Datasheet for the decision of 30 May 2008

Case Number: T 1709/06 - 3.5.03
Application Number: 94916545.0
Publication Number: 0803163
IPC: H04J 3/16

Language of the proceedings: EN

Title of invention:
A multiplexer system using constant bit rate encoders

Applicant:
Thomson Inc.

Opponent:
-

Headword:
Multiplexer System/THOMSON

Relevant legal provisions:
EPC Art. 56, 111(1), 113(1)
EPC R. 103(1)(a), 111(2)
RPBA Art. 11

Relevant legal provisions (EPC 1973):
EPC R. 67, 68(2)

Keyword:
"Infringement of the right to be heard (yes)"
"Reasoned decision (no)"
"Substantial procedural violation (yes)"
"Reimbursement of the appeal fee (yes)"
"Remittal without substantive examination of the appeal (no)"
"Inventive step (yes, following amendment)"

Decisions cited:
G 0010/93, T 0740/93, T 1309/05, T 1356/05
Case Number: T 1709/06 - 3.5.03

DECISION
of the Technical Board of Appeal 3.5.03
of 30 May 2008

Appellant: Thomson, Inc.
10330 North Meridian St.
Indianapolis
IN 46290-1024 (US)

Representative: Ruellan-Lemonnier, Brigitte
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Composition of the Board:
Chairman: A. S. Clelland
Members: T. Snell
R. Moufang
Summary of Facts and Submissions

I. This appeal is against the decision of the examining division refusing European patent application No. 94916545.0, published as international application No. WO-A-95/29559.

II. In the course of the examining procedure, the examining division issued first, second and third communications under Article 96(2) EPC 1973, dated respectively 12.06.02, 19.08.03 and 30.12.04.

In the above communications, the examining division referred to the following two documents:


III. The applicant responded to the above communications with first, second and third replies dated respectively 04.04.03, 13.02.04, and 11.07.05. With each reply, an amended set of claims was filed.

IV. In the first communication of the examining division, objections were raised under the terms of Article 52(1) EPC, inter alia on the grounds that claims 1 and 2 did not meet the requirement of novelty, or at least inventive step, having regard to D1, that claim 1 did not meet the requirement of inventive step having regard to D2, and that claim 19 (dependent on claim 2) did not meet the requirement for an inventive step having regard to D1 and the algorithm set out in D2.
In the second communication, new claim 1 was attacked for lack of inventive step based on D2 as closest prior art, combined with D1. Various objections under Article 84 EPC were also raised.

In the third communication, further objections under Article 84 EPC were raised. The applicant's analysis of D2 submitted in the applicant's second reply was contested.

V. In a communication annexed to a summons to attend oral proceedings dated 08.02.2006 (to be referred to as the "fourth communication"), the examining division stated that claim 1 was not allowable "as per the objections of the first official communication with respect to the then claim 19". Thereafter, lack of inventive step with respect to D1 (taken alone) was argued; as part of the reasoning the examining division referred to "a result to be achieved" and to the Guidelines C-III, 4.7. The communication stated further: "For completion, and as described in detail in the second official communication, D2 applies such a principle of bandwidth sharing to a multiplex of MPEG streams".

VI. The fourth communication additionally contained the following advice to the applicant: "If the applicant simply disagrees with the analysis of the examining division and intends to submit argumentation to that effect without substantive and significant changes to the claims addressing the objections raised, he is encouraged to request an appealable decision according to the state of the file in accordance with the Guidelines E-X, 4.4".

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VII. In a reply to the summons to oral proceedings under Rule 71a(1) EPC 1973 received on 13.04.06 and dated (obviously erroneously) 13.04.05 (to be referred to as the "fourth reply"), the applicant submitted further observations in support of inventive step with respect to D1 and D2.

VIII. In a further submission dated 12.05.06, the applicant withdrew the request for oral proceedings and requested a decision "on the basis of the file as it stands".

IX. The examining division issued the impugned decision in a standard form. The decision refers to the first, second and fourth communications. The full text of the grounds for the decision reads as follows:

"In the communication(s) dated 08.02.2006, 19.08.2003, 12.06.2002 the applicant was informed that the application does not meet the requirements of the European Patent Convention. The applicant was also informed of the reasons therein.

The applicant filed no comments or amendments in reply to the latest communication but requested a decision according to the state of the file by a letter received in due time on 12.05.2006.

The application must therefore be refused."

X. In the statement of grounds of appeal the appellant requested that the board reconsider the application and allow the application to issue as a patent.
The appellant submitted the following observations on the procedure followed by the examining division:

"The decision to refuse the European patent application was based on grounds the applicant has not filed comments or amendments in reply to the latest communication. This latest communication was the summons to attend oral proceedings, dated February 8, 2006.

The applicant sent an answer to this letter on April 13, 2006. No counter arguments were given by the Examiner in answer to these new arguments. Consequently, the applicant considers the grounds on which the decision is based are not valid and respectfully requests the Board of Appeal to reconsider the case".

The statement of grounds further contained detailed arguments as to why the subject-matter of claim 1 involved an inventive step with respect to D1 and D2, corresponding essentially to the fourth reply filed during the examining procedure.

As a precautionary measure, oral proceedings were requested.

XI. In a communication accompanying a summons to oral proceedings the board noted that although the appellant had challenged the validity of the decision on procedural grounds, no reimbursement of the appeal fee had been requested under Rule 67 EPC 1973 (Rule 103(1)(a) EPC). In any event, given the age of the application the board proposed to examine the case in
substance rather than consider remittal to the examining division. The board gave a preliminary opinion in which objections under Articles 123(2), 84, and 52(1) in combination with Article 56 EPC were raised.

XII. In response to the board's communication, the appellant filed a new set of claims 1-18 intended to replace the previous set of claims on file as a main request. An alternative version of claim 1 was filed as an auxiliary request. Supporting arguments were also submitted.

XIII. Oral proceedings were held on 30.05.08. The appellant requested that the decision be set aside and a patent be granted on the basis of a single set of claims 1-18 filed during the oral proceedings (termed "main request"). Implicitly the request included the description and drawings currently on file, namely:

Description:
pages 1-3, 5 and 7-39 as published; pages 4, 4a, 6 received on 13.02.2004.

Drawings:
Sheets 1/3-3/3 as published.

The appellant requested further that the appeal fee be reimbursed. After deliberation, the board's decision was announced at the end of the oral proceedings.
XIV. Claim 1 of the appellant's request reads as follows:

"A multiplexing system, comprising:
- a plurality of sources (5) of data signals representing respective sequences of pictures extending over a given GOP time period;
- a multiplexer (20) having a plurality of input terminals (1-K), and an output terminal (15),
- a plurality of channel processors (10), each having a data input terminal coupled to a respective one of the sources (5), a complexity output terminal adapted to produce a signal representative of the complexity of the entire sequence of pictures represented by the data signal at the data input terminal, a control input terminal, and a data output terminal coupled to a respective one of the input terminals (1-K) of the multiplexer (20) and adapted to produce an encoded signal at a constant bit rate set in response to the signal at the control input terminal; and
- a bit rate allocator (30), having a plurality of pairs of associated input and output terminals, each pair associated with a respective one of the channel processors, the input terminal of each pair coupled to the complexity output terminal of the associated channel processor, and the output terminal of each pair coupled to the control input terminal of the associated channel processor and adapted to generate a bit rate quota signal such that each channel processor (10) is allocated a bit rate related to the complexity represented by the signal at the associated input terminal and to the combined complexity represented by the signals at the input terminals of all of the plurality of pairs, wherein
- said multiplexer (20) is adapted to produce a signal at its output terminal (15) having a predetermined constant bit rate,
- each data signal source (5) is adapted to produce a data signal that is a video signal comprising picture data of said sequence of pictures comprising a number of frames, wherein said given GOP time period is the same for each of the plurality of channel processors,
- each channel processor (10) is adapted to generate the complexity representative signal during encoding of the sequence of pictures represented by the data signal at the channel processor data input terminal; and
- the bit rate allocator (30) is adapted to generate a separate bit rate quota signal for each channel processor, the separate bit rate quota signals being valid for the entire GOP time period following the given GOP time period, in response to the complexity representative signals, such that each channel processor (10) is allocated a proportion of the predetermined constant bit rate based on the proportion of the complexity represented by the signal at the associated input terminal of each pair to the combined complexity represented by the signals at the input terminals of all of the plurality of pairs."
Reasons for the Decision

1. Procedural matters

1.1 Article 113(1) EPC

1.1.1 The impugned decision is in the form of a so-called "decision according to the state of the file". The decision includes the statement:

"The applicant filed no comments or amendments in reply to the latest communication but requested a decision according to the state of the file by a letter received in due time on 12.05.2006".

1.1.2 This statement is factually incorrect, since the fourth reply of the applicant, including extensive comments in respect of the patentability of the claims, was filed after the last communication of the examining division.

1.1.3 The examining division's fourth and final communication included an objection of lack of inventive step based on document D1 taken alone. The matter distinguishing the claim from D1 was considered to be a mere re-statement of the objective technical problem in the form of a result to be achieved "without defining any technical structural features which would serve to distinguish the invention in an inventive manner from the prior art". It was however also argued that D1 at column 9, line 62 - column 10, line 3 would lead a skilled person to adapt the apparatus of D1 without the need for an inventive step. This argumentation based on D1 alone was presented by the examining division for the first time.
1.1.4 In the fourth reply of the applicant, filed in response to this communication, the following arguments are raised, at least in part, for the first time:

(i) "The specification then points out that by using a GOP, the problems of buffer management and bit rate oscillations are reduced - that is, the technical solution (the use of GOPs as claimed) provides technical advantages."

(ii) "Document D1 discloses at least some of the problems mentioned in our specification such as buffer underflow and overflow, rate oscillations. Nevertheless, document D1 only discloses a rate allocation at an image level. The one skilled in the art having to solve such a problem of bit rate oscillation or buffer overflow would not be enticed to use our invention, i.e. a rate control at a gop level as another [sic] solutions are given in document D1".

(iii) "As in our patent application, problems raised in D2 relate to image quality, buffer overflow (last paragraph of page 159). Nevertheless, the document proposes a bit rate control at an "instant" level as \( R_i(t+1-T) \) corresponds to an instant \( t+1-T \), or more precisely at an [sic] "multiplexing epoch" level.

Consequently, although D2 discloses the use of GOP structures for determination of a cyclostationary period, to estimate \( R \), this document doesn't propose a bit rate control at a gop level for solving such problems.
In fact, if D2 discloses the GOP structure, it's only to benefit of its cyclostationary characteristic. An epoch duration is less than a frame period, a fortiori a gop period. In an example, a gop duration corresponds to 90 multiplexing epoches [sic].

The one skilled in the art having to solve such problems would be taught away, through the teaching of D2, from our invention, i.e. a rate control at gop level as such a solution is not suggested in D2 although buffer overflow, statistical multiplexing and gop structure are disclosed.

1.1.5 In accordance with Article 113(1) EPC, the decisions of the European Patent Office may only be based on grounds or evidence on which the parties concerned have had an opportunity to present their comments. In accordance with established case law, this means that not only must an opportunity to present comments be given, but these comments must also be actually taken into account. As the decision "on the state of the file" expressly states that no submissions of the applicant were filed after the final communication, and that the decision was based only on the first, second and fourth communications all issued before the date of the applicant's final submission, objectively considered, the fourth reply of the applicant has not been taken into account. Since the applicant's fourth reply contains a number of new arguments, it follows that the examining division did not consider these arguments when taking their decision. Moreover, at least some of these comments may be seen as a response to the examining division's having presented a new factual
basis for objecting to the claims in its fourth communication.

In consequence, by ignoring potentially significant arguments presented in a reply following a communication containing a new objection, the applicant has been denied its right to comment on all the grounds for refusing the application. Hence, the board concludes that the applicant's right to be heard enshrined in Article 113(1) EPC has not been respected.

1.2 Rule 68(2) EPC 1973 (now Rule 111(2) EPC)

1.2.1 In accordance with Rule 68(2) EPC 1973 (now Rule 111(2) EPC), all decisions issued by the EPO must be reasoned. Although the Guidelines E-X, 4.4, suggest a procedure for issuing a decision "on the state of the file" taking a standard form, a number of decisions of the EPO Boards of Appeal (cf. T 1309/05, T 1356/05) have pointed out that a standard decision form for issuing a decision "on the state of the file" which refers to several communications, leaving it up to the board of appeal to construct the applicable reasons by "mosaicing" various arguments from the file, or which leaves it in doubt which arguments apply to which claim version, does not meet the "reasoned" requirement of Rule 68(2) EPC 1973.

1.2.2 In the present case, the wording of the impugned decision does not allow the applicant or the board to properly discern the grounds on which the examining division has refused the application. In the three communications referred to in the decision, ie the first, second and fourth communications, numerous
objections are raised against three different versions of the claims. In the fourth communication, the final version of claim 1 is attacked on the basis of D1 alone, and apparently (by means of a reference to original claim 19 dealt with in the first communication) on the basis of D1 as closest prior art combined with D2. There is also a reference to a "result to be achieved", which conventionally refers to an objection under Article 84 EPC (although Article 84 is not mentioned in the communication). In addition, the fourth communication (point 2.2) seems to suggest that D2 could if necessary be combined with D1 to render the distinguishing features identified with respect to D1 obvious, for reasons "as described in detail in the second official communication". In the second communication on the other hand lack of inventive step based on D2 as closest prior art combined with D1 is alleged, ie these two approaches are not consistent. There are also objections to claim 1 in the second communication relating to a lack of clarity under Article 84 EPC, but it is unclear from the decision whether these objections were still considered to apply at the time the impugned decision was taken. In the first communication (based on substantially different claims), lack of novelty is alleged with respect to D1; in addition, lack of inventive step based on D2 alone is alleged, although with only minimal substantiation.

Hence the decision potentially encompasses a plurality of objections, and it is unclear which of the whole gamut of objections were applicable to the final version of the claims. Moreover the objection of lack of inventive step based on a combination of D1 and D2
is pieced together from different communications with no common chain of argumentation.

1.2.3 In view of the above, the board takes the same view as in above-cited cases T 1309/05 and T 1356/05 that the form of decision adopted by the examining division in the present case was not appropriate for meeting the requirements of a reasoned decision within the meaning of Rule 68(2) EPC 1973 (now Rule 111(2) EPC).

1.2.4 In addition, it is the consistent case law of the boards of appeal (cf. eg T 740/93, point 5.4 of the reasons for the decision) that a "reasoned" decision should deal with all important issues of dispute. In the present case, none of the three communications referred to in the decision respond explicitly to the applicant's arguments submitted in the first to third replies, whilst as noted above the decision does not deal with the new arguments provided in the applicant's fourth reply. Indeed, the only communication directly responding to arguments put forward by the applicant is the third communication, which is not referred to in the impugned decision. The board thus considers that the failure to deal with the arguments submitted by the applicant also infringes Rule 68(2) EPC 1973 (cf. Rule 111(2) EPC).

1.2.5 Accordingly, the board concludes that a substantial procedural violation has been committed.
1.3 Reimbursement of the appeal fee

In the light of the board's conclusion that a substantial procedural violation has been committed, and considering that for the reasons given below the appeal is allowable, the board deems that reimbursement of the appeal fee as requested by the appellant in the oral proceedings is equitable in the present case (cf. Rule 67 EPC 1973, Rule 103(1)(a) EPC).

1.4 Remittal of the file to the department of first instance

According to Article 11 RPBA, a board shall remit a case to the department of first instance if fundamental deficiencies are apparent in the first instance proceedings, unless special reasons present themselves for doing otherwise. In the present case, the board takes the view that remittal to the examining division would be inappropriate given the already advanced age of the application and the considerable further delay which would ensue from remittal. Moreover, the appellant made clear in the oral proceedings its desire for the board to decide on the case. Therefore, the board has exercised its discretion to decide on the merits of the case itself, as it is empowered to do under Article 111(1) EPC (cf. G 10/93, OJ EPO 1995, 172, paragraph 5 of the reasons for the decision).

2. Compliance with Article 123(2) EPC

2.1 In the following analysis, the board refers to the published application WO-A-95/29559, unless otherwise indicated. Line numbers refer to the numbering in the
left margin of the published application rather than the actual line numbers.

2.2 Claim 1 is based on claims 2 and 19 as filed with the following modifications and additional features derived from the description:

The features "data signals representing respective sequences of pictures extending over a given GOP time period" and "said given GOP time period is the same for each of the plurality of channel processors" are derived from the embodiment described on page 27, line 18 - page 28, line 13 of the description. In this embodiment, the given GOP period, which is the same in each channel, extends across a GOP boundary in some channels. Consequently the sequence of pictures need not belong to a single GOP, but only extend over a GOP period. Hence these features are disclosed in the application as filed.

The feature "a complexity output terminal adapted to produce a signal representative of the complexity of the entire sequence of pictures represented by the data signal at the data input terminal" is based on original claim 19, which provides support for a single signal representative of the complexity of an entire group of pictures, in combination with page 28, lines 4-7 of the description, from which it is inherent that a sequence of pictures extending over one GOP period may be derived from two GOPs.

The feature "the bit rate allocator is adapted to generate a separate bit rate quota signal for each channel processor, the separate bit rate quota signals
being valid for the entire GOP time period following the given GOP time period" is disclosed on page 11, lines 9-11 together with page 19, lines 12-14 of the description.

The amendment to replace the wording "equal to" by "based on" in claim 1 (cf. claim 1, second page, line 5) is disclosed on page 18, line 21 of the description.

Hence the board is satisfied that claim 1 meets the requirements of Article 123(2) EPC.

3. Compliance with Article 84 EPC

The board considers that claim 1 as amended clearly expresses the matter for which protection is sought. In particular it is now clearly expressed that the complexity output terminal of each channel processor is adapted to produce a signal representative of an entire sequence of pictures extending over a given GOP time period, and that the bit rate quotas are valid for the entire following GOP time period. Moreover, with regard to the argument raised in the fourth communication of the examining division, the board is satisfied that claim 1 in its present form neither defines "a result be achieved" nor is merely a statement of the underlying technical problem.
4. **Claim 1 - novelty and inventive step (Articles 52(1), 54 and 56 EPC)**

4.1 The present invention relates to a multiplexing system for multiplexing several video sources into an output bit stream with a constant bit rate, whereby the bit allocation for each individual source is allocated dynamically. The signals to be multiplexed comprise respective sequences of pictures extending over a given GOP (GOP = "group of pictures"; this term comes from MPEG coding, whereby a GOP consists generally of 12 or 15 pictures or frames). A "constant" bit rate encoding principle is used (i.e. for a particular rate setting, a constant bit rate is output), but the bit rate is set dynamically according to a "complexity representative signal" determined from the sequence of signals extending over a GOP interval, for use in the following GOP interval.

4.2 **Novelty with respect to D1 (Articles 52(1) and 54 EPC)**

D1 differs from the subject-matter of claim 1 in that there is no mention of a video coding method making use of a group of pictures, and hence no complexity signal representative of an entire sequence of pictures extending over a GOP time period, or of a bit rate allocation valid for an entire GOP time period. Hence the subject-matter of claim 1 is novel with respect to D1.

4.3 **Novelty with respect to D2 (Articles 52(1) and 54 EPC)**

4.3.1 The board considers D2 to be the document representing the closest prior art, since, unlike D1, it discloses a
multiplexing system with data signal sources representing respective sequences of pictures extending over the same GOP period (page 155, lines 11-12). It is therefore a more plausible starting point than D1, which apart from a short reference near the end of the document suggesting that individual video signals from separate sources may be multiplexed (cf. col. 9, line 62 - col. 10, line 3), deals entirely with the multiplexing of sub-images of a single HDTV image, without any suggestion of GOP-based processing.

4.3.2 More particularly, D2 discloses a statistical multiplexer operating normally in variable rate mode. However, in situations of buffer overflow, the system is constrained to operate in constant rate mode (page 157, lines 4-10). This is the mode that comes closest to the present invention.

4.3.3 As in the presently claimed invention, signals are produced representative of the complexity of the source data signals, and bit rates R are allocated to each signal channel in accordance with the relative complexities X of each video source signal (cf. D2, page 156, equation 2.4; although this equation is presented in association with the variable rate mode of operation, it appears to apply implicitly to both variable and constant rate modes).

In the constant rate mode of D2, bit rate allocation is carried out afresh for each multiplexing period, or "epoch" (page 157, line 6; page 158, paragraph c)). A signal is produced representative of the complexity of each source every epoch. An epoch is defined to be one-sixth of a frame period, i.e. in the example given in
D2 of a GOP consisting of 15 frames, there are ninety updates of bit rate per GOP time period (page 157, last section and page 158, paragraph c)).

Hence the subject-matter of claim 1 differs from the disclosure of D2 in that, as claimed, there is one update per GOP time period based on signals representative of the complexity of the entire picture sequence of the GOP, whereas according to D2 both the complexity representative signals and the update period are based on one-ninetieth of a GOP time period.

Hence the subject-matter of claim 1 is novel with respect to D2.

4.4 Claim 1 - inventive step (Articles 52(1) and 56 EPC)

4.4.1 Starting from the disclosure of D2, the objective technical problem can be considered as being to provide simplified processing and improved bit rate fluctuation behaviour in an environment of video coding using dynamic bit rate allocation.

4.4.2 The board is not aware of any prior art document which solves this problem by performing updates only once per GOP period, based on complexity signals representative of a whole sequence of pictures extending over a GOP period.

4.4.3 With regard to D2, the appellant in the statement of grounds argued the following:

"As in our patent application, problems raised in D2 relate to image quality, buffer overflow (last
paragraph of page 159). Nevertheless, the document proposes a bit rate control at an "instant" level as $R_i(t+1-T)$ corresponds to an instant $t+1-T$, or more precisely at a "multiplexing epoch" level.

Consequently, although D2 discloses the use of GOP structures for determination of a cyclostationary period, to estimate $R$, this document doesn't propose a bit rate control at a gop level for solving such problems.

In fact, if D2 discloses the GOP structure, it's only to benefit of its cyclostationary characteristic. An epoch duration is less than a frame period, a fortiori a gop period. In an example, a gop duration corresponds to 90 multiplexing epoches [sic].

The one skilled in the art having to solve such problems would be taught away, through the teaching of D2, from our invention, i.e. a rate control at a gop level as such a solution is not suggested in D2 although buffer overflow, statistical multiplexing and gop structure are disclosed."

The board finds this argumentation persuasive. D2 makes use of the GOP period to achieve cyclostationary buffer behaviour by basing its complexity calculation for a particular epoch on the bit rate allocations of an epoch occurring exactly one GOP period earlier, but fails to recognise that the processing can be simplified by producing one complexity signal representative of the whole GOP period, in order to calculate bit allocations valid for the whole following GOP period. Indeed, the invention apparently retains
GOP-based cyclostationary properties achieved by D2, but with a drastically reduced number of bit rate computations per GOP.

4.4.4 The board considers further that whilst a skilled person would obviously be aware that any choice of a longer multiplexing epoch could reduce the processing to be performed, a change from the very short multiplexing epoch of D2 to the GOP period cannot be regarded as a mere obvious choice of an arbitrarily longer period. In this respect, the GOP period is one to two orders of magnitude greater than the multiplexing epoch proposed in D2, so that it is unlikely to be arrived at in the course of routine experimentation. This is even more evident from the passage on page 158, paragraph c) of D2, which states: "Thus, to limit the degradation caused by keeping the rate control active outside congestion intervals, the multiplexing epoch must approximately match the extend [sic] of the congestion duration. In this study the multiplexing epoch is set to 1/6th of a frame, or 5.5 msec". This clear guidance as to the approximate duration of the multiplexing period would lead a skilled person away from experimenting with much longer periods. Therefore, a skilled person using common knowledge or attempting routine experimentation on the arrangement of D2 would not arrive at the claimed invention.

4.4.5 It is further noted that even if the teaching of D1 were considered, either alone or in combination with D2, a skilled person would not arrive at the claimed solution. D1, which is not concerned with video sources which are coded using a "group of pictures"-based
The board concludes that the subject-matter of claim 1 is not obvious having regard to the state of the art. Hence claim 1 meets the requirements for an inventive step (Articles 52(1) and 56 EPC).

5. Further prosecution

The board has considered dependent claims 2-18 and finds no reason to raise any objection.

However, the description is currently not adapted to the claims on file. Moreover, the reference to D2 on page 4a does not appear to reflect accurately the relevant prior art contained therein.

The board however considers that these matters are best dealt with by the examining division.
Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the examining division with the order to grant a patent on the basis of the main request filed at the oral proceedings and a description yet to be adapted.

3. The appeal fee is reimbursed.

The Registrar: 

The Chairman:

D. Magliano 

A. S. Clelland