estimating an occurrence probability of one of the binary symbols, and a second codeword allotting step of encoding the sequence of binary symbols, said second encoding step outputting the codeword representing the encoding picture element,

wherein the second main encoding step comprises:
a second predicting step of calculating a prediction values of the encoding picture elements based on the value of the reference picture element;
a second prediction error calculating step of calculating a difference between the value of the encoding picture element and the prediction value calculated by the second predicting step as a prediction error; and
a third encoding step of encoding the prediction error calculated by the second prediction error calculating step into the codeword using a second error-to-symbol converting step of receiving the prediction error and converting the prediction error into a sequence of binary symbols, and using a second conversion table
including the prediction error value zero, a third probability estimating step of receiving the sequence of binary symbols and estimating an occurrence probability of one of the binary symbols, and a third codeword allotting step of encoding the sequence of binary symbols, and said third encoding step outputting the codeword representing the encoding picture element, and

wherein the mode deciding step receives the values of the reference picture elements output from said outputting step and the prediction result of the determination output from said zero determination step, and selects an encoding mode between the specific encoding mode (Mode A) used by the first encoding section (101) and the encoding mode (Mode B) other than the specific encoding mode used by the second encoding section (102) such that the specific encoding mode (Mode A) is continued when the determinator (4) determines that the prediction has proved to be correct, when the determinator (4) determines that the prediction has proved to be incorrect the encoding picture element is coded in the specific encoding mode (Mode A) and then the encoding mode (Mode B) other than the specific encoding mode is set, the specific encoding mode (Mode A) is selected when the value of adjacent reference picture elements are the same and the encoding mode (Mode B) other than the specific encoding mode is continued when the values of the reference picture elements are not the same."
"13. A decoding method, comprising:

an outputting step of storing a value of a decoding picture element to be decoded, and outputting the values of the decoded picture elements adjacent to a decoding picture element as values of reference picture elements:

a mode deciding step of determining one of a specific decoding mode and a decoding mode other than the specific decoding mode from a plurality of predefined encoding modes for the decoding picture element;

a first main decoding step of receiving a codeword, predicting a value of the decoding picture element, determining a prediction result whether the prediction is correct or not, and decoding the codeword into the value of the decoding picture element based on a prediction result of the determination under the determined specific decoding mode;

a second main decoding step of receiving a codeword, predicting the value of the decoding picture element, and decoding the codeword into the value of the decoding picture element under the decoding mode other than the specific encoding mode; and

a decoding controlling step of selectively operating the first main decoding step and the second main decoding step based on a determined decoding mode of the mode deciding step,
wherein the first main decoding step comprises:
a first predicting step of calculating a prediction value of the decoding picture element based on the value(s) of the reference picture element(s);
a first decoding step of decoding the codeword representing the decoding picture element, the first decoding step comprising a first symbol restoring step for receiving the codeword and decoding the codeword into a sequence of binary symbols and a first probability estimating step of estimating an occurrence probability of one of the binary symbols, and a step of outputting one of the binary symbols as a result of the determination indicating whether a prediction error is zero,
a second decoding step of decoding the codeword for the decoding picture element and having the prediction error not zero into the prediction error not zero using a second symbol restoring step of receiving the codeword and decoding the codeword into a sequence of binary symbols, a second probability estimating step of estimating an occurrence probability of one of the binary symbols, and a first symbol-to-error converting step using a first conversion table not including the prediction error value zero, of receiving the sequence of binary symbols and converting the sequence of binary symbols into the prediction error; and
a first decoding picture element calculating step of calculating the value of the decoding picture element based on the prediction value for the decoding picture element calculated by the first predicting step, and the prediction error not zero obtained by the second decoding step,
wherein the second main decoding step comprises:
a second predicting step of calculating a prediction value(s) of the decoding picture element(s) based on the value of the reference picture element;
a third decoding step of decoding the codeword for the decoding picture element using a third symbol restoring step of receiving the codeword and decoding the codeword into a sequence of binary symbols, a third probability estimating step of receiving the binary symbols and estimating an occurrence probability of one of the binary symbols, and a second symbol-to-error converting step of receiving the sequence of binary symbols and converting the sequence of binary symbols into the prediction error using a second conversion table including the prediction error value zero; and
a second decoding picture element calculating step of calculating the value of the decoding picture element based on the prediction value calculated by the second predicting step and the prediction error calculated by the third decoding step, and

wherein the mode deciding step receives the values of the reference picture elements output from said outputting step and the result of the determination decoded by said first decoding step, and selects a decoding mode between the specific decoding mode used by the first decoding section (201) and the decoding mode other than the specific decoding mode used by the second decoding section (202), such that the specific decoding mode (Mode A) is continued when the prediction result of determination determines that the prediction has proved to be correct, when the prediction result determines that the prediction has proved to be incorrect the decoding picture element is decoded in
the specific decoding mode (Mode A) and then the decoding mode (Mode B) other than the specific decoding mode is set, the specific decoding mode (Mode A) is selected when the values of adjacent reference picture elements are the same and the decoding mode other than the specific decoding mode is continued when the values of adjacent reference picture elements are not the same."

XI. The reasoning in the decision under appeal, insofar as it is relevant for the present decision, may be summarised as follows.

(a) The problem to which the application is directed is to provide efficient encoding and decoding by switching between different types of encoding and decoding systems.

Claim 1 defines a first and a second encoding section, each comprising an encoder. Claim 1 does not imply that the above (second and third) encoders are different and output different codewords. Switching between them thus serves no technical purpose.

The mode determinator of claim 1 is a broad generalisation of the flow chart of figure 10, and the relationship between the technical nature of the various modes and the "combination pattern" is neither defined nor implied. Claim 1 is not limited to the embodiment of figure 4 and the switching according to figure 10.
As a result, claim 1 allows embodiments not solving the technical problem and not making technical sense. It is therefore not supported by the description.

(b) Claims defining the codeword output by the first encoder having a "small codeword length" and the codeword output by the second encoder having a "greater codeword length" infringe Article 123(2) EPC.

XII. The appellant's argumentation may be summarised as follows.

An essential inventive feature of the encoding apparatus lies in the first encoder encoding the (binary) result of the test as to whether the prediction error is zero, indicating that the prediction is correct, in contrast to the other encoders encoding the prediction error.

Claim 1 has to be considered as a whole, i.e. the interaction between the different parts of the apparatus has to be considered. The first encoding section comprises a first encoder encoding all the picture elements having a zero prediction error in a way different from those having a non-zero prediction error, and a second encoder encoding non-zero prediction errors. The third encoder in the second encoding section encodes all the other prediction errors. The skilled person furthermore gathers from claim 1 that the choice of the encoding mode and/or encoder depends on the prediction result and on a condition for the reference picture elements.
The person skilled in the technical field of encoding thus deduces from the claim that the first encoding section (comprising the second encoder) may encode picture elements differently from the second encoding section (comprising the third encoder) and may be used when a good predictability is given.

The application as a whole has to sufficiently disclose the invention for it to be carried out as required by Article 83 EPC, which is not at issue in the present case. In contrast, Article 84 EPC does not require that the claim define the details of the embodiments. The description teaches that in case of good predictability a very high efficiency can be achieved by the first encoder providing a codeword encoding a number of prediction results before an incorrect prediction result is determined. The description also teaches that the second encoder generates shorter codewords than the third encoder because it is designed not to encode the zero prediction error. Setting out these details in claim 1 is however not necessary because claim 1 gives enough technical information for the person skilled in the art to routinely implement the apparatus and solve the technical problem of enhancing coding efficiency.

The structure of the apparatus and the rules for choosing a mode and/or an encoder according to claim 1 provide sufficient flexibility for the skilled person to design an implementation having an enhanced compression efficiency, and to routinely discard disadvantageous or technically senseless implementations, even if those are in principle allowed by the claim.
As a result, claim 1 and the further corresponding independent claims are supported by the description.

A basis for the last paragraph of claim 1 according to the main request may be essentially found in the definition of the mode determinator in paragraph [0037] of the present application as published together with figure 10 and the corresponding passages in the description. The claim complies therefore with the requirements of Article 123(2) EPC.

**Reasons for the Decision**

1. The appeal is admissible.

2. **Main request**

2.1 The last paragraph of claim 1 sets out that the mode determinator "determines the encoding mode based on the prediction results of the determination and whether all the values of the reference picture elements have the same value". In the context of claim 1 this means that one of the plurality of predefined encoding modes, namely the specific encoding mode (Mode A) or the encoding mode other than the specific encoding mode (Mode B), is determined based on any combination of the two conditions.

2.2 Paragraph [0037] (in the following all the references to paragraph numbers relate to the present divisional application as published) discloses that the mode determinator selects an encoding mode "based on the
value of the reference picture element" (an identical wording is used on page 17, paragraph 1, of the divisional application as filed). The mode deciding operation shown in the flow chart of figure 10 essentially discloses that Mode A is initially set (S11) and newly set when, being in Mode B, the reference picture elements have the same value (decision box S16). Mode B is set (S17) when, being in Mode A, the zero determinator indicates that the prediction result is not correct (not zero; decision box S15). A very small prediction error is also considered as a correct prediction result (see paragraphs [0117] and [0140]).

2.3 Figure 10 and the corresponding passages in the description do not disclose a mode determination based on another combination of the prediction results and of whether all the reference picture elements have the same value, for instance by setting (back) Mode A based on the prediction results or setting Mode B based on a particular other combination of both the prediction results and all the reference picture elements having the same value.

2.4 The above feature of claim 1 is also not derivable from another embodiment in the flow chart of figure 18, in which the encoding mode is determined based only on whether all the reference picture elements have the same value (see decision box S3). Similarly it is also not derivable from an alternative combination of reference picture elements envisaged in paragraph [0268], which corresponds to the last paragraph on page 119 of the divisional application as filed.
2.5 Therefore claim 1 of the main request does not comply with the requirements of Article 123(2) EPC.

2.6 As a result, the main request is not allowable.

3. First auxiliary request

3.1 Concerning the problems solved by the present application, the description refers to a "related art 2" for counting and encoding a number of consecutive more probable symbols (MPS) into a codeword using a plurality of codeword tables. The codeword tables must allot an (at least one-bit long) code for each picture element regardless of whether or not the prediction has proved to be correct (see paragraphs [0011] and [0028]; figures 67 and 68). The description also refers to a "related art 3" switching between a mode A and a mode B for encoding/decoding depending on a condition for the value(s) of reference picture element(s) (see paragraph [0019]; figure 69). According to a further "related art 4", an apparatus switches between an encoding section comprising a lossy picture compression circuit and an encoding section comprising a lossless picture compression circuit according to the condition (see paragraph [0029]; figure 70).

3.2 The most general object of the present invention is to efficiently implement encoding and decoding of picture information, in particular by switching between different types of encoding and decoding systems (see paragraphs [0031] and [0032]).
3.3 The claims according to the first auxiliary request are directed to the first embodiment described (see, for instance, figure 4 for the encoding apparatus and figure 10 for the flow chart of the mode deciding operation).

3.4 As is apparent from the description, in view of this background encoding efficiency is considerably enhanced in the first place by the first encoder outputting a codeword for a series of more probable symbols (MPS), essentially by forming a codeword reflecting the count of consecutive MPS (see paragraphs [0144], [0145] and [0163]). The first encoder encodes into a single codeword a series of consecutive MPS as prediction results indicating a correct prediction (i.e. Boolean-type match/mismatch binary information), for instance a series of zeroes (see figure 67). Encoding the count of correct prediction results instead of each (zero) prediction error (for each of which at least a one-bit code is required) can greatly reduce the number of encoding bits for images with good predictability. The first encoder operates under these favourable conditions only if the rules for switching the encoding mode under which the first encoder operates are chosen such that the first encoder predominantly receives series of MPS.

Therefore the features are presented as essential which make the first encoder suitable for predominantly processing series of picture elements yielding prediction results consecutively indicating a correct prediction, by switching the encoding mode according to judicious rules, and for efficiently encoding such
series of prediction results representing the encoding picture elements.

The disclosure in the description having regard to the technical problems and the advantageous effects of the invention supports a claim where these features constitute the improvement over the known pieces of "related art" referred to in the description. The board can see no support in the description for a generalised teaching that a combination of switching between encoding modes and, in one of the modes, switching between two encoders would provide an enhanced coding efficiency. It follows that the requirement of support by the description according to Article 84 EPC 1973 is fulfilled only if the claimed encoding apparatus reflects these essential features.

3.5 The last paragraph of claim 1 sets out rules for determining and operating a particular encoding mode (and encoder) essentially as shown in the flow chart of figure 10, in particular continuing the specific encoding mode (Mode A; under which the first encoder operates) when the prediction has proved to be correct (i.e. when the prediction error is zero); in the alternative setting the other than the specific encoding mode (Mode B) and switching from Mode B to Mode A when the values of adjacent reference picture elements are the same. The skilled person would recognise that determining whether the values of adjacent reference picture elements are the same or not provides an indication of the predictability of a picture element, i.e. of the likelihood that the prediction result for the encoding picture element will be correct (see figure 69 and the condition boxes S15
and S16 in the flow chart of figure 10). The specific encoding mode (under which the first and second encoders operate) is thus predominantly determined for predictable picture elements.

3.6 However the first encoder according to claim 1 is merely defined as "for receiving and encoding the prediction result of the determination output from the zero determinator (4), and for outputting the codeword representing whether the prediction result of the zero determinator is correct or not". It may output a codeword for each prediction result and may, for instance, also be used together with the second encoder to output a codeword for a given picture element (see "outputting a codeword representing the encoding picture element" in the feature specifying the first encoding section). Claim 1 is thus not explicitly limited to the first encoder receiving and encoding a prediction result indicating a correct prediction into a codeword, let alone encoding a series or a sequence thereof into the codeword. The board also does not see a limitation on the first encoder that would implicitly result from the determination of the encoding mode (see the foregoing section) and from the definition of the second encoder. As a result, claim 1 does not define all the features of the first encoder identified in section 3.4 above as being necessary to achieve enhanced coding efficiency.

3.7 The board accepts that the first encoder encoding prediction results (i.e. binary results), rather than prediction errors (i.e. values in the range [-255, +255] in the examples of figures 8 and 9), is a crucial feature of the invention. It is however per se not
sufficient to bring about the enhanced coding efficiency, if claim 1 does not specify the essential features to ensure that the first encoder predominantly receives and encodes sequences of more probable binary symbols representing such prediction results as a codeword.

3.8 The appellant argues that an apparatus with two sections and three encoders is more flexible and therefore may be more optimal than the prior art systems. However this does not take into account that encoding apparatuses with several encoders are acknowledged in the description as being prior art, in particular according to the "related art 3" or the "related art 4" disclosing the switching between two encoding modes or sections (see section 3.1 above). The present invention seeks to improve such prior art (see paragraphs [0022] to [0024] and [0029]). The board agrees with the appellant that three encoders allow in principle more flexibility than one or two and that they may be implemented so as to bring about the sought-after advantage. This structure alone is however not sufficient in the board's view to bring about the enhanced efficiency of the present invention.

3.9 The appellant argues that the skilled person would not contemplate embodiments of the invention not regarded as advantageous, i.e. embodiments not achieving an enhanced efficiency. However in accordance with Article 84 EPC 1973 the claims shall define the matter for which protection is sought. To this effect they have to explicitly specify all of the essential features needed to define the invention as it can be understood from the description.
3.10 In conclusion, claim 1 is not supported by the description and therefore infringes Article 84 EPC 1973.

3.11 As a result, the first auxiliary request is not allowable.

4. **Second auxiliary request**

4.1 The claims according to this request are also directed at the first embodiment described.

4.2 Claim 1, as distinguished from claim 1 of the first auxiliary request, specifies an encoding apparatus with a first encoder according to figure 5, comprising *inter alia* a first probability estimator for receiving the result of the determination output from the determinator as a sequence of binary symbols, and a first codeword allotter for encoding the sequence of binary symbols into a codeword and for outputting said codeword. The last paragraph of claim 1 sets out the mode determinator switching between the two encoding modes (Mode A, Mode B) in the same terms as the first auxiliary request.

Claim 1 thus defines both the first encoder coding a sequence of binary symbols into a codeword and the rules ensuring that the first encoder predominantly receives and encodes more probable binary symbols (see sections 3.4 and 3.5 above).

4.3 As a result, claim 1 defines the technical features ensuring that enhanced coding efficiency may be
achieved and it is supported by the description in the
meaning of Article 84 EPC 1973.

4.4 The examining division objected that claim 1 was not so
worded as to imply that the second and third encoders
would be different and output different codewords. The
board is of the opinion that the (amended) definition
of the criteria essentially according to the flow chart
of figure 10 for switching between the two encoding
modes (Mode A, Mode B), i.e. between the first and
second encoding sections respectively comprising the
second and third encoders, ensures that the first
encoding section (comprising the second encoder) and
thus a specific encoding mode is selected when
identical values of the reference picture elements hint
at good predictability. The second encoding section
(comprising the third encoder) and thus the encoding
mode other than the specific encoding mode is only
selected when the values of the reference picture
elements hint at bad predictability. Moreover claim 1
now also specifies that the second and third encoders
have different conversion tables, one including the
prediction error value zero and the other not.
Switching between them thus makes technical sense under
these conditions because both the second and third
encoders can be adapted to their different tasks, the
second encoder only encoding the prediction error
before the mode is changed and the third encoder
encoding prediction errors in case of bad
predictability, regardless of whether the prediction is
correct.

4.5 Corresponding definitions are included in the other
independent claims relating to the corresponding
decoding apparatus (claim 6), encoding method (claim 11) and decoding method (claim 13). These claims are therefore also supported by the description in the meaning of Article 84 EPC 1973.

4.6 In conclusion the grounds for refusing the present application under Article 84 EPC 1973 do not apply any more to the claims according to the second auxiliary request.

5. The expressions "small codeword length" and "greater codeword length" found to infringe Article 123(2) EPC in the decision under appeal are not comprised in the independent claims according to the present second auxiliary request. As a result, the ground for refusing the present application under Article 123(2) EPC no longer applies.

6. Hence, none of the grounds for refusing the present application applies any more to the second auxiliary request, and the decision under appeal must be set aside.

7. Remittal to the first instance

The examining division has dealt essentially with the issue of support by the description in the examination proceedings. A full examination as to whether the application complies with the other requirements of the EPC is still outstanding. In view of these circumstances the board exercises its discretion in accordance with Article 111(1) EPC 1973 and decides to remit the case to the first instance for further prosecution on the basis of the second auxiliary
request. The board has noted that the set of claims still shows several linguistic and typographical errors which are reproduced in the set of claims above as they were filed.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance for further prosecution.

The Registrar                        The Chairman

L. Fernández Gómez                   F. Edlinger